DRAFT REMEDIAL ACTION PLAN
East Slag Pile Landfill
Former Kaiser Steel Mill Site
Fontana, California

Project No. 115008

December 2006

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Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
B(a)P	benzo(a)pyrene
CCG	CCG Ontario, LLC
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Constituent of Concern
COPC	Constituent of Potential Concern
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ESP	East Slag Pile
IT	IT Corporation
LEL	lower explosive limit
LFG	landfill gas
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
ppmv	parts per million by volume
PRG	preliminary remediation goal
RAA	remedial action alternative
RAO	remedial action objective
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
SCS	SCS Engineers
STLC	Soluble Threshold Limit Concentration
SVOC	semivolatile organic compound
TBC	to be considered
TPH	total petroleum hydrocarbons
VOC	volatile organic compound
yd^3	cubic yards
µg/dL	micrograms per deciliter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter

Executive Summary

This Remedial Action Plan (RAP) describes a proposed remedy to control environmental hazards at the East Slag Pile (ESP) Landfill and surrounding area, the ESP Landfill Area, in Fontana, California. The ESP Landfill was once used to dispose of waste materials from the now-closed Kaiser Steel Mill. A remedy is now proposed to protect human health and the environment by capping the ESP Landfill Area with a soil cover, constructing a landfill gas (LFG) collection system, and placing a deed restriction on future land uses. This RAP describes how the proposed remedy was chosen and invites public review and comment as required by Section 25356.1 of the California Health and Safety Code. More information about the remedy selection and the field and laboratory information on which it was based, can be found in the Remedial Investigation/Feasibility Study (RI/FS) (Shaw, 2006).

The ESP Landfill Area is part of 592.1 acres of former Kaiser land purchased for redevelopment by CCG Ontario LLC. (CCG), a wholly owned subsidiary of Catellus Development Corporation that has since been acquired by ProLogis. The Kaiser land lies west of the city of Fontana, north of Interstate Highway 10 and east of Interstate Highway 15, in unincorporated San Bernardino County, California (Figure 1). A Consent Order between CCG and the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), dated August 10, 2000, governs environmental cleanup activities on this land. This RAP was prepared pursuant to sections 5.2.3.1 and 5.11 of the Consent Order.

Background Information

The ESP Landfill Area consists of a 25.5-acre landfill (the ESP Landfill) and a 10.9-acre surrounding area, which is part of the East Slag Pile, a steep-sloped, flat-topped man-made hill (Figure 2). It is bounded by Valley Boulevard on the south, a large, single-story warehouse on the west, Mulberry Ditch on the east, and the Consolidated Waste Cell (CWC; former Chem West Upper Facility), Chrome Ponds, and Wastewater Treatment Plant on the north. The CWC, Chrome Ponds and Mulberry Ditch are currently undergoing investigation and remediation under DTSC oversight. California Steel Industries now operates the Water Treatment Plant. The land uses within 3 miles of the ESP Landfill Area are low-density industrial and residential uses. To the west, other parts of the Kaiser site have been remediated, graded, and redeveloped for industrial use. Valley Boulevard now occupies what was the southwest corner of the East Slag Pile, a short distance from the ESP Landfill Area boundary. The nearest industrial and commercial sites are new warehouses and commercial buildings adjacent on the east, west and south sides. The closest such site, the warehouse to the west, extends to within about 100 feet from the ESP Landfill Area boundary. The nearest residential areas are a little over 1/4 mile east of the ESP Landfill Area, along Calabash Avenue, and the nearest schools are 1.5 miles to the south. Figure 3 shows the locations of the nearest residential areas and schools. No parks or recreational areas exist in the immediate vicinity.

The ESP Landfill Area was part of the former Kaiser Steel Mill (1942–1983). While the East Slag Pile itself consisted mostly of iron and steel slag, a landfill reportedly operated on its surface from 1943. Materials disposed included plant rubble, furnace slag, brick, sections of pipe potentially coated with asbestos containing materials, sludge from various mills and treatment processes, lime neutralized waste pickle liquor, waste oil, ash, and aluminum debris. From 1979 to 1983, the ESP Landfill operated as a Class III landfill permitted by the California Solid Waste Management Board and the Santa Ana Regional Water Quality Control Board (RWQCB). Little waste went to the landfill after the mill closed in 1983. Except for about 135,000 yd^3 of soil and waste from the aggregate mining of the West Slag Pile, and the consolidation of piles of dispersed solid waste (approximately 175,000 yd^3) located to the northwest of the landfill, no other waste was accepted after June 30, 1985. The waste-consolidation activity occurred when dispersed wastes of the types once placed in the ESP Landfill were excavated and removed from an area immediately northwest of the ESP Landfill.

Contaminants in Environmental Media

The landfill contains about 1,510,000 cubic yards (yd^3) of waste, including about 600,000 yd^3 of solid waste (such as brick, scrap metal, plastic, concrete rubble, wood, gravel, and soil), 532,000 yd^3 of industrial inert solids and residues, and 59,000 yd^3 of blast-furnace gas washer residue. In 1990, SCS (1990a) excavated five trenches into the landfill surface and described the wastes as:

- **Blast Furnace Gas Washer Water Sludge (BFGWWS) -** made up 10 to 12 percent of the volume examined by SCS. This material contained about 1,500 to 3,000 milligrams per kilogram (mg/kg) lead and 4,500 to 7,000 mg/kg zinc. The BFGWWS also contained up to 15 mg/kg total polynuclear aromatic hydrocarbons (PAHs). Iron content may be up to 10 percent.
- **Mixed BFGWWS –** this black to grey to reddish waste, made up 12 to 15 percent of the waste observed. This material had some characteristics of BFGWWS but contained lower concentrations of lead and zinc and higher concentrations of iron. Lead concentrations ranged up to about 1,000 mg/kg and zinc concentrations up to nearly 9,000 mg/kg. Only traces of PAHs were found. Total phthalates were found at concentrations of up to 16 mg/kg. Iron concentrations ranged up to about 20 percent.
- **Limey Sludges –** these white to light grey sludges made up 10 to 12 percent of the volume examined. These materials did not have high concentrations of the tested heavy metals. Samples contained up to 10 percent phthalates.
- **Oily Sludges –** this black to dark grey waste, made up 12 to 15 percent of the waste observed. These materials did not have high concentrations of the tested heavy metals but contained up to 32 percent iron. TPH concentration ranged up to 110,000 mg/kg. Up to 2 mg/kg pyrene was found.

- **Coke Waste -** waste comprised of coke dust and other coal or coke derived material, was found in only one of the five trenches. It was assigned an approximate percentage of 5 percent, which may not be representative of the landfill in general.
- **Mixed Debris -** material made up 50 percent of the volume examined by SCS, consisting of bricks, scrap metal, plastic, concrete rubble, wood, gravel, and soil.

After landfill operations ceased in 1985, investigations were made between 1989 and 2005 to explore the site and the materials present, assess potential hazards to human health and the environment, and develop remedies to correct those hazards. These were performed in consultation with the DTSC, using site-specific chemical and soils data, and are summarized in the RI/FS (Shaw, 2006). This process defined the following Constituents of Concern (COCs), or chemicals at the site that could pose potential health risks to persons exposed to them:

- Arsenic
- Chromium
- Lead
- PCB (Aroclor 1242)
- Semivolatile organic compounds (SVOCs) such as benzo(a)pyrene
- Volatile organic compounds (VOCs) such as benzene, methane, and toluene

Selection of Remedial Alternative

Selecting the proposed remedy for the ESP Landfill involved the following steps as detailed in the RI/FS (Shaw, 2006):

- Developing remedial action objectives (RAOs) and other evaluation criteria
- Identifying Applicable or Relevant and Appropriate Requirements (ARARs)
- Screening technologies that could be used to remediate the site
- Defining the candidate remedial action alternatives (RAAs) and their components; and
- Analyzing each RAA against appropriate criteria and selecting the proposed alternative

RAOs are specific goals for protecting human health and the environment. They describe the performance criteria for remedial actions needed to protect human health, ecological receptors, or both. For the ESP Landfill, the following RAOs were developed (Shaw, 2006):

- Eliminate or minimize direct human contact with the media of concern
- Eliminate or minimize wind contact with the media of concern
- Eliminate or minimize storm-water contact with the media of concern
- Eliminate or minimize the potential for uncontrolled migration of landfill gas (LFG) and VOCs
- Minimize the need for future maintenance of the containment system

- Achieve compliance with local, State and Federal regulations
- Be compatible with future land use of the site

ARARs are the Federal and State environmental laws and regulations, known as “applicable or relevant and appropriate requirements” that govern remedial actions at the ESP Landfill. Briefly stated, an *applicable requirement* is an enforceable standard that directly pertains to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a site. A *relevant and appropriate requirement* is one that is not applicable but addresses problems or situations very similar to those at a site.

ARARs can be location-specific, chemical-specific, or action-specific requirements. Here, there are no location-specific ARARs. Chemical-specific ARARs for the ESP Landfill include:

- Provisions of the Resource Conservation and Recovery Act (RCRA) that define hazardous waste

- Maximum contaminant levels from the Safe Drinking Water Act (and corresponding State laws) for contaminants in water

- Primary and secondary standards for ambient air quality from the Clean Air Act (referenced in rules of the South Coast Air Quality Management District (SCAQMD) that are approved parts of the State Implementation Plan)

- Methane concentrations limits at a landfill boundary of no more than the lower explosive limit (LEL) of 5 percent methane in air, and limits at any landfill structure of no more than 25 percent of the LEL per 27 CCR 20919

Action-specific ARARs pertaining to the ESP Landfill include:

- California's Porter-Cologne Water Quality Control Act, which is the basis for many water-quality requirements found in the Santa Ana River Basin Water Quality Plan and various State Water Resources Control Board (SWRCB) resolutions

- SCAQMD rules governing emissions of gases, particulate matter, and fugitive dust, as well as air-quality-related nuisance conditions that are approved parts of the State Implementation Plan pursuant to the Clean Air Act

- Stormwater discharges during and after construction, regulated by National Pollutant Discharge Elimination System general permits under the Clean Water Act

- Various provisions of the California Civil Code and the California Health and Safety Code governing land-use restrictions placed on property as institutional controls

- Joint regulations of the SWRCB and the California Integrated Waste Management Board in Title 27 of the California Code of Regulations (CCR), which provide that capping is the presumptive remedy for Class III landfills

- SCAQMD Rule 1150, requiring mitigation when an inactive landfill is excavated
- SCAQMD Rule 1150.1(h), setting requirements for landfill gas controls and boundary sampling probes, and incorporating the substantive requirements of 27 CCR 20918

In addition, DTSC regulations in 22 CCR, Division 4.5, were considered but found not to be ARARs. Although relevant, these regulations concerning hazardous-waste management were considered to be neither applicable nor appropriate.

A preliminary screening of technologies was made to consider the many potential remedies available, discard those that were clearly less suitable, and formulate combinations of remedies to be evaluated in detail. Containment, the presumptive remedy for nonhazardous solid waste (municipal) landfills, applies to the ESP Landfill. Other options, such as excavation and stabilization in place, were considered but rejected. Some technologies were not effective as stand-alone remedies but were effective if combined with other technologies. All technologies were screened for cost, effectiveness, and implementability.

Five RAAs were developed via the technology screening as candidate alternative:

- RAA 1: No Action
- RAA 2: Prescriptive Cover (Title 27) with Deed Restrictions, LFG Collection System, and Post-Closure Development
- RAA 3: Monolithic Cover (Title 27 Alternative) with Deed Restrictions, LFG Collection System and Post-Closure Development
- RAA 4 Enhanced Monolithic Cover (Title 27 Alternative) with Deed Restrictions, LFG Collection System, and Post-Closure Development
- RAA 5 Prescriptive Cover (Title 22) with Deed Restrictions, LFG Collection System, and Post-Closure Development

Each cover option (RAAs 2 through 5) had two potential scenarios for post closure development:

1. A parking lot for light vehicles to provide all-weather, open-air parking space for attendees of California Speedway races and other events. The area would be used for compatible purposes when not needed for parking. The scenario includes an access route to and from local streets.
2. A heavy laydown or storage yard to provide storage and parking space for tractor-trailers, shipping containers, and heavy freight. It would allow for continuous usage by heavy forklifts and other hoisting equipment. This scenario would include a heavy-vehicle access route to and from local streets.

The selected alternative for remediating the site must satisfy each RAO and ARAR. In addition, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), at 40 Code of Federal Regulations (CFR) Part 300, lists nine evaluation criteria for making a detailed analysis of alternatives and selecting the proposed alternative. These nine criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility, or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

Based on the RI/FS analysis, construction of an enhanced monolithic cover (RAA 4) was chosen as the preferred remedy (Shaw, 2006). A monolithic soil cover uses plant transpiration and soil evaporation to minimize water from infiltrating through the cover. It differs from the Title 27 prescriptive cover, which uses a low-permeability soil layer to slow the downward movement of water. The specific thicknesses of the various cover components will be determined during the Remedial Design phase of the project. The enhanced monolithic cover will be designed to reduce potential infiltration of surface water into the landfill to a level between that associated with a Title 27 prescriptive cover and that associated with a Title 22 prescriptive cover. This will be done during final design and construction by careful choice of the soil used in the cover, restricting the allowable permeability. The degree of impermeability of the soil in the monolithic cover will be defined during the Remedial Design phase of the project.

The enhanced monolithic cover would be placed over the side slopes and benches, as well as on areas not otherwise developed. On the relatively flat upper surface of the ESP, an asphalt concrete pavement section for vehicular parking or storage to accommodate one of the possible post-remediation development scenarios would be designed and constructed to prevent direct human contact with waste and to reduce the permeability of the surface to minimize the likelihood of chemical migration to the groundwater. The enhanced monolithic cover will consist of three layers, as follows:

- A foundation layer at the base, consisting of rolled waste or soil
- A 3-foot thick (estimated) soil layer of select material
- An upper layer consisting of either a 1-foot thick (minimum) vegetative layer or (in parking or storage areas) an asphalt-concrete pavement for vehicular parking

A drainage system would be built to convey storm-water runoff from a 100-year, 24-hour storm event from the cover. The drainage system would consist of downdrain pipes and lined ditches draining into existing, off-site storm-water conveyances.

The selected remedy also includes measures for controlling LFG. Specific details regarding the control of LFG will be included in the Remedial Design document. An active LFG collection system consisting of horizontal collector pipes in gravel or slag-filled trenches will be installed under the entire cap, at a likely spacing of 200 feet. A manifold at the ends of the trenches will collect the LFG and treat it as necessary prior to venting it to the atmosphere. LFG probes, spaced 100 to 200 feet apart, will monitor for lateral migration of gas past the cover. The closer probe spacing will be used in areas where new buildings have been built nearby.

RAA 4 would include a minimum of 30 years of site maintenance. Site maintenance would consist of routine inspections of the cover and the gas collection system, maintenance of the drainage structures, and maintenance of the shallow-rooted vegetation or other material used to prevent erosion.

Institutional controls would be recorded on deeds at the site to prevent its use for residences, day care centers for children, long-term care hospitals, or traditional public or private schools for persons less than 21 years of age. Institutional controls must be recorded with the County of San Bernardino Auditor/Controller Recorder before DTSC grants final approval for completion of the remedy. All construction within 1,000 feet of the landfill must comply with 27 CCR 21190, which pertains to habitable structures.

Because the ESP Landfill Area is contiguous with, and downgradient from, the RCRA-regulated Consolidated Waste Cell and Chrome Ponds, an appropriate groundwater monitoring system will be put in place. Specific details regarding the groundwater monitoring system will be included in the Remedial Design document.

RAA 4 protects human health and the environment, fulfills all of the RAOs, and conforms to the ARARs. On this basis, RAA 4 is selected as the preferred remedy for the ESP Landfill (Shaw, 2006).

Public Involvement

Consistent with the Public Participation requirements for the RAP process, the public process includes:

- Development of a mailing list, including at a minimum all commercial, industrial and residential occupants within at least a 1/4 mile radius
- Preparation of a fact sheet

- Public notice
- A 30-day comment period

The public has access to the project documents for the ESP Landfill Area. Copies of the Draft Remedial Action Plan, California Environmental Quality Act (CEQA) determination, and other documents related to the site are available for review at the following locations:

Fontana Public Library
8334 Emerald Avenue
Fontana, California 92335
Tel: (909) 822-2321

California Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630-4732
Hours: 8 a.m. to 4 p.m. Please contact the file coordinators at
(714) 484-5337 or (714) 484-5336 to make an appointment.

The public may also comment on the project and the project documents. The 30-day public comment period begins **January 17, 2007** and ends on **February 15, 2007**, during which time the public can provide comments and questions about the draft Remedial Action Plan and proposed Negative Declaration. All comments must be postmarked or emailed by **February 17, 2007**, and sent to:

Greg Sweel, Project Manager
California Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630-4732
GSweel@dtsc.ca.gov

The comment period will include a public hearing on the RAP and the California Environmental Quality Act (CEQA) determination. Comments will be compiled, read, analyzed, and responded to by project staff, after which they and the responses will become part of the public record.

Administrative Record List

An Administrative Record has been compiled for the ESP Landfill. The Administrative Record is the complete set of documents considered or relied upon to select a response action. It includes:

- An index (the Administrative Record List)

- General and site-specific guidance documents
- Final reports such as the RI/FS and this RAP
- Technical and site-specific information
- Information or comments from interested parties and the public
- Responses of DTSC as the lead agency to public comments

The Administrative Record for the ESP Landfill decision may be examined during normal business hours at:

Fontana Public Library
8334 Emerald Ave.
Fontana, CA 92335
Tel. 909-822-2321

California Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4732
Tel. 714-484-5300

Appendix A contains a list of the materials contained in the Administrative Record.

1.0 Site Background

The ESP Landfill Area is part of the former Kaiser Steel Mill, which lies west of the city of Fontana, north of Interstate Highway 10 and east of Interstate Highway 15, in unincorporated San Bernardino County, California (Figure 1). It consists of a 25.5-acre landfill as well as a 10.9-acre surrounding area. The ESP Landfill Area, a part of the Kaiser Steel Mill property that was purchased by CCG, is bounded by Valley Boulevard on the south, a warehouse on the west, Mulberry Ditch on the east, and San Bernardino Avenue on the north. Figure 2 shows the relationships of the ESP Landfill Area to the East Slag Pile and to the larger property.

As part of the former Kaiser Steel Mill, which operated from 1942 to 1983, the East Slag Pile was mostly used to dispose of slag, a product of iron and steel production composed largely of calcium oxide (lime), silicon dioxide, and magnesium oxide. However, a landfill reportedly operated on the East Slag Pile's surface as early as 1943. Landfilled materials include plant rubble, furnace slag, waste brick, sections of pipe potentially coated with asbestos containing materials, sludge from various mills and treatment processes, lime neutralized waste pickle liquor, waste oil, ash, and aluminum debris.

From 1979 until 1983, the ESP Landfill operated as a Class III landfill under California Solid Waste Management Board Permit No. 36-SS-018, issued November 2, 1979. Waste discharge requirements for the facility were set by the Santa Ana Regional Water Quality Control Board Order No. 79-112, adopted August 31, 1979. The site was permitted to receive inert wastes, including industrial inert solids, blast-furnace gas washer-water sludge, waste firebricks, construction debris, metal scrap, and wood. Little waste went to the landfill after 1983 (SCS, 1990a). And, except for about 135,000 yd^3 of soil and waste from the aggregate mining of the West Slag Pile, and the consolidation of piles of about 175,000 yd^3 of dispersed solid waste located to the northwest of the landfill in 2002, no other waste was accepted after June 30, 1985.

1.1 Known Chemicals and Documented Releases

The ESP Landfill contains about 1,200,000 yd^3 of waste (SCS, 1990a) plus the 310,000 yd^3 of soil and waste brought to the landfill from aggregate mining and the consolidation of dispersed solid waste. About 600,000 yd^3 is solid waste such as brick, scrap metal, plastic, concrete rubble, wood, gravel, and soil. The remainder includes about 532,000 yd^3 of industrial inert solids and residues, and 59,000 yd^3 of blast-furnace gas washer residue (SCS, 1990a). Although contaminant releases from the site have not been definitively established, toluene has been detected in groundwater samples from downgradient wells. These detections will be evaluated as part of the post-closure groundwater monitoring. Also, relatively high concentrations of lead and zinc were found in soil south of the ESP Landfill Area. These elevated levels could be the result of runoff from the ESP, aerial deposition from traffic (due to the proximity to Valley Boulevard), or a combination of sources. In addition, a lower pH value found in a soil surface sample located outside of the southwest corner of the East Slag Pile, could have resulted from runoff from the East Slag Pile, considering that the native soils are alkaline.

Waste was present in both the main landfill, at a thickness up to 43 feet, and in an area of dispersed waste extending northwest from the main landfill (Figure 4). The dispersed waste occurred as isolated piles up to 12 feet high. These piles were removed to the main landfill in 2002. Also in 2002, impacted materials were found while excavating slag along the west slope of the ESP Landfill Area. The grading contractor found discolored soil and slag having a strong odor, and removed about 50,000 yd^3 of VOC-impacted soil. This soil was placed in the west Chrome Pond. Following the excavation, no confirmation samples were obtained. Based on the pre-excavation samples (samples 831057-2, -3, -4, -5, and -6 in Tables 1 and 2) and the subsequent sampling and analyses of the stockpiled soil in the Chrome Pond (Shaw, 2006), the constituents of potential concern (COPCs) in this material, including maximum and average observed concentrations, were:

- Arsenic (130 mg/kg and 23 mg/kg)
- Chromium (860 mg/kg and 194 mg/kg)
- Lead (188 mg/kg and 77 mg/kg)
- Nickel (1,300 and 103 mg/kg)
- Vanadium (540 mg/kg and 197 mg/kg)
- Zinc (2,100 mg/kg and 649 mg/kg)
- Benzo(a)pyrene (250 mg/kg and 25 mg/kg)
- Naphthalene (240 mg/kg and 26 mg/kg)
- Benzene (260 mg/kg and 39 mg/kg)
- Toluene (270 mg/kg and 53 mg/kg)
- TPH – Gasoline (3,400 mg/kg and 399 mg/kg)

The impacted material is thought to have been entirely removed. However, further investigation is planned at the base of the ESP Landfill Area west slope to confirm this removal.

The following subsections describe classes of chemicals evaluated within the landfill and the COPCs derived from them. This evaluation was based on the investigations described in Section 3. Figure 4 shows the locations at which the chemicals were detected.

1.1.1 Title 22 Metals

Iron and zinc were detected at the highest concentrations in the waste. Other detected metals were chromium and lead, of which the greatest concentrations were detected between 0.5 and 20 feet at sample locations G-2 and BH-1-20, respectively (SCS, 1990a). Chromium was also detected in shallower soil samples at concentrations exceeding background levels: 120 mg/kg in sample ESP-1 at 3 feet, 170 mg/kg in sample BH-1 at 5 feet, and 261 mg/kg in sample ESP-3 at 1 foot (SCS, 1990a). The maximum detected concentrations of lead (5,330 mg/kg), iron (199,000 mg/kg), and arsenic (44 mg/kg) exceed the respective industrial preliminary remediation goals (PRGs) (U.S. Environmental Protection Agency [EPA], 2004). Higher concentrations of arsenic (up to 130 mg/kg) were detected in the soil discovered during the 2002 grading and is addresses in Section 1.1. Another metal, zinc (12,700 mg/kg), was present at levels not exceeding the PRG.

1.1.2 Semivolatile Organic Compounds

PAHs were the major SVOCs found at the ESP Landfill, and benzo(a)pyrene (B[a]P) was chosen to represent PAHs for evaluation. In the landfill, the highest B(a)P concentration (2.6 mg/kg) was detected in BH-1 at 20 feet (SCS, 1990a). Higher concentrations of B(a)P (up to 250 mg/kg) were detected in the soil discovered during the 2002 grading and is addressed in Section 1.1. Neither B(a)P nor any other SVOCs were detected below depths of 20 feet in the wastes. Three deep borings drilled into the ESP (BH-1 through BH-3) in 1989 did not detect either B(a)P or any other SVOC below a depth of 20 feet. Concentrations of polychlorinated biphenyls (PCBs) were below detection limits in all but one of the deep soil boring samples collected during the Phase I Remedial Investigation (RI) (SCS, 1990a). One PCB (Aroclor-1242) was detected at 0.79 mg/kg in boring BH-2 at 6 feet (SCS, 1990a).

1.1.3 pH, Cyanide, and TPH

In the ESP Landfill Area, the pH levels reported at the surface and within the waste were strongly alkaline, ranging from 8.5 to 12.2 (SCS, 1990a; HLA, 1998). Acidic or alkaline soil tends to be naturally buffered (neutralized) over time. In the deepest samples collected from native soil, pH levels were generally lower, ranging from 8.5 to 10.1 (SCS, 1990a; HLA, 1998). According to SCS (1990a), cyanide was found in boring BH-2, in the landfill waste, at 170 mg/kg (10 feet bgs) and 280 mg/kg (21.5 feet bgs). Cyanide was also detected in much lower concentrations at various depths in borings BH-1, BH-2, and BH-3, as well as in surface samples G-1 through G-4. All of these locations were within the landfill boundaries. TPH was detected in all four samples collected from the trenches in the landfill, at concentrations ranging from 198 to 110,000 mg/kg (SCS, 1990a).

1.1.4 VOCs, Dibenzofuran, and Phenols

VOCs were detected in three trench samples at very low concentrations: toluene at 14 and 55 micrograms per kilogram (µg/kg) and 4-methyl-2-pentanone at 83 µg/kg (SCS, 1990c). However, the sampling and analytical methods used then are no longer considered valid and DTSC does not consider these data to be representative. The 2003 soil-gas survey also found detectable concentrations of VOCs. The SCS investigation (1990a) reported a detected phenol concentration in only one sample, BH-2 at a 10-foot depth at a concentration of 1.8 mg/kg. Sample BH-2 at a 6-foot depth reported a maximum dibenzofuran concentration of 31 mg/kg (SCS, 1990a). In soil discovered during the 2002 grading, higher concentrations of phenol (up to 4.4 mg/kg) and dibenzofuran (up to 63 mg/kg) were reported (IT, 2002).

1.1.5 Soil Gas

A soil-gas survey was conducted in 2003 to answer questions regarding VOC concentrations in the landfill soil-gas phase (Shaw, 2003). The results indicated that concentrations of benzene, a VOC, were up to 1,400 µg/L in soil gas. Methane was present at concentrations of up to 95,000 parts per million by volume (ppmv), which exceeds the lower explosive limit of 50,000 ppmv.

1.1.6 Constituents of Concern

Based on the data above and on the results of risk assessments employing them, the COPCs were reduced to the following list of COCs:

Constituents of Concern	Maximum Observed Concentrations [a]	Average Observed Concentrations [a, b]	Medium and Reference [c]
Arsenic	44 mg/kg [d] 130 mg/kg	6.6 mg/kg 23 mg/kg	Landfill wastes (SCS, 1990a) Impacted soil (IT, 2002; Shaw ,2006)
Chromium	520 mg/kg 860 mg/kg	77 mg/kg 194 mg/kg	Landfill wastes (SCS, 1990a) Impacted soil (IT, 2002)
Lead	5,330 mg/kg 188 mg/kg	633 mg/kg 77 mg/kg	Landfill wastes (SCS, 1990a) Impacted soil (IT, 2002)
Benzo(a)pyrene [e]	2.6 mg/kg 250 mg/kg	0.49 mg/kg [f] 25 mg/kg [f]	Landfill wastes (SCS, 1990a) Impacted soil (IT, 2002)
Naphthalene	13 mg/kg 240 mg/kg	1.4 mg/kg [f] 26 mg/kg	Landfill wastes (SCS, 1990a) Impacted soil (IT, 2002)
Benzene	1,400 µg/L [g] 90,000 µg/kg [h]	45 µg/L 41,000 µg/kg	Landfill gas (Shaw, 2003) Impacted soil (IT, 2002)
Toluene	55 µg/kg 71,000 µg/kg	24 µg/kg 24,800 µg/kg	Landfill wastes (SCS, 1990a) Impacted soil (IT, 2002)
PCB (Aroclor 1242)	0.79 mg/kg	Not Calculated [i]	Landfill wastes (SCS, 1990a)
Methane	95,000 ppmv [j]	7,900 ppmv	Landfill gas (Shaw, 2003)

[a] From various field and laboratory investigations, 1989 through 2005.
[b] Unless otherwise footnoted, averages were calculated using ½ the detection limit for values reported as below the detection limit.
[c] The impacted soil was reportedly removed from the ESP western slope in 2002.
[d] Milligrams per kilogram.
[e] Other polynuclear aromatic hydrocarbons were also detected.
[f] Values reported as below detection but with elevated detection limits were not included in the calculation of the average.
[g] Micrograms per liter.
[h] Micrograms per kilogram.
[i] An average was not calculated because there was only one sample reported to contain a concentration above the detection limit.
[j] Parts per million by volume (Methane lower explosive limit = 50,000 ppmv)

1.2 DTSC Involvement at the ESP Landfill

Kaiser Steel Corporation, the owner and operator of the steel mill, formerly managed the site pursuant to an Interim Status Document issued jointly on March 30, 1981, by the California Department of Health Services (DTSC's predecessor) and the EPA. After the 1983 mill closure, Kaiser Steel Corporation filed for bankruptcy reorganization in 1987. On August 22, 1988, the reorganized successor, Kaiser Ventures, Inc. (KVI), signed a consent order with DTSC regarding environmental response actions on about 800 acres of the former mill site (DTSC, 1988). Kaiser elected to pursue "single agency" designation for the land subject to the 1988 consent order and, in 1995, DTSC was designated as the administering agency by the AB 2061 Site Designation Committee. KVI was the lead party responsible for response actions.

CCG purchased about 592.1 acres of the former mill site in 2000 and assumed responsibility for the remediation related to that part of property. Consequently, CCG signed a second consent order on August 10, 2000. Under the 2000 Consent Order, DTSC remained the administering agency. Several remedial actions and construction projects have since taken place under the 2000 Consent Order. Under DTSC's supervision, CCG is now undertaking remedial action at the ESP Landfill Area as directed in section 5.2.3.1 of the 2000 Consent Order.

1.3 Scope and Role of Operable Unit

The Kaiser Steel Mill site has been divided into four Operable Units (OUs). An OU is a part of a large or complex contaminated site, divided based on geography, type of problem, or program timing; and which manages migration or that eliminates or mitigates a release, threat of release, or exposure pathway for that area. The ESP Landfill is in OU 3. Other nearby areas, such as the two Chrome Ponds and the Consolidated Waste Cell, are parts of OU4. They will undergo remedial action in the near future. OUs 1 and 2 generally consisted of contaminated areas elsewhere on the former Kaiser property, all of which have been remediated. The completion of remedial actions at the ESP Landfill will close out the OU3 activities specified in the 2000 Consent Order (DTSC, 2000). However, a work plan will be developed to investigate potential residual contamination from the 2002 grading in an area northwest of the ESP Landfill.

2.0 Remedial Investigation

Seven investigations were conducted between May 1990 and December 2003 to characterize the nature and extent of contamination within the ESP Landfill. They addressed not only the contamination within soils and waste materials, but also contamination within soil gas beneath the surface. Many of these investigations also included areas outside of the ESP Landfill. However, the summaries provided in this section address only those parts of the investigations and results that are relevant to the ESP Landfill.

2.1 1990 Phase I Remedial Investigation Report

The Phase I RI by SCS Engineers (SCS, 1990a) assessed the nature and extent of chemicals in the landfill by installing three deep soil borings (BH-l through BH-3) and collecting four surface soil samples (G-1 through G-4). Figure 4 shows the sample locations. The borings extended about 20 feet into native soil under the landfill. Samples from the borings were analyzed for pH, cyanide, metals, PCBs, PAHs, electrical conductivity, and chloride. Surface soil samples were analyzed for pH, electrical conductivity, cyanide, metals, and PAHs.

Results for slag and other landfill wastes showed elevated levels of lead, zinc, chromium, and copper. PAHs were detected near the ground surface, at depths between 5 and 11 feet. Lead was soluble at concentrations above the Soluble Threshold Limit Concentration (STLC) in four samples (BH-2 at 10 feet and 21.5 feet, G-1, G-2). Zinc was soluble at concentrations above the STLC in BH-2 at 21.5 feet (SCS, 1990a). No organic chemicals were detected in native soils. Inorganic chemicals, particularly lead and zinc, were either not detected or found at background levels. Metals concentrations in native soils were in the range of background (BH-1 at 70 feet and 88 feet, BH-2 at 80.5 feet, and BH-3 at 80 feet and 100 feet).

2.2 1990 Water Quality Solid Waste Assessment Test

The water quality solid waste assessment test report described the results of groundwater and vadose zone monitoring near the ESP Landfill (SCS, 1990b). As the assessment did not find contaminants in wells downgradient from the East Slag Pile, the report concluded that there was no evidence that the ESP Landfill contributed to groundwater degradation. However, the wells were not specifically designed and installed for landfill evaluation, and their location and construction may have affected the validity of that conclusion.

2.3 1990 & 1997 Sampling and Testing of Landfill Waste

Landfill waste was sampled and tested to estimate the approximate percentages of different types of wastes in the landfill (SCS, 1990c). Five trenches were excavated at the locations shown on Figure 4. Samples from the trenches were analyzed for metals, PAHs, TPHs, and VOCs. Tables

1 and 2 summarize the results. Because the methods used then to sample and measure VOCs are now thought to give nonrepresentative results, these data may not be valid.

In 1997, slag from the East Slag Pile was analyzed for leachability of selected metals using the California Waste Extraction Test (SCS, 1997). The object of the test was to assess the mobility of each metal under the strongly acidic conditions likely in Class III landfills. It therefore indicated if the potential existed for metals to migrate from the ESP Landfill to groundwater. The results showed no detectable chromium or lead leaching from the slag. However, barium did leach at a concentration of 0.5 mg/L. The total concentrations of other metals in the slag did not exceed background levels, so they were not tested for leachable concentrations. For these and other reasons, DTSC determined in a letter dated January 6, 1998, that the slag was not a hazardous waste (DTSC, 2000). Although specific test data were not available for individual waste streams placed in the landfill, some samples from the ESP Landfill showed that zinc and lead apparently could mobilize at concentrations exceeding the STLCs (SCS, 1990a).

2.4 1990 Draft Phase 2 Remedial Investigation Report

The draft Phase II RI collected and analyzed five near-surface samples to characterize soils in parts of the ESP Landfill that had been identified as containing potentially contaminated soils (SCS, 1990d). Two samples were from the east part of the landfill and three in the area south of the landfill (Figure 4). The samples were analyzed for metals and PAHs to evaluate if surface-water runoff had transported chemicals outside the landfill boundary. It was concluded that there was no evidence of waste transport from the landfill by stormwater. However, concentrations of lead and zinc were at elevated levels. Those levels could have resulted from runoff from the East Slag Pile, aerial deposition from traffic on Valley Boulevard, or a combination of sources. In addition, a low pH value in the sample from G-15 could have resulted from runoff from the East Slag Pile, considering that the native soils are alkaline.

2.5 2000 Supplemental Investigation of ESP Waste Management Unit Western Boundary

Under contract to IT, Kleinfelder Inc. conducted a supplemental investigation to analyze borings and samples from the west boundary of the ESP Landfill. Kleinfelder drilled 32 borings to depths of 39 to 89 feet into the ESP and excavated 40 shallow test pits to define the landfill boundary. IT (2000) reported the results of Kleinfelder's investigation. Samples were collected to identify landfill debris, but not for chemical analysis. Figure 3 shows the waste limits, which define the landfill boundary.

2.6 2003 Landfill Soil-Gas Survey

A landfill soil-gas survey (Shaw, 2003) was made to investigate the nature and extent of LFG and VOCs in the landfill. Shallow soil-gas samples were collected by direct- push technology and hollow-stem auger, and analyzed at both an on-site mobile laboratory and a fixed-facility laboratory. Methane concentrations of 5 percent by volume (the LEL), or higher, were measured in 10 of 48 samples. Methane was detected at a maximum concentration of 95,000 ppmv, or 9.5 percent by volume. Most of the affected samples were obtained in the central part of the landfill. However, methane concentrations were lower than the regulatory threshold of 5 percent by volume at the landfill boundaries and at depth. Benzene was detected at concentrations of up to 1,400 µg/L in the same area where methane was detected.

3.0 Summary of Removal Actions

No removal actions, as defined in the regulatory sense, have been conducted at the ESP Landfill. However, there were two instances in which contaminated materials were relocated to the ESP Landfill during ongoing remediation activities that took place in 2000 and 2002. The first involved about 135,000 yd^3 of soil and waste from the aggregate mining operations at the West Slag Pile that were placed in the landfill in 2000 and 2001. The second consisted of the consolidation of approximately 175,000 yd^3 of dispersed solid waste that was excavated and placed into the landfill in 2002. This waste was delineated in the Western Boundary Investigation (IT, 2000) and was located to the northwest of the ESP Landfill.

4.0 Summary of Site Risks

The potential risks to human health and the environment at the ESP Landfill were evaluated by a three-step process. First, a conceptual site model was developed to describe what and where the contaminants were, and how and through what media they could be transported to human or environmental receptors. Second, a series of risk assessments were carried out to estimate the health and environmental risks accruing to the receptors. And third, the conceptual site model and risk assessments were reviewed and synthesized into a comprehensive statement describing the risks and their implications for remedial actions at the ESP Landfill.

4.1 Conceptual Site Model and Exposure Pathways

Using data obtained during the RI activities, a conceptual site model was developed for the ESP Landfill (Figure 5). The conceptual site model describes the:

- Source and nature of the wastes and chemicals of concern
- Contaminant release and transport mechanisms
- Characteristics of the site that influence fate, transport, and exposures
- Affected environmental media (surface soil, subsurface soil, air, water, etc.)
- Exposed or potentially exposed people, animals, and plants
- Complete or potentially complete exposure pathways

This conceptual model was used to develop the risk screening, site-specific remedial action objectives, and potentially applicable remediation technologies for the ESP Landfill.

The model's elements, including chemical sources, fate and transport, exposure pathways, and health-risk assessment, are based on the 1993 EPA model for a generic municipal landfill. The primarily affected medium is surface soil, and the potentially affected receptors are future site workers and trespassers. The complete or potentially complete exposure pathways are direct contact with the soil (ingestion and skin contact), inhalation of VOCs emitted into outdoor or indoor air, and inhalation of suspended particulates. Ecological species (mammals and birds) have been observed using the area for forage and perhaps for nesting. However, there are no known uses of the site by special-status ecological species.

4.1.1 Chemical Sources

The sources of the chemicals are industrial wastes. These wastes are primarily organic and inorganic chemical sludges and construction debris. Chemical characterization studies indicate that the waste within the ESP Landfill is relatively inert. Soil-gas surveys indicate that VOCs and landfill gas are also present. TPH was not selected as a parameter for risk assessment because it is a nonspecific chemical analyte. This is consistent with Section 2.5.4 of the Consent Order between the DTSC and CCG.

4.1.2 Release, Fate and Transport Processes

Inhalation of VOCs emitted into outdoor air is a potentially complete exposure pathway for this site. For model purposes, it was assumed that one or more buildings will be constructed. The pathway for inhalation of VOCs infiltrating into indoor air is therefore complete.

Under present conditions, water infiltrating through the wastes could produce leachate that could migrate to, and perhaps through, the soil zone above the water table. Available leachability test results for metals in wastes and slag (SCS, 1990a, 1997) show zinc and lead to be the only metals that apparently could mobilize at concentrations exceeding the STLCs. Benzene was detected in soil gas, meaning that it could dissolve in, and move downward with, infiltrating water. This pathway is potentially complete. Groundwater monitoring will be used to evaluate chemical mobility through the vadose zone.

Storm water could erode the surface waste and carry suspended or soluble chemicals from the site. Surface-water runoff eventually flows to the nearby San Sevaine Flood Control Channel or the adjacent Mulberry Ditch. Although contaminant releases from the site have not been definitively established, relatively high concentrations of lead and zinc were found in soil south of the ESP Landfill Area. These elevated levels could be the result of runoff from the East Slag Pile, aerial deposition from traffic (due to the proximity to Valley Boulevard), or a combination of sources. In addition, a lower pH value found in a soil surface sample located outside of the southwest corner of the East Slag Pile, could have resulted from runoff from the East Slag Pile, considering that the native soils are alkaline.

Most heavy metals have low mobility in alkaline soils although others (arsenic and hexavalent chromium) could have higher mobility. PAHs also have very low mobility in soil, particularly in the fine-grained sludge and other landfilled materials. The semiarid climate with an average annual precipitation of 15.32 and 16.82 inches per year (Fontana Kaiser Weather Station from 1951-1984 and 1971-2000, respectively) and relatively high pan evaporation rate of 64 inches per year (JMM, 1986) should limit infiltration of surface water into and through the wastes. It should be noted that under the present condition and during the unusual heavy rainfall years water infiltrating through the waste could have produced leachate. Maximum recorded annual rainfall is 35.05 inches and maximum daily rainfall is 6.07 inches.

Perched groundwater has been found at various levels in the ESP Landfill Area. The presence of this groundwater may increase the potential for contaminant leaching and transport deeper into the vadose zone and, possibly, even to the groundwater aquifer. Post-closure groundwater monitoring will investigate this potential.

4.1.3 Receptors and Exposure Pathways

The receptors for the ESP Landfill are trespassers, on-site workers, and off-site workers. On-site workers would be exposed to chemicals at the site through:

- Incidental ingestion
- Skin contact
- Particulate inhalation of wind and mechanically eroded dusts
- Inhalation of soil gases that are emitted to outdoor air
- Inhalation of soil gases that infiltrate into indoor air

Except for inhalation of soil gases that infiltrate into indoor air, trespassers may be exposed to chemicals via the same exposure pathways as on-site workers. However, the frequency, duration, and (potentially) contact rates would differ between workers and trespassers. Workers would be exposed more days per year and for more years than trespassers. Therefore, the risks to trespassers are likely lower than those to on-site workers.

Off-site receptors would only be exposed to chemicals emitted into the ambient air. Inhalation of eroded soil particulates and VOCs emitted into ambient air are potentially complete pathways.

4.2 Overview of Baseline Risk Assessments

Five risk assessments of the ESP Landfill, made between 1991 and 2005, are discussed below.

4.2.1 1991 Risk Assessment

In 1991, a draft preliminary risk assessment was made of just the ESP Landfill (SCS, 1991). It was mostly qualitative, and based only on the limited data then available and on toxicity and exposure parameters that are now obsolete. The assessment concluded that health issues of potential concern existed for direct-exposure pathways.

4.2.2 1995 Baseline Risk Assessment and 2005 Updates

Another health-risk assessment was made in 1995 (Environmental Risk Sciences, 1995) and updated twice since. The first update in 2002 (IT, 2002) used the original data to check if advances in the understanding of toxicity and exposure since 1995 would change the risk assessment conclusions or the identified chemicals of concern. The second update in 2005 (Shaw, 2005) concerned potential health risks from impacted soils found when the west slope of the ESP Landfill Area was graded in 2002. Because those soils were excavated and removed in September 2002, they may not be representative of the remaining soils. However, no confirmation samples were taken after the 2002 removal. As a result, July 2002 pre-removal data were used for the second update.

The original 1995 risk assessment (Environmental Risk Sciences, 1995) studied five receptor groups and exposure pathways:

- Current On-Site Workers who may be exposed to chemicals in soil from 0 to 10 feet below the surface due to soil ingestion, soil dermal contact, inhalation of wind-eroded soil, or inhalation of VOCs from below the surface. Ingestion of groundwater from the site as drinking water was also considered a complete exposure pathway.
- Future On-Site Workers who may be exposed in the same ways as Current On-Site Workers (above).
- Current Off-Site Residents who may be exposed to chemicals in soil from 0 to 10 feet below the surface due to inhalation of compounds in the air as a result of wind erosion of soil or volatilization of chemicals into the air.
- Future Off-Site Residents who may be exposed in the same ways as Current On-Site Residents (above).
- Future On-Site Residents (hypothetical) who may be exposed to chemicals in the top 10 ft of soil through soil ingestion, soil dermal contact, inhalation of wind-eroded soil, or inhalation of VOCs from the subsurface. Ingestion, dermal contact, and inhalation of VOCs emitted during use of site groundwater as drinking water were considered complete exposure pathways.

The risk assessment did not fully address potential risks associated with contaminants, if present, in the groundwater. The groundwater investigation is planned to address these risks.

The excess cancer risks were:

- 8×10^{-5} for on-site workers, current and future
- 4×10^{-8} for off-site residents, current and future
- 2×10^{-4} for hypothetical future on-site residents

Based on cancer risk, the chemicals of concern were found to be PAHs, PCBs, arsenic, and beryllium. No other chemicals of concern were identified based on noncarcinogenic effects. Projected blood lead levels were 4.0 µg/dL for on-site workers and 32.1 µg/dL for a child residing on the site. The level for the residential child was above the action level of 10 µg/dL, so lead was classified as a chemical of concern as well.

Risk Updates for Data Available for 1995

In 2002, a screening risk assessment was conducted to judge if the 1995 conclusions remained valid and if they were adequate for the assessment of remedial alternatives (IT, 2002). Both DTSC and EPA had revised their toxicity and exposure factors since 1995. To judge if these revisions substantively affected the risk characterization, 2000 PRGs were used in the new risk screening. These PRGs were appropriate for use because they were based on the same exposure pathways used in the 1995 baseline risk assessment (soil ingestion, soil-skin contact, and particulate inhalation). More recently, in 2005, the maximum detected concentration of each chemical was screened against 2004 PRGs to assess potential impacts of changes between 1995 and 2004 (Shaw, 2005). The 2005 screening was not intended to replace the 1995 baseline risk assessment. But it concluded that the 1995 risk characterization was appropriate.

The 2002 and 2005 screenings assessed chemicals in the soil and waste zone between 0 and 10 feet. Soil disturbance at greater depths was not considered because institutional controls would likely prevent such disturbance. The screening involved four steps:

- Soil samples collected within the landfill at depths of 0 to 10 feet were identified and summarized.
- The maximum concentration of each organic and inorganic chemical detected in the landfill at least once was identified.
- The maximum concentration of each metal was compared against the ambient high-end concentrations of metals in the area (SCS Engineers, 1990d, 1994). The high end is the value equal to the mean concentration plus two times the standard deviation (a value that approximates the 99 percent value of the ambient distribution). If the site maximum was less than the high-end ambient value, the metal was eliminated from further consideration.
- The site maximum values of all detected organic chemicals and those inorganic chemicals exceeding background were compared against PRGs for industrial soil. If the site maximum concentration of a chemical exceeded the associated PRG, it was considered a chemical of concern.

Tables 3a and 3b summarize the risk-screening results. The cancer risk and noncarcinogenic hazard index were estimated via PRGs using the equations provided in the PRG documentation. The estimated cumulative cancer risk was $4x10^{-5}$, which was comparable to the $8x10^{-5}$ estimated in the 1995 baseline risk assessment. In the 2002/2005 screenings and the 1995 baseline risk assessment, arsenic and PAHs contributed significantly to the cumulative cancer risk. The 2005 risk-screening results yielded an estimated hazard index of 0.2 and 7 (when lead is excluded and included, respectively). Lead was determined to be a chemical of concern in both the 1995 risk assessment and the 2002/2005 risk screenings.

Risk Screening for Soils Excavated from the West Slope

When the impacted soils found in 2002 along the landfill's west slope were excavated for removal, confirmation samples were not taken. Consequently, the chemical quality of the soil remaining on the slope was not defined. For the purposes of risk screening, the chemical properties of the excavated soils were assumed to be representative of the soil remaining in place. A risk screening (Shaw, 2005) based on these data was conducted using the maximum detected concentration of each chemical as the potential exposure point concentration.

A risk screening for soil on the west slope estimated a cancer risk for an industrial/commercial worker exposed to the soils via inhalation of dusts, incidental ingestion, and skin contact of 2×10^{-3}. This risk is primarily associated with B(a)P (risk is 1×10^{-3}) and other PAHs. However the risk for arsenic (8×10^{-5}) and benzene (6×10^{-5}) are also within the range of potential concern. The metals and other chemicals at the site might pose potential non-carcinogenic health effects to workers, as the cumulative hazard index is 1.5. However, the significant contributors to this cumulative hazard index are lead (hazard quotient of 0.2), vanadium (hazard quotient of 0.5), 1,3,5-trimethylbenzene (hazard quotient of 0.2), and toluene (hazard quotient of 0.1). The individual health end-point hazard indices for these constituents were all below 1.0. These chemicals have different target organs and mechanisms of toxicity and are unlikely to act via the simple additive toxicity assumed in this assessment.

Benzene and other VOCs in the soil on the west slope may also contribute to vapor-inhalation exposure pathways. This pathway was not quantitatively evaluated in this screening; however the results for vapor-phase benzene in other parts of the landfill are considered representative of potential vapor exposures on the west slope. That is, the residuals of these soils, if any, along the west slope of the landfill could result in unacceptable health hazards to workers on the landfill who are exposed to these chemicals in indoor air.

Ecological Risk Screening

The 1995 baseline risk assessment (Environmental Risk Sciences, 1995) included a Tier 1 ecological risk assessment, which identified potential ecological receptors based on a biological survey, and on physical, chemical, and biological characteristics of the wastes. The biological survey did not find endangered or threatened plants or animals, nor did it locate any wetlands. The receptor species for the ecological risk assessment were common species seen at the site, such as birds, lizards, rabbits, and squirrels.

4.2.3 2003 Revised East Slag Pile Landfill Feasibility Study Risk Assessment

Because of questions about VOC concentrations in the landfill soil gas, a soil-gas survey was conducted in 2003 (Shaw, 2003). This survey included a supplement to the risk assessment because the earlier assessments did not address exposures and risks from VOC inhalation. This exposure pathway was potentially complete for off-site workers who might be working there in the future, even if there are no such workers there today. Exposures were based on those at developments proposed for nearby parcels.

Exposures, risks, and health hazards for off-site workers were assessed using South Coast Air Quality Management District methods to estimate the air concentrations of benzene and other

VOCs that would create an excess cancer risk of $1x10^{-6}$, or a hazard index of 1, at two receptor locations. Those locations were a proposed new fire station at the ChemWest Lower Facility (residential receptors), and warehouses located south of Valley Boulevard (industrial receptors). Permissible air concentrations at these locations defined the maximum allowable emission rates for VOCs and, therefore, the maximum allowable rate for soil-gas flow from the ESP Landfill. Because the potential soil gas flow rate was less than the maximum allowable, it was concluded that risks were not higher than $1x10^{-6}$.

4.2.4 2nd Supplemental Risk Evaluation for Benzene in Soil Gas

An additional assessment of the 2003 soil-gas data was conducted (Shaw, 2005) to evaluate human health risks from benzene. The assessment found that known or potential benzene sources were mill sludges from various locations and facilities at the former steel mill. Persons potentially exposed to benzene included on-site residents and both on-site and off-site workers.

To assess risks to potential residents at the site, the ESP Landfill was assumed to be open and uncapped, with soil gas containing benzene moving from inside the landfill to the ground surface and then into a home. Two cases were studied for a hypothetical person living at the site:

- A maximum-exposure case, where the maximum benzene concentration measured at the site (1,400 μg/L) (Shaw, 2005) occurred at a source depth of 10 feet
- A reasonable maximum exposure (RME) case, where a concentration equal to the 95th percent upper confidence limit on the mean measured benzene concentration (250 μg/L) (Shaw, 2005) occurs at a source depth of 10 feet

The predicted risks of excess cancers were 2×10^{-2} and 3×10^{-3} for the maximum and RME cases, respectively.

Three potential occupational exposure cases were considered for on-site workers:

- Workers installing the cap and landfill gas collection system may be exposed for short-periods (such as 6 months) to benzene coming from inside the landfill
- Future maintenance workers may be exposed for a few days per year to relatively high benzene concentrations, assuming no gas collection system and soil cover is present
- Future on-site workers at the site on a daily basis may be exposed to benzene that has spread into the air, assuming no gas collection system and soil cover systems exist

For these cases, risks were assessed by estimating the benzene flow from the landfill into the air; estimating the resulting air concentration; and estimating cancer risks and health hazards using toxicity information from the California Office of Environmental Health Hazard Assessment. The results were as follows:

- For a construction worker installing the cap, the maximum-case risk was 3×10^{-6} and the RME case risk was $4 \times 10^{-7.}$
- For a maintenance worker, the maximum-case risk was 6×10^{-6} and the RME case risk was $9 \times 10^{-7.}$
- For future on-site workers at the site daily, the maximum-case risk was 1×10^{-4} and the RME case risk was $2 \times 10^{-5.}$

The results of the risk assessment showed that benzene can be a COC under the conditions of unrestricted land use and uncontrolled emission of landfill gas.

4.2.5 3rd Supplemental Risk Evaluation for Benzene in Soil Gas

At DTSC's request, a third supplement evaluated potential risks to adult workers exposed to benzene accumulating in indoor air (Shaw, 2005). This assessment assumed that a single-story building on a slab foundation would be built on top of the ESP Landfill. The assumed exposure parameters were an exposure frequency of 250 days per year, exposure duration of 25 years, and a non-carcinogenic averaging time of 25 years. The default carcinogenic averaging time of 70 years was retained for this evaluation. As in the other supplemental evaluations, two exposure cases were considered: the maximum (worst case) scenario using a benzene concentration of 1400 µg/L (1,400,000 µg/m3) at a source depth of 10 feet, and an RME exposure case based on the 95% upper confidence limit exposure concentration of 250 µg/L (250,000 µg/m^3) at a source depth of 10 feet. The results showed that the cancer risk from benzene in the worst case is 4×10^{-3} and for the RME case is 7×10^{-4}. Both values exceed the risk guideline of 1×10^{-4}, indicating that additional action is required. The hazard quotients for the worst and RME cases are 6.6 and 1, respectively. Again, the worst-case result exceeds the threshold of concern of 1.

4.2.6 Conclusions of Risk Assessments

The 1995, 2002, 2003, and 2005 risk assessments for the ESP Landfill found arsenic, benzene, PAHs, and lead to be chemicals requiring risk management. Given the nature and extent of chemicals, the risk assessments concluded that potential engineering and administrative controls that can prevent wind and water erosion of the wastes and prevent people from coming into direct contact with the wastes should be considered. Engineering and administrative controls also should be evaluated for compatibility with any future land use. The risk assessments also concluded that a land use restriction prohibiting residential use at this location is appropriate.

4.3 Conclusions Regarding Environmental Risks

This section addresses the chemicals, media, and receptors of concern, as well as the exposure pathways, for the ESP Landfill. The media of concern are the solid waste materials and LFG, including VOCs. The slag is not a medium of concern because it is not a hazardous waste and has been approved by the DTSC for use as construction fill. Within the solid waste materials, arsenic and B(a)P are the constituents of concern. However, the waste material also contains elevated concentrations of other metals (such as lead) and other PAHs. Future site workers are the individuals of greatest concern. If no remedial actions are taken, adults could be exposed to chemicals of concern through direct contact and inhalation of wind-eroded wastes. Within the soil-gas phase, benzene and methane are of greatest concern. Benzene could pose a threat to a person working on top of the site in a building.

For the Phase 1 investigation, SCS (1990a) tested metals leachability of 16 samples from the ESP Landfill. The boring logs indicated that the samples represented a mixture of various waste streams and slag. SCS found lead to be soluble at concentrations above the STLC in four samples (BH-2 at 10 feet and 21.5 feet; surface samples G-1 and G-3). Zinc was also reported to be soluble in a concentration above the STLC in one sample (BH-2 at 21.5 feet). For other metals, the concentrations in the leachate were either below detection or below STLCs. Furthermore, background samples G-7 through G-12 yielded pH values of 8.6 to 9.6 (SCS, 1990a). These values indicate that the natural soil at the site is alkaline. Accordingly, metals that might leach from the ESP may encounter perched groundwater and may migrate through the vadose zone. This will be investigated and evaluated during post-closure groundwater monitoring.

Based on existing data, the waste has not been shown to pose a threat to surface-water quality. However, redevelopment of the areas surrounding the site could change the volume and velocity of runoff. Precipitation and runoff could erode the surface of the waste material and result in impacts to downgradient surface water or collected storm waters.

4.4 Determination of Cleanup Levels

The ESP Landfill is proposed to be closed in place; therefore, no cleanup levels were established.

5.0 Summary and Evaluation of Alternatives

There are four key elements to evaluating remedies for the ESP Landfill. These are:

- The remedial action objectives (RAOs), which are the goals of any remedy considered
- The Applicable or Relevant and Appropriate Requirements (ARARs)
- The preliminary screening of technologies that could be used to remediate the site
- Definition of the remedial action alternatives and their component activities

This section compares and analyzes the relative advantages and disadvantages of each RAA.

5.1 Remedial Action Objectives

RAOs are specific goals for protecting human health and the environment. The NCP specifies that RAOs must address the following site-specific elements:

- Chemicals of concern
- Media of concern
- Receptors of concern
- Complete or potentially complete exposure pathways

At the ESP Landfill, the RAOs were developed to evaluate the remedial alternatives and to protect human health and the environment. RAOs reflect evaluation of the results of the site investigations and risk assessments, as well as regulatory requirements. RAOs describe the remedial actions needed to protect human health, ecological receptors, or both. Narrative RAOs were developed as follows, based on the results of the site characterization and risk screenings (Shaw, 2006):

- Eliminate or minimize direct human contact with the media of concern
- Eliminate or minimize wind contact with the media of concern
- Eliminate or minimize storm-water contact with the media of concern
- Eliminate or minimize the potential for uncontrolled migration of LFG and VOCs
- Minimize the need for future maintenance of the containment system
- Achieve compliance with local, State, and Federal regulations
- Be compatible with future potential land use of the site

These RAOs are the foundation for developing suitable remedial action alternatives. The selected alternative for remediating the site must be shown to satisfy each RAO.

5.2 ARARs and Other TBC Criteria

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that remedial actions attain a general standard of cleanup that protects human health and the environment, is cost effective, and uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. CERCLA does not establish specific regulations to attain this standard. Instead, remedial actions draw on other Federal and State environmental laws and regulations, known as "applicable or relevant and appropriate requirements" (ARARs). The NCP defines "applicable" and "relevant and appropriate" requirements as follows:

> *Applicable requirements* means 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.
>
> *Relevant and appropriate requirements* means 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, 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.

Remedial actions must comply with the ARARs promulgated under any Federal environmental law or any more stringent standard promulgated under State environmental law. The selected remedy must attain and be consistent with the ARARs, unless these requirements are waived or a variance is granted.

Federal and State standards that lack general applicability or are not legally enforceable, policies, guidance documents, or local requirements are not ARARs. However, they can be considered when evaluating the remedial actions necessary to protect human health and the environment. These standards are the "to be considered" (TBC) criteria. Although TBCs are not potential ARARs because they are neither promulgated nor enforceable, they can be consulted to develop remedial goals when ARARs do not exist for particular contaminants or when information is needed as to how to carry out certain actions or requirements.

5.3 Location-, Chemical-, and Action-Specific ARARs

ARARs fall into three groupings: location-specific, chemical-specific, and action-specific requirements. Both State and Federal ARARs are shown on Table 4, which should be consulted for more information regarding the requirements and their applicability.

Location-specific ARARs are restrictions on maximum concentrations of hazardous substances or on the conduct of activities because of the specific location. The ESP Landfill is not located on a sensitive or protected area, and no location-specific ARARs were identified for the ESP Landfill.

Chemical-specific ARARs are health- or risk-based numerical values limiting the amount or concentration of a chemical that can be left in place or discharged to the ambient environment. Chemical-specific ARARs for the ESP Landfill include:

- RCRA provisions defining hazardous waste
- Maximum contaminant levels from the Safe Drinking Water Act (and corresponding State laws) for surface-water quality
- Primary and secondary standards for ambient air quality from the Clean Air Act (in SCAQMD rules that are approved parts of the State Implementation Plan)
- Vehicle emission standards per 13 CCR 1956.8 and 2423. These California Air Resources Board regulations as they pertain to oxides of nitrogen emission standards will be applied to haul trucks and dozers, respectively.
- Methane concentration limits at a landfill boundary of no more than the LEL (5 percent methane in air), and methane concentration limits in any landfill structure of no more than 25 percent of the LEL per 27 CCR 20919

Action-specific ARARs usually are technology requirements to implement specific remedial activities. Action-specific ARARs pertaining to the ESP Landfill include:

- California's Porter-Cologne Water Quality Control Act, which is the basis for many water-quality requirements found in the Santa Ana River Basin Water Quality Plan (Santa Ana RWQCB, 1994) and various SWRCB resolutions
- SCAQMD rules governing emissions of gases, particulate matter, and fugitive dust, as well as air-quality-related nuisance conditions that are approved parts of the State Implementation Plan pursuant to the Clean Air Act
- Stormwater discharges during and after construction, which are regulated by National Pollutant Discharge Elimination System general permits under the Clean Water Act
- Various provisions of the California Civil Code and the California Health and Safety Code governing land-use restrictions placed on properties as institutional controls
- Joint regulations of the SWRCB and the California Integrated Waste Management Board in CCR Title 27, which require capping to be the presumptive remedy for Class III landfills
- SCAQMD Rule 1150, which requires mitigation measures when an inactive landfill is being excavated

- SCAQMD Rule 1150.1(h) – Control of Gaseous Emissions from Municipal Solid Waste Landfills – Inactive Landfill Requirements, which define the requirements for landfill gas controls and boundary sampling probes and incorporates the substantive requirements of 27 CCR 20919

In addition, DTSC regulations in 22 CCR, Division 4.5, were considered but found not to be ARARs. Although relevant, these regulations concerning hazardous-waste management were considered to be neither applicable nor appropriate.

5.4 Preliminary Technology Screening

A preliminary screening of technologies considered the many potential remedies available, discarded those that were clearly less suitable, and formulated combinations of the remaining remedies to be evaluated in detail. Containment is the presumptive remedy for nonhazardous solid waste landfills and is applicable to the ESP Landfill. Other options, such as excavation or stabilization in place, were also considered. Some were ineffective as stand-alone remedies but were effective when combined with other technologies. The following technologies were screened for cost, effectiveness, and implementability, with the results discussed below:

- No Action: The NCP requires this option to be considered as a basis for comparison. It was unacceptable in terms of cost, effectiveness, and implementability, and was therefore not considered further.

- Excavation: Waste excavation permits clean closure of the site. The technology is effective, but very expensive and difficult to carry out. It poses severe health and safety risks during construction. It was therefore not considered further.

- Prescriptive Cover (Title 27): This technology involves installing the presumptive low-permeability cover used for nonhazardous solid waste landfills. It was acceptable in terms of cost, effectiveness, and implementability, and was therefore carried through for further evaluation.

- Monolithic Soil Cover (Title 27 Alternative): This technology is an alternative to the presumptive cover for nonhazardous solid waste landfills. It was acceptable in terms of cost, effectiveness, and implementability, and was therefore carried through for further evaluation.

- Enhanced Monolithic Soil Cover: This technology is similar to the monolithic soil cover, but employs tight design and construction control to minimize water infiltration. It was acceptable in terms of cost, effectiveness, and implementability, and was therefore carried through for further evaluation.

- Asphalt Concrete Cover: This technology is too expensive for use only as a remedy. It may be cost effective if it generates revenue as a part of property redevelopment. It was therefore carried through for further evaluation together with other technologies.

- Clay Cover: This technology is ineffective in limiting infiltration in an arid climate, as clay covers will dry and crack. It was therefore not considered further.
- Prescriptive Cover (Title 22): This technology involves installing a presumptive low-permeability cover used for hazardous waste landfills. It will be expensive, require long-term maintenance, and limit future reuse of the site. Because it is a preferred remedy for hazardous waste sites, it was carried through for further evaluation because the site apparently contains some hazardous constituents.
- Stabilization In Place: This technology involves injecting or mixing lime, Portland cement, or other chemical substances that prevent entry of water into the waste or limit mobility of constituents. It is expensive, hard to monitor, unpredictable as far as performance is concerned, and was not considered further.
- Landfill Gas Collection: As LFG is present, although at relatively low concentrations, it could migrate after a cover is installed. Therefore, landfill gas collection is carried through for further evaluation together with other technologies.
- Leachate Control: There is no known effective leachate-control technology to retrofit an existing unlined landfill. It is therefore not considered further.
- Deed Restrictions & Institutional Controls: This technology is cost effective and easy to implement, but not fully protective under future land-use scenarios. It is therefore carried through for further evaluation together with other technologies.

5.5 Development of Alternatives

Based on the technologies screened above, the following five RAAs were developed as candidates for the preferred remedial action (Shaw, 2006):

- RAA 1: No Action
- RAA 2: Prescriptive Cover (Title 27) with Deed Restrictions, LFG Collection System, and Post-Closure Development
- RAA 3: Monolithic Cover with Deed Restrictions, LFG Collection System and Post-Closure Development
- RAA 4 Enhanced Monolithic Cover with Deed Restrictions, LFG Collection System, and Post-Closure Development
- RAA 5 Prescriptive Cover (Title 22) with Deed Restrictions, LFG Collection System, and Post-Closure Development

Each cover option (RAAs 2 through 5) has two potential scenarios for post closure development:

1. The first scenario, a parking lot for light vehicles, would provide all-weather, open-air parking space for attendees of California Speedway races and other events. The area

would be used for compatible purposes when not needed for parking. The scenario includes an access route to and from local streets.

2. The second scenario, a heavy laydown or storage yard, would provide storage and parking space for tractor-trailers, shipping containers, and heavy freight. It would allow for continuous usage by heavy forklifts and other hoisting equipment. This scenario would include a heavy-vehicle access route to and from local streets.

These scenarios are described at greater length on Table 5.

5.5.1 RAA 1: No Action

The no-action alternative is required by the NCP as a baseline for comparison with other RAAs providing greater levels of response. Under no action, no physical remedial actions would be performed to reduce the toxicity, mobility, or volume of contaminants in the shallow soil at the ESP Landfill. There would be no physical changes to the site conditions and contaminants would be expected to remain at the landfill for an extended period of time. Contaminants could also potentially migrate via wind or storm-water erosion. Risk to human health would remain the same as under present conditions as long as the present materials remained undisturbed. This alternative would render the property unusable and the site would remain undeveloped.

5.5.2 RAA 2: Prescriptive Cover (Title 27) on Slopes with Deed Restrictions, Landfill Gas Collection System, and Post-Closure Development

RAA 2 includes the prescriptive cover specified for Class III landfills in 27 CCR 21090. Such a cover uses a low-permeability earth barrier to limit water entry to the underlying waste materials. Figure 6 shows the proposed location and cross section of the proposed prescriptive cover.

The prescriptive cover would include three layers:

- A foundation layer at the base, consisting of rolled waste or soil to form a firm base for the rest of the cover
- A 1-foot thick layer of compacted, low-permeability, clayey soil to serve as a barrier to infiltrating water
- An upper layer consisting of one of the following
  - A 1-foot thick (minimum) vegetative layer, which will include a layer to limit biotic intrusion
  - An asphalt-concrete pavement designed and constructed to prevent direct human contact with waste and limit water inflow into the wastes on the flat, developable surfaces

Because methane concentrations in the soil gas equal or exceed the LEL in places, an active LFG collection system consisting of horizontal collector pipes in gravel- or slag-filled trenches will be installed to provide full coverage under the cap. This system could be converted to passive operation if warranted in the future. LFG probes to monitor lateral migration of gas will be installed on 200-foot centers around the landfill perimeter (Figure 6). However, this spacing will be reduced to 100 feet on the east, west, and south sides of the ESP Landfill where new buildings have been built. LFG modeling will be performed during the design to develop a system that will meet emission standards. If post-extraction LFG treatment is required, a treatment system will be added to the final design. About 19 acres of the 36 acres to be capped are located on a flat, developable area that could be used for light vehicle parking or heavy laydown and storage uses. Although the pavement for each use will differ significantly, they will generally consist of asphalt concrete over compacted base and subbase courses as needed to support vehicle traffic and other loads. Due to the heavy, concentrated loads, the pavement section for a laydown and storage yard will be much heavier and more costly than that for light-vehicle parking.

A surface-water drainage system would be built to convey storm-water runoff from a 100-year, 24-hour storm event from the cover. It would consist of pipe downdrains and lined ditches draining into existing, off-site storm-water facilities.

RAA 2 would include a minimum of 30 years of site maintenance. Site maintenance would consist of periodic inspections of the cover and the gas collection system, maintenance of the drainage structures, and maintenance of the shallow-rooted vegetation or other material used to prevent erosion. Groundwater monitoring will also be performed as a long-term requirement.

Institutional controls would be recorded to prevent reuse of the ESP Landfill Area as a residence, day care center for children, long-term care hospital, or a traditional public or private school for persons less than 21 years of age. The controls would be recorded with the County of San Bernardino Auditor/Controller Recorder before DTSC will grant final approval to completion of the remedy. All construction within 1,000 ft of the landfill must comply with 27 CCR 21190, which requires certain building construction and monitoring standards for such habitable structures.

5.5.3 RAA 3: Monolithic Cover (Title 27 Alternative) with Deed Restrictions, LFG Collection System and Post-Closure Development

RAA 3 is identical to RAA 2 except for the cover design. A monolithic soil cover would be used over the ESP Landfill Area instead of a prescriptive cover. Such a cover would be an engineered alternative to the prescriptive cover, as allowed by 27 CCR 20080. The monolithic cover would be placed on the side slopes, benches, and otherwise undevelopable areas. On the relatively flat upper surface, one or both of the development scenarios involving paved areas, described above, could be used. Because such a paved surface will likely affect the performance of a monolithic cover, the cover in these locations will be carefully designed to maximize its performance.

The monolithic cover will consist of three layers, as follows:

- A foundation layer at the base, consisting of rolled waste or soil to form a firm base for the rest of the cover
- A 3-foot thick (estimated) soil layer, which will be compacted at a water content somewhat below the soil's field capacity
- An upper layer consisting of one of the following
  - A 1-foot thick (minimum) vegetative layer, which will include a layer to limit biotic intrusion
  - An asphalt-concrete pavement designed and constructed to prevent direct human contact with waste and limit water inflow to the wastes on the flat, developable surfaces

Specific thicknesses of the various cover components will be determined during the Remedial Design phase of the project.

The monolithic cover would reduce surface-water infiltration to the landfill to at least the level associated with a prescriptive cover. Specification requirements will be defined during Remedial Design. Strict design, construction quality control, and quality assurance requirements would be developed and enforced to enhance the cover's effectiveness. Most other aspects of RAA 3 are identical to those for RAA 2. These include:

- An active LFG control and collection system
- A system of LFG monitoring probes
- Pavement on the upper, developable surface of the site
- A surface-water drainage system
- Groundwater monitoring
- A minimum of 30 years of site maintenance

The same institutional controls would be placed on the site as proposed for RAA 2.

5.5.4 RAA 4: Enhanced Monolithic Cover with Deed Restrictions, LFG Collection System and Post-Closure Development

RAA 4 is identical to RAA 3 except that strict limits would be placed on the performance of the monolithic cover. Other than the limits, the extent, design, and ultimate development of the enhanced monolithic cover would be the same as the RAA 3 cover. The enhanced cover will be designed to reduce infiltration of surface water into the landfill to a level between that of a Title 27 prescriptive cover and that of a Title 22 prescriptive cover. This will be done by:

- Strictly specifying the soil used in the cover
- Limiting the permeability and unsaturated-flow properties of the soil to values that produce the desired cover characteristics
- Applying strict quality control and quality assurance efforts during cover construction

Specification requirements for the cover will be defined during Remedial Design. The other aspects of RAA 4 are identical to those for RAA 2. These include:

- An active LFG control and collection system
- A system of LFG monitoring probes
- Pavement on the upper, developable surface of the site
- A surface-water drainage system;
- Groundwater monitoring
- A minimum of 30 years of site maintenance

The same institutional controls would be placed on the site as proposed for RAA 2.

5.5.5 RAA 5: Prescriptive Cover (Title 22) with Deed Restrictions, LFG Collection System and Post-Closure Development

RAA 5 includes a RCRA "Subtitle C" prescriptive cover as described in 22 CCR 66264.310 and 66264.228. Such a cover combines a low-permeability soil barrier with a plastic membrane to reduce water entry to the underlying wastes to very low values. Except for the plastic membrane and an overlying drainage layer, the extent, design, and ultimate development of the cover would be the same as with the cover in RAA 2.

The Title 22 prescriptive cover would include five layers:

- A foundation layer at the base, consisting of rolled waste or soil to form a firm base for the rest of the cover
- A 1-foot thick layer of compacted soil with a sufficiently low hydraulic conductivity to be consistent with the permeability requirements of 22 CCR 66264.228
- A synthetic liner, consisting of a geomembrane sheet such as high-density polyethylene or linear-low density polyethylene
- A drainage layer above the synthetic liner, consisting of either a plastic drainage net or a layer of free-draining sand and gravel
- An upper layer consisting of one of the following

- A 1-foot thick (minimum) vegetative layer, which will include a layer to limit biotic intrusion
- An asphalt-concrete pavement designed and constructed to prevent direct human contact with waste and limit water inflow to the wastes on the flat, developable surfaces

The combined synthetic membrane and the underlying compacted soil layer would prevent the downward entry of water to the foundation layer for at least 100 years. The liner system must have a permeability less than or equal to the permeability of the native soils beneath the East Slag Pile. Specification requirements for the cover will be defined during the Remedial Design phase of the project. Other aspects of RAA 5 are identical to those for RAA 2. These include:

- An active LFG control and collection system
- A system of LFG monitoring probes
- Pavement on the upper, developable surface of the site;
- A surface-water drainage system
- Groundwater monitoring
- A minimum of 30 years of site maintenance

The same institutional controls would be placed on the site as proposed for RAA 2.

5.6 Alternatives Analysis

A detailed analysis was conducted to compare the alternatives, select a proposed remedy, and show that the remedy will satisfy CERCLA requirements (Shaw, 2006). This detailed analysis conformed to the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA, 1988) and the NCP. The NCP lists nine evaluation criteria for use in conducting a detailed analysis of alternatives and selecting a preferred alternative. The nine criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility, or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

Of these, the first two are *threshold criteria*. Alternatives not meeting the threshold criteria are eliminated from further consideration. Criteria 3 through 7 are *balancing criteria*, used to evaluate, compare and rank all alternatives that pass the threshold-criteria test. The final criteria, 8 and 9, are evaluated in public hearings and agency reviews before the selected remedy is approved to be carried out.

Table 6 summarizes the analysis of alternatives.

5.6.1 Overall Protection of Human Health and the Environment

RAA 1 will not reduce or monitor potential risks to human health or the environment. RAAs 2 through 5 will reduce potential human health risks because they place a cover between the wastes and potential receptors and they use institutional controls to limit human exposures. The covers will also greatly reduce water infiltration into the waste. RAA 4 and RAA 5 will likely be more effective in this regard than RAA 2 or RAA 3. RAAs 2 through 5 include gas collection systems to control the migration and emission of LFG and VOCs. RAA 4 and RAA 5 are therefore the most desirable from the standpoint of overall protection of human health and the environment. RAA 2 and RAA 3 are slightly less desirable.

5.6.2 Compliance with ARARs

RAA 1 does not conform to ARARs, except those involving construction air quality, because there will be no construction under this alternative. RAAs 2 through 5 include LFG collection and venting systems conforming to the air-quality ARARs and the hazardous-waste and water quality ARARs. RAAs 2 through 5 can be planned and implemented to meet all action-specific ARARs. They are therefore most desirable from the standpoint of ARARs compliance.

5.6.3 Long-Term Effectiveness and Permanence

RAA 1 provides no long-term effectiveness or permanence in reducing risk at the site. RAA 2 and RAA 5 would mitigate long-term risk almost equally well if the cover and gas collection systems are maintained. The prescriptive covers in both alternatives include layers of low-permeability soil that must remain intact, but that could dry out and crack. The monolithic covers in RAA 3 and RAA 4 are less susceptible to cracking, making them more effective and permanent in the long term. RAAs 3 and 4 are therefore most desirable from the standpoint of long-term effectiveness and permanence, although RAAs 2 and 5 are only slightly less desirable.

5.6.4 Reduction of Toxicity, Mobility, or Volume through Treatment

RAA 1 would not reduce the toxicity, mobility, or volume because no capping or other remedial measure will take place. RAA 2 and RAA 3 would reduce mobility almost equally if the cover and gas collection system are maintained. RAAs 4 and 5 may provide slightly better reductions of mobility. RAA 4 and RAA 5 are therefore most desirable from the standpoint of reduction of toxicity, mobility, or volume. RAA 2 and RAA 3 are only slightly less desirable.

5.6.5 Short-Term Effectiveness

RAA 1 does not pose short-term risks to the community or construction workers because no actions will be taken. RAAs 2 through 5 could pose risks to the community or construction workers because they involve similar construction activities. However, the risks can be mitigated by proper design, management, engineering controls, and health and safety procedures. The time required to implement these RAAs is relatively short, on the order of 6 months. RAAs 2 through 5 are therefore equally desirable from the standpoint of short-term effectiveness.

5.6.6 Implementability

RAA 1 is easiest to implement because it requires no action, equipment, operations, or maintenance. RAAs 2 through 5 are approximately equal in implementability because they involve common construction activities, conventional equipment, and services that should be reliable and readily available. The technologies are proven and mature. The alternatives have approximately equal operation and maintenance requirements. RAAs 2 through 5 are equally implementable.

5.6.7 Cost

The estimated net-present-worth costs of the three alternatives, calculated in accordance with EPA guidance (EPA, 2000), are as follows:

- RAA 1: $ 0
- RAA 2: $ 10,214,557 (Scenario 1 – light vehicle parking)
  $ 12,710,168 (Scenario 2 – heavy laydown area)
- RAA 3: $ 10,808,791 (Scenario 1 – light vehicle parking)
  $ 13,295,397 (Scenario 2 – heavy laydown area)
- RAA 4: $ 13,383,127 (Scenario 1 – light vehicle parking)
  $ 15,286,467 (Scenario 2 – heavy laydown area)
- RAA 5: $ 13,654,215 (Scenario 1 – light vehicle parking)
  $ 16,091,825 (Scenario 2 – heavy laydown area)

RAA 1 will be the least expensive alternative. RAA 2 and RAA 3 are progressively more expensive, and RAAs 4 and 5 are more expensive yet. However, RAAs 2 through 5 all have the potential to leave a site capable of economic use, so that revenues from that use may possibly be available to offset both initial and ongoing costs.

5.6.8 State Acceptance

State agencies will not accept RAA 1 because it will not protect human health and the environment. RAA 2 or RAA 3 may be acceptable because caps conform to the regulations and policies of State agencies having primary authority over the site. Containment of this type is the presumptive remedy for nonhazardous solid waste landfills. Nevertheless, some agencies may be less likely to accept RAA 2, the prescriptive cover alternative, because of concerns that the low-permeability clay layer could dry, crack, and lose its integrity over the long term. RAA 3, the monolithic cover alternative, therefore, may be more acceptable because monolithic covers have been shown to be effective in the southern California setting. The enhanced performance potentially achievable with RAAs 4 or 5 may make them even more desirable to the State agencies than RAAs 2 and 3. RAA 4 and RAA 5 are therefore the most acceptable from the State agencies' standpoint.

5.6.9 Community Acceptance

The community is unlikely to accept RAA 1 because it will leave the site unremediated, out of compliance with ARARs, and a source of health risks to local workers and the general public. Any of RAAs 2 through 5 likely would be acceptable because they all effectively contain wastes and reduce risks to human health and the environment. Any cover will improve the appearance of the site. Allowing the site to be available for productive economic use will also be viewed favorably. RAAs 2 through 5 are therefore most desirable from the standpoint of community acceptance.

5.7 Identification of, and Rationale for, Proposed Alternative

Based on the analysis above, construction of an enhanced monolithic cover (RAA 4) was chosen as the selected remedy. This remedy fulfills all the RAOs defined in Section 6.1. It will:

1. Eliminate or minimize direct human contact with the media of concern.
   An enhanced monolithic soil cover will be a permanent physical barrier between the public and the slag and other wastes. An LFG system will be also be installed to vent LFG and VOCs in a controlled manner that does not endanger human health.

2. Eliminate or minimize wind contact with the media of concern
   The proposed cover will effectively prevent wind contact with the media of concern.

3. Eliminate or minimize storm-water contact with the media of concern
   Constructing a cover over the ESP Landfill Area will effectively eliminate storm-water contact with the media of concern.

4. Eliminate or minimize the potential for uncontrolled migration of LFG and VOCs
   The proposed cover system includes a gas collection and venting network to efficiently intercept LFG and VOCs, and vent them under controlled conditions and in accordance with air-quality ARARs.

5. Minimize the need for future maintenance of the containment system
   The proposed cover and related features lend themselves to economical, efficient maintenance. The cover is accessible for ready inspection and easy maintenance. The

maintenance needed, such as drainage, landscaping, and pavement repairs, requires only common equipment, materials, and expertise, and not exotic technologies, rare materials, or unusual training. The RWQCB considers monolithic covers superior to prescriptive covers in this arid setting.

6. Achieve compliance with State and Federal regulations
   The components of the selected remedy are considered to be those that best comply with ARARs. Therefore, the selected alternative complies with applicable State and Federal regulations.

7. Allow potential future reuse of the site.
   The selected alternative will explicitly allow and encourage reasonable reuse of the site where the nature of the site and the contaminants so permits.

RAA 4 protects human health and the environment, conforms to the ARARs, and fulfills all of the RAOs. Therefore, RAA 4 is the selected alternative for the ESP Landfill.

6.0 References

California Department of Health Services [now California Department of Toxic Substances Control (DTSC)], 1988, *Consent Order, Docket No. HAS 87/88-023CO, In the Matter of: Kaiser Steel Corporation, 9400 Cherry Avenue, Fontana, California, Respondent: Kaiser Ventures, Inc.,* August 22 (amended November 13, 1997).

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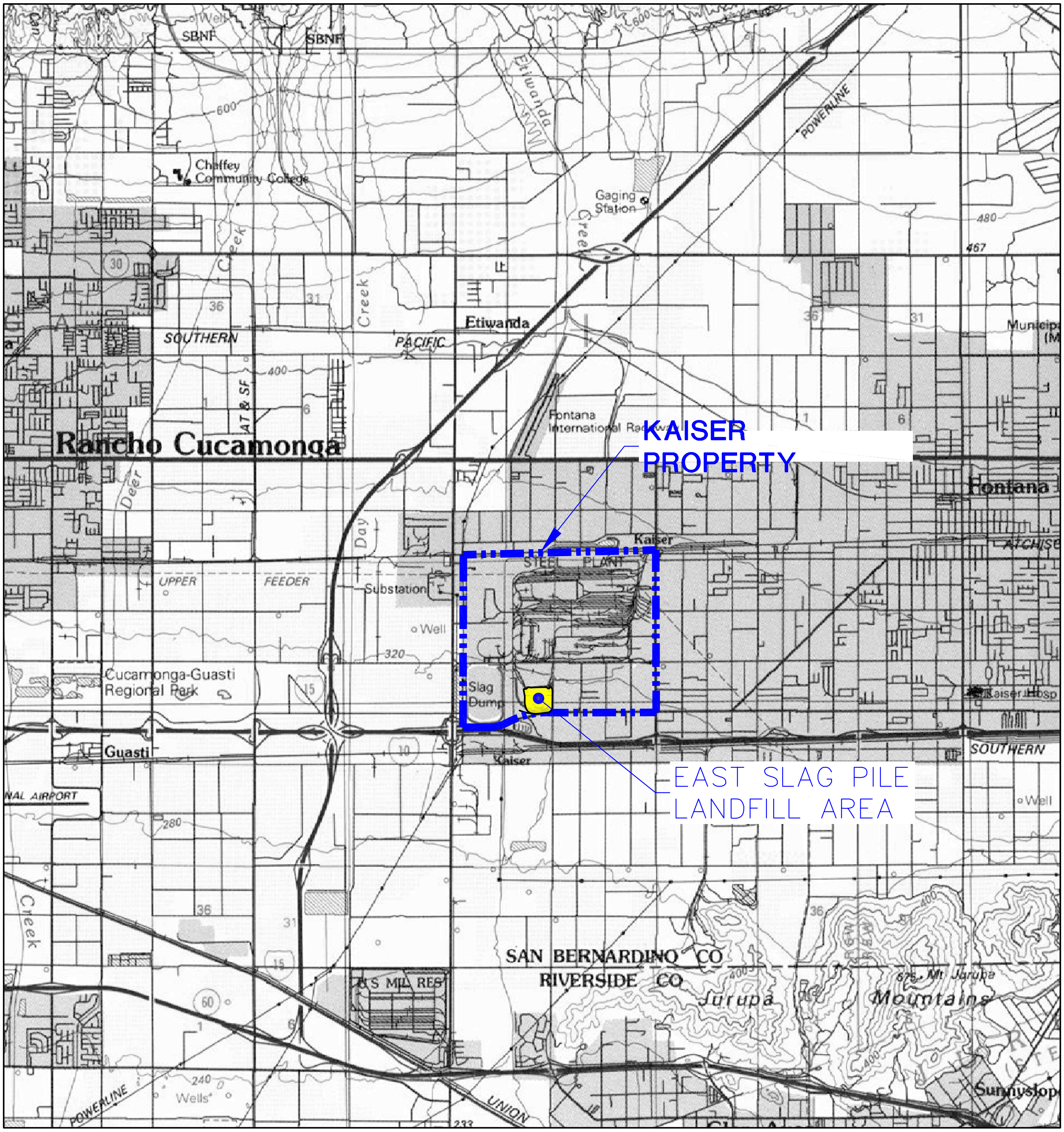
Figures



N

SCALE

0 1.5 3 MILES

REFERENCE:
USGS TOPO!
NATIONAL GEOGRAPHIC 2001 EDITION

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FONTANA, CALIFORNIA

FIGURE 1

KAISER PROPERTY AND ESP LANDFILL AREA SITE LOCATION MAP

FORMER KAISER STEEL MILL
FONTANA, CALIFORNIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Rev. by ICG 7/25/06	MEU 7/25/06	LOY 7/25/06	115008-A1

XREF Files: IMAGE Files: LOCATION MAP.TIF
File: S:\CAD_San Diego office\115008-CCG Ontario-RAP\RAP figures 7-06\115008-A1.dwg Layout: FIGURE 1 User: terry.schaeffer Jul 25, 2006 - 1:18pm

SITE OWNED BY CCG ONTARIO, L.L.C.

MAP REFERENCES:

1. EAST SLAG PILE TOPOGRAPHY BY TOWILL SURVEYING, MAPPING, AND GIS SERVICES. DATE: 12/12/03. JOB No. 10268
2. CWC AREA TOPOGRAPHY BY OLYMPIC MAPPING SYSTEMS DATE: 12/12/03. PROJECT TITLE: OMS23114
3. CHROME PONDS TOPOGRAPHY BY ASSOCIATED ENGINEERS, INC. FILE DATE: 09/13/02. FLIGHT DATE: 08/20/02
4. PARCEL NUMBERS AND BOUNDARIES ARE FROM COUNTY OF SAN BERNARDINO TENTATIVE PARCEL MAP No. 15640.

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FONTANA, CALIFORNIA

FIGURE 2

LOCATION DIAGRAM FOR EAST SLAG PILE

FORMER KAISER STEEL MILL
FONTANA, CALIFORNIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ICG 7/26/06	RNM 7/26/06	LOY 7/26/06	115008-A2

XREF Files: IMAGE Files:
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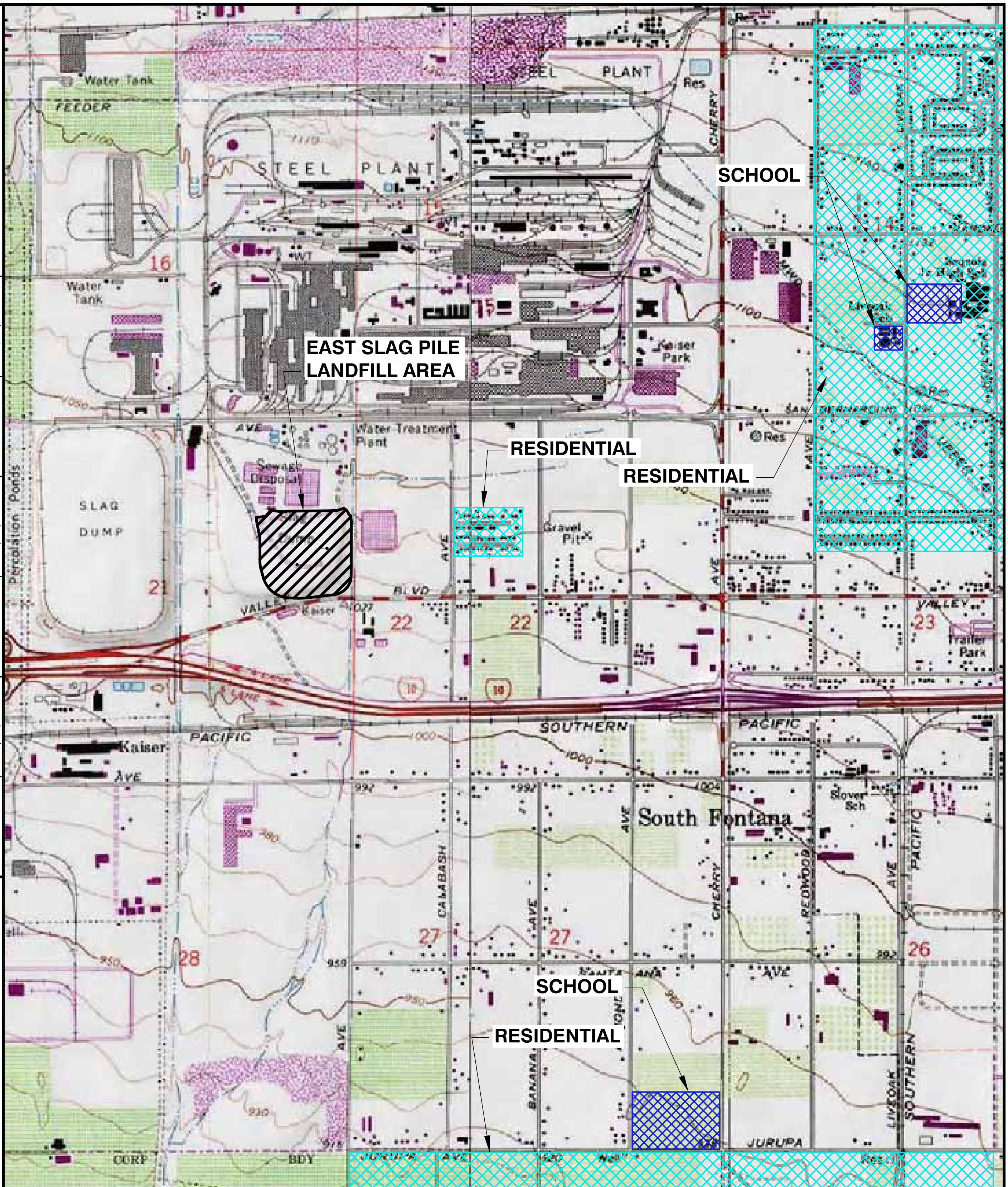

SCALE

0 2000 4000 FEET

N

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FIGURE 3

NEARBY SCHOOLS AND
RESIDENTIAL NEIGHBORHOODS

FORMER KAISER STEEL MILL
FONTANA, CALIFORNIA

DRAWING NUMBER	115008-A3	
APPROVED BY	LOY	8/1/06
CHECKED BY	RNM	8/1/06
DRAWN BY	SJZ	8/1/06

XREF Files: IMAGE Files: Kaisergex-SECTION.jpg
File: S:\CAD_San Diego office\115008-CCG Ontario-RAP\RAP figures 7-06\115008-B16.dwg Layout: Figure 5 User: terry.schaeffer Jul 25, 2006 - 2:11pm

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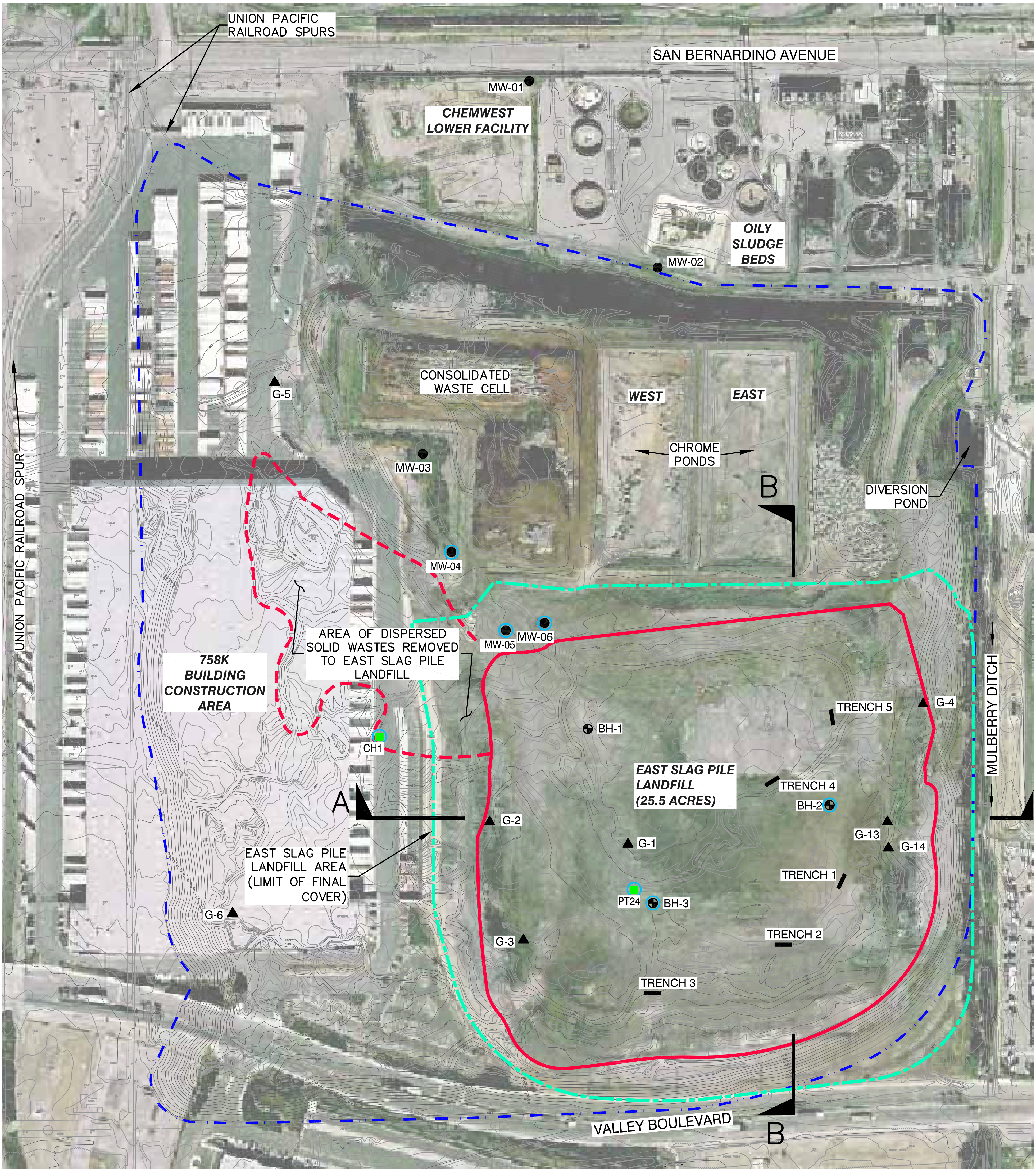
ICG	7/25/06	RNM	7/25/06	LOY	7/25/06		



N

SCALE

0 250 500 FEET

TOPOGRAPHIC REFERENCE:

AERIAL PHOTOGRAMMETRY DATE: 1994

AERIAL PHOTOGRAPH FROM: www.GlobeXplorer.com.
DATE OF PHOTOGRAPHY: 02/01/2005

EXPLANATION

- LOCATIONS WHERE PERCHED GROUNDWATER WAS OBSERVED
- MONITORING WELL LOCATION
- SOIL BORINGS (SCS, 1990c)
- SURFACE SAMPLE LOCATIONS (SCS, 1990c)
- MAXIMUM EXTENT OF EAST SLAG PILE
- EAST SLAG PILE LANDFILL AREA (LIMIT OF PROPOSED FINAL COVER)
- APPROXIMATE EAST SLAG PILE LANDFILL BOUNDARY
- APPROXIMATE BOUNDARY OF DISPERSED WASTE

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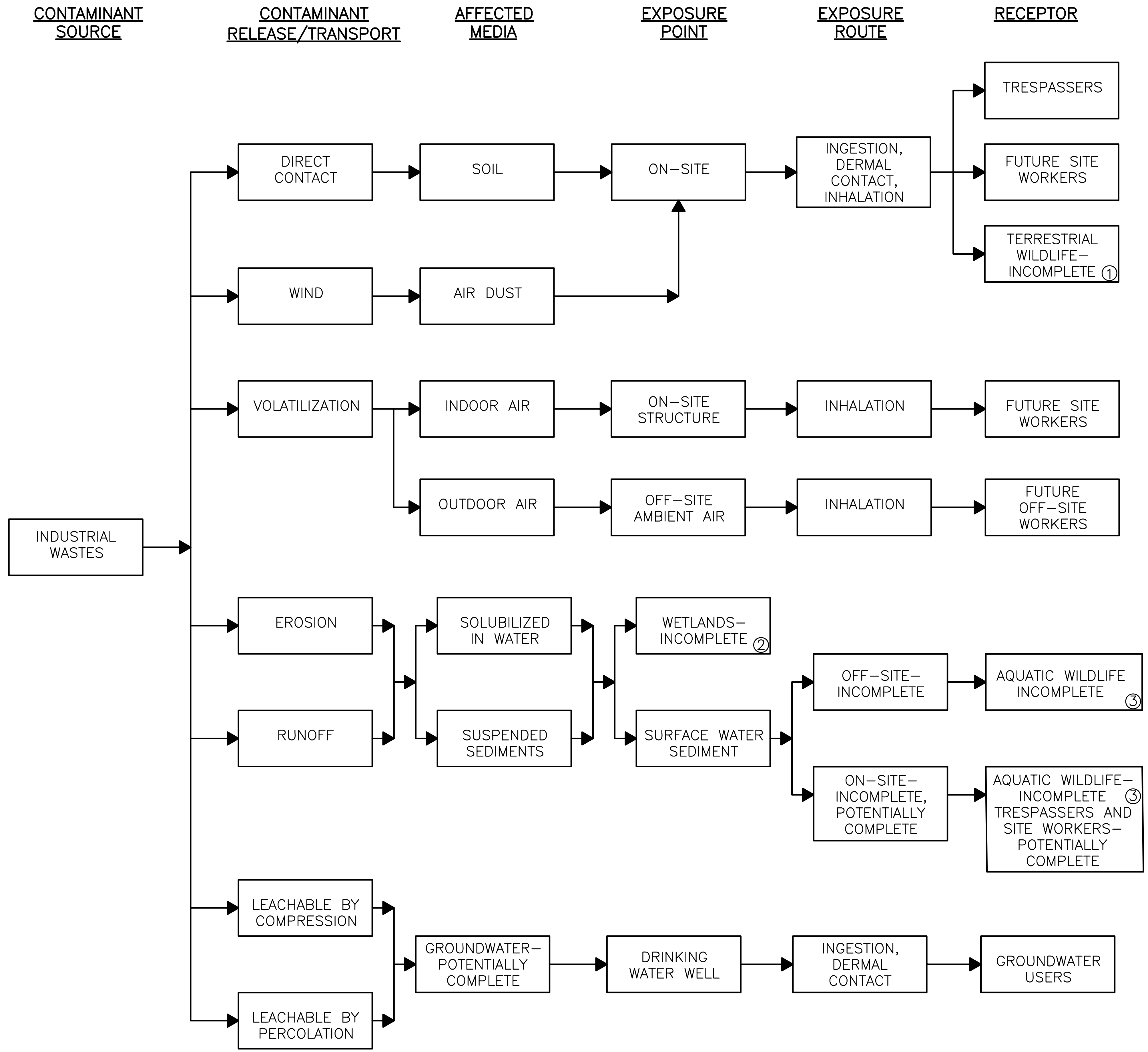
FONTANA, CALIFORNIA

FIGURE 4

SITE LIMITS AND LOCATIONS OF SAMPLE POINTS

FORMER KAISER STEEL MILL
FONTANA, CALIFORNIA



NOTES:

1. TERRESTRIAL WILDLIFE EXPOSURES ARE CONSIDERED INCOMPLETE DUE TO CURRENT AND FUTURE INDUSTRIALIZED SETTING: NO EXTENSIVE HABITAT IS AT THE SITE.
2. WETLANDS ARE AN INCOMPLETE EXPOSURE PATHWAY SINCE NO WETLANDS ARE PRESENT AT THE SITE.
3. ON–SITE AND OFF–SITE RUNOFF EXPOSURE PATHWAYS ARE CONSIDERED INCOMPLETE OR INSIGNIFICANT FOR AQUATIC WILDLIFE. ANY RUNOFF IS LIKELY TO ENTER EITHER SAN SEVAINE CHANNEL OR MULBERRY DITCH. BOTH OF THESE ARE ENGINEERED STRUCTURES WITH NO PERMANENT HABITATS FOR WILDLIFE.

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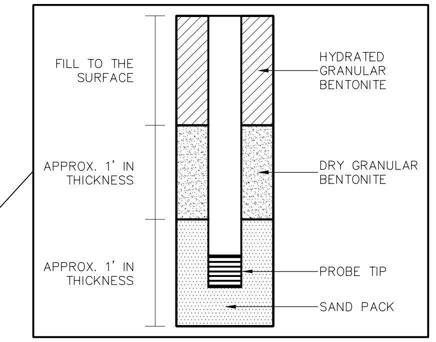
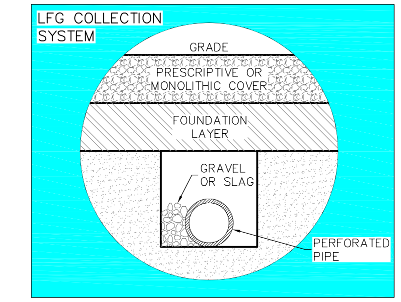
FIGURE 5
CONCEPTUAL SITE MODEL FOR ESP LANDFILL AREA
FORMER KAISER STEEL MILL
FONTANA, CALIFORNIA

IMAGE	X–REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	---	CONCORD	SJZ	7/25/06	RNM	7/25/06	LOY	7/25/06	115008–B17

GAS PROBE CONSTRUCTION DIAGRAM

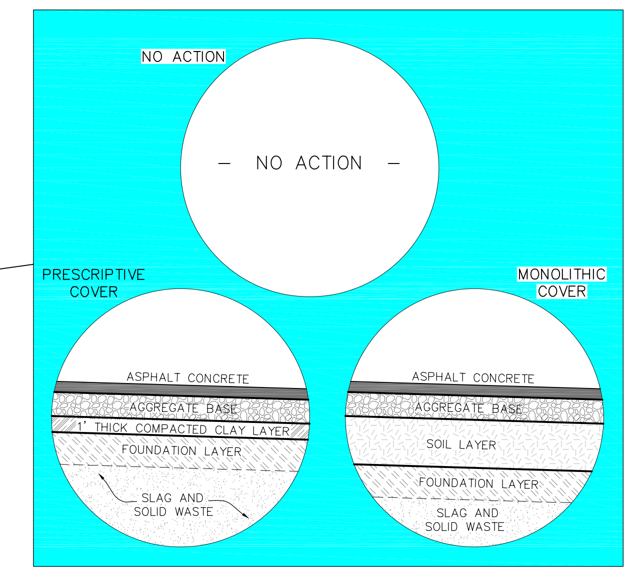


LFG COLLECTION SYSTEM DETAIL



(LAYOUT OF TRENCHES TO BE DETERMINED DURING REMEDIAL DESIGN)

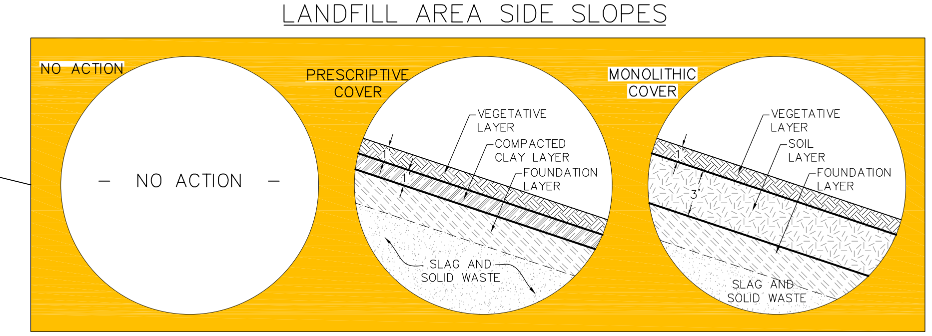
REMEDIAL ACTION ALTERNATIVES FOR EAST SLAG PILE LANDFILL AREA DEVELOPABLE PART



DETAIL NOTE:

THE SPECIFIC THICKNESSES OF THE VARIOUS COVER COMPONENTS WILL BE DETERMINED DURING THE REMEDIAL DESIGN PHASE OF THE PROJECT.

REMEDIAL ACTION ALTERNATIVES FOR EAST SLAG PILE LANDFILL AREA SIDE SLOPES



LEGEND:

- DEVELOPABLE PARTS OF REMEDIATION AREAS
- SIDE SLOPE PARTS OF REMEDIATION AREAS
- GAS PROBE LOCATION

GAS COLLECTION AND VENTING SYSTEM ON ESP

- SOLID WALL PIPE
- PERFORATED WALL PIPE

NOTES:

1. DETAILS SHOWN ON THIS SHEET ARE CONCEPTUAL ONLY.
2. FOR REMEDIAL ACTION ALTERNATIVES INVOLVING DEVELOPMENT, ONLY DEVELOPMENT AS A PAVED AREA IS SHOWN.

SOURCE OF TOPOGRAPHY:

1. EAST SLAG PILE TOPOGRAPHY PROVIDED BY TOWILL SURVEYING, MAPPING, AND GIS SERVICES. DATE: 12/12/03. JOB#: 10268
2. CWC AREA TOPOGRAPHY PROVIDED BY OLYMPIC MAPPING SYSTEMS DATE: 12/12/03. PROJECT TITLE: OMS23114
3. CHROME PONDS TOPOGRAPHY PROVIDED BY ASSOCIATED ENGINEERS, INC. FILE DATE: 09/13/02. FLIGHT DATE: 08/20/02

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FONTANA, CALIFORNIA

FIGURE 6

PROPOSED REMEDIAL ACTIONS AND ALTERNATIVES

FORMER KAISER STEEL MILL
FONTANA, CALIFORNIA

DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
ICG	9/26/06	RNM	9/26/06	LOY	9/26/06	115008-B18

Tables

Table 1
Summary of Inorganic Chemical Analytical Results
East Slag Pile Landfill Area

Sample Location	Sample	Depth (ft bgs)	Collection Date	Concentration (mg/kg)											Concentration (mg/kg)							pH
				Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Vanadium	Zinc	Cyanide	
Trench 1	ESP1-1	2	Jun-90						18		164		67			< 1				140		
Trench 1	ESP1-3	8	Jun-90						120		165		3110			38				7100		
Trench 2	ESP2-1	2	Jun-90						167		356	317000	91			86				162		
Trench 3	ESP3-1	4	Jun-90						261		343	191000	830			192				8790		
Trench 3	ESP3-2	6	Jun-90						9.3		27		5			< 1				51		
Trench 3	ESP3-3	4	Jun-90						147		176		168			132				1860		
Trench 3	ESP3-4	8	Jun-90						7.3		109	81400	1540			14				4420		
Trench 4	ESP4-1	2	Jun-90						109		300	199000	27			89				66		
Trench 4	ESP4-3	4	Jun-90						9.7		118		99			14				180		
Trench 5	ESP5-1	1	Jun-90						16		22	9920	23			12				30		
Trench 5	ESP5-3	5	Jun-90						27		38	21000	72			36				963		
Landfill - Subsurface	BH-1-5	5	Dec-89		7.6	60	< 2	4	170		89		370			16	< 1	3		1950	14	11.6
Landfill - Subsurface	BH-1-10	10	Dec-89		2.2	66	< 2	3	70		78		95			16	< 0.5	< 3		450	12	10.3
Landfill - Subsurface	BH-1-20	20	Dec-89		1.9	97	< 2	< 2	520		12		86	< 0.2		19	< 1	4		340	1	11.3
Landfill - Subsurface	BH-1-40	40	Dec-89		<1	96	< 2	< 2	350		76		54	< 0.2		< 10	< 1	5		76	<1	12
Landfill - Subsurface	BH-1-61	61	Dec-89		< 10	140	< 2	< 2	18		14		< 50	< 0.2		< 10	< 5	< 3		100	1	12.2
Landfill - Subsurface	BH-1-70	70	Dec-89		ND		< 2	ND	18				ND	< 0.2		< 10				43	ND	11.1
Landfill - Subsurface	BH-1-88	88	Dec-89		3.8		< 2	ND	8.5		9		ND	< 0.2		< 10				27	ND	9.5
Landfill - Subsurface	BH-2-6	6	Dec-89		16	< 50	< 2	7	49		240		780	< 0.2		< 10	< 0.5	< 3		2050	16	9
Landfill - Subsurface	BH-2-10	10	Dec-89		16	61	< 2	32	5		79		3390	< 0.2		< 10	1	5		12700	170	9.8
Landfill - Subsurface	BH-2-21.5	21.5	Dec-89		8.8	51	< 2	34	9		68		3470	< 0.2		< 10	0.6	< 3		10800	280	10.9
Landfill - Subsurface	BH-2-41	41	Dec-89		<1	130	2	< 2	4		8		65	< 0.2		< 10	< 0.5	< 3		310	7	10.3
Landfill - Subsurface	BH-2-61	61	Dec-89		<1	71	< 2	< 2	61		11		< 50	< 0.2		< 10	< 0.5	< 3		64	6	11.6
Landfill - Subsurface	BH-2-80.5	80.5	Dec-89		ND		< 2	< 2	5.8		5		ND	< 0.2		4				45	ND	8.5
Landfill - Subsurface	BH-3-6	6	Dec-89		7	< 50	< 2	< 2	< 3		180		380	< 0.2		< 10	< 1	< 3		1860	8	8.6
Landfill - Subsurface	BH-3-11	11	Dec-89		< 10	64	< 2	< 2	92		100		86	0.2		16	< 1	< 3		280	4	8.7
Landfill - Subsurface	BH-3-21	21	Dec-89		< 10	110	2	< 2	120		42		< 50	< 0.2		14	< 1	< 3		200	< 1	11.2
Landfill - Subsurface	BH-3-41	41	Dec-89		< 10	134	3	< 2	220		16		< 50	< 0.2		< 10	< 1	4		44	2	11.5
Landfill - Subsurface	BH-3-81	81	Dec-89		5			0.5	12		11		ND			9				32	ND	9.4
Landfill - Subsurface	BH-3-100	100	Dec-89		0.9			ND	8.7		5		ND			2				40	ND	10.1
Landfill - Subsurface	831057-2	NA	Jul-02	29	120	410	3		34	78	490	38000	110	0.044	110	28	1.6		18	1800		7.6
Landfill - Subsurface	831057-3	NA	Jul-02	21	130	420	3.4		37	54	540	35000	110	0.0057	120	28	3.2		20	2100		8.7
Landfill - Subsurface	831057-4	NA	Jul-02	1.9	27	44		5.3	860	40	260	130000	180	0.26	140	1300			26	460		6.6
Landfill - Subsurface	831057-5	NA	Jul-02		2.1	48			140	2	17	13000	26	0.055		4.9	1.4		77	140		5.1
Landfill - Subsurface	831057-6	NA	Jul-02		6.9	76			300	7.3	42	44000	46	0.032		14			540	300		8.7
Landfill - Surface	G-1	0.5	Dec-89	< 3	< 1	< 10	< 0.3	< 0.3	2.2		6		28	< 0.2		< 2		< 0.5		7	<1	9.7
Landfill - Surface	G-2	0.5	Dec-89	< 20	4.6	150	< 2	35	96		96		5330	1		21		4		12700	9	9.2
Landfill - Surface	G-3	0.5	Dec-89	25	44	< 50	4	10	220		380		1120	< 0.2		210		< 3		3320	2	9.2
Landfill - Surface	G-4	0.5	Dec-89	< 20	3.1	< 50	< 2	< 2	< 3		ND		< 50	< 0.2		< 10		< 3		43	2	9.2
Foundry Sands	G-13	0.5	Dec-89	< 5	8.3	33	< 0.1	< 0.1	0.96	0.56	7.1		3.9	< 0.01	< 0.5	1.6		< 0.1	3.3	6.3		8.6
Foundry Sands	G-14	0.5	Dec-89	< 5	< 1	35	< 0.1	< 0.1	1.8	< 0.5	6.8		4.9	< 0.01	1.6	< 0.5		< 0.1	5.7	8.7		8.6
Downslope	G-15	0.5	Dec-89		ND	34		ND	7.1	< 0.5	5.7		6.8			3.5			13	30	ND	5.4
Downslope	G-16	0.5	Dec-89		5.5	26		1	8	< 0.5	13		88			5.8			11	490	ND	7.3
Downslope	G-17	0.5	Dec-89		ND	33		ND	15	4.7	8.7		16			8.7			25	72	ND	6.9

Sources: SCS Engineers (1990a), Harding Lawson Associates (1998b), and IT (2002).
A blank indicates that no result was reported.
mg/kg: milligrams per kilogram
ND: Not detected

Table 2
Summary of Organic Chemical Analytical Results
East Slag Pile Landfill Area

Polycyclic Aromatic Hydrocarbon (PAH) Concentration (µg/kg)

Area	Sample	Depth (ft bgs)	Collection Date	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(g,hi)perylene	Benzo(a)pyrene	Chrysene	Fluoranthene	Fluorene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene	2,4-Benzo-fluorene	Other PAHs	Total PAH
Trench 1	ESP1-1	2	Jun-90	< 30	< 30	< 30	< 30	ND	ND	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	ND	ND	
Trench 1	ESP1-3	8	Jun-90	<30	< 30	< 30	1900	1300	1300	< 30	1300	< 30	3000	< 30	290	< 30	1300	3200	3200		16790
Trench 2	ESP2-1	2	Jun-90	< 300	< 300	< 300	< 300		< 300	< 300	< 300	< 300	< 300	< 300	< 300	< 300	< 300	2200	2200	ND	4400
Trench 3	ESP3-1	4	Jun-90	< 30	< 30	< 30	< 30		< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	ND	ND	
Trench 3	ESP3-2	6	Jun-90	< 30	< 30	< 30	< 30		< 30	< 30	< 30	< 30	220	< 30	< 30	< 30	92	200	ND	ND	
Trench 3	ESP3-3	4	Jun-90	< 30	< 30	< 30	80		< 30	< 30	< 30	100	230	< 30	< 30	< 30	150	< 30	ND	ND	560
Trench 3	ESP3-4	8	Jun-90																ND	ND	
Trench 4	ESP4-1	2	Jun-90	< 30	< 30	< 30	< 30		< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	440	440	ND	880
Trench 4	ESP4-3	4	Jun-90																		
Trench 5	ESP5-1	1	Jun-90																		
Trench 5	ESP5-3	5	Jun-90																		
Landfill - Subsurface	BH-1-5	5	Dec-89	360	< 330	490	1300	1900		370	1000	1400	2200	< 330	< 330	1400	1900	2500		3930	18390
Landfill - Subsurface	BH-1-10	10	Dec-89	6100	< 1600	1800	< 1600	<1600		< 1600	< 1600	2900	5600	2400	3600	13000	14000	5200		ND	48500
Landfill - Subsurface	BH-1-20	20	Dec-89		ND	< 660	3600	3800	1200	1000	2600	3000	5600	ND	< 660	< 660	3100	3900		10700	39600
Landfill - Subsurface	BH-1-40	40	Dec-89		ND	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	ND	< 330	< 330	< 330	< 330		ND	
Landfill - Subsurface	BH-1-61	61	Dec-89		ND	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	ND	< 330	< 330	< 330	< 330		ND	
Landfill - Subsurface	BH-1-70	70	Dec-89		ND	ND		< 330	< 330	< 330	< 330	< 330	< 330	ND	< 330	< 330	< 330	< 330		ND	
Landfill - Subsurface	BH-1-88	88	Dec-89		ND	ND		< 330	< 330	< 330	< 330	< 330	< 330	ND	< 330	< 330	< 330	< 330		ND	
Landfill - Subsurface	BH-2-6	6	Dec-89	< 16000	53000	31000	< 16000	< 330	< 330	< 330	< 330	< 330	< 330	39000	< 330	< 330	< 330	< 330		ND	123000
Landfill - Subsurface	BH-2-10	10	Dec-89	< 1600	< 1600	< 1600	< 1600	< 330	< 330	< 330	< 330	< 330	< 330	< 1600	< 330	< 330	< 330	< 330		2600	2600
Landfill - Subsurface	BH-2-21.5	21.5	Dec-89		ND	< 3300	< 3300	< 3300	< 3300	< 3300	< 3300	< 3300	< 3300	ND	< 3300	< 3300	< 3300	< 3300		ND	
Landfill - Subsurface	BH-1-41	41	Dec-89		ND	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	ND	< 330	< 330	< 330	< 330		ND	
Landfill - Subsurface	BH-2-61	61	Dec-89		ND	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	ND	< 330	< 330	< 330	< 330		ND	
Landfill - Subsurface	BH-2-80.5	80.5	Dec-89		ND	ND		< 330	< 330	< 330	< 330	< 330	< 330	ND	< 330	ND	ND	ND		ND	
Landfill - Subsurface	BH-3-6	6	Dec-89	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330		ND	
Landfill - Subsurface	BH-3-11	11	Dec-89		<0.33	460	< 330	520	340	< 330	500	< 330	728	ND	430	1300	1100	1100		860	7338
Landfill - Subsurface	BH-3-21	21	Dec-89		ND	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330		ND	
Landfill - Subsurface	BH-3-41	41	Dec-89																		
Landfill - Subsurface	BH-3-81	81	Dec-89		ND	ND					ND	ND	ND	ND	ND	ND		ND		ND	
Landfill - Subsurface	BH-3-100	100	Dec-89																		
Landfill - Subsurface	831057-2	NA	Jul-02																		
Landfill - Subsurface	831057-3	NA	Jul-02																		
Landfill - Subsurface	831057-4	NA	Jul-02	4500	100000	110000	200000	220000	250000	150000	250000	290000	390000	90000	36000	240000	370000	1200000			
Landfill - Subsurface	831057-5	NA	Jul-02													3000					
Landfill - Subsurface	831057-6	NA	Jul-02													590					
Landfill - Surface	G-1	0.5	Dec-89		ND	ND	< 330	< 330	< 330	< 330	< 330	< 330	< 330	ND	ND	620	< 330	< 330		ND	
Landfill - Surface	G-2	0.5	Dec-89		ND	ND	< 3300	< 3300	< 3300	< 3300	< 3300	< 3300	< 3300	ND	ND	< 3300	< 3300	< 3300		ND	
Landfill - Surface	G-3	0.5	Dec-89		ND	ND	< 3300	< 3300	< 3300	< 3300	< 3300	< 3300	< 3300	ND	ND	< 3300	3900	6000		ND	9900
Landfill - Surface	G-4	0.5	Dec-89		ND	ND	490	420	350	380	340	470	680	ND	ND	< 330	520	690		2020	6740
Foundary Sands	G-13	0.5	Dec-89		ND	ND	110	< 100	190	< 500	< 100	200	150	ND	ND	220	160	180	ND	300	
Foundary Sands	G-14	0.5	Dec-89		ND	ND	< 100	< 100	< 100	< 500	< 100	< 100	< 100	ND	ND	< 100	< 100	< 100	ND	ND	
Downslope	G-15	0.5	Dec-89		ND	ND					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Downslope	G-16	0.5	Dec-89		ND	ND					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Downslope	G-17	0.5	Dec-89		ND	ND					ND	ND	ND	ND	ND	ND	100	160	ND	120	

Volatile Organics (µg/kg) and Other Chemicals (µg/kg)

Area	Sample	4-Methyl-2-Pentanone	Toluene	Benzene	Ethyl Benzene	Isopropylbenzene	n-Propylbenzene	m,p-Xylenes	o-Xylene	Di-n-butyl phthalate	Aroclor 1260	Benzoic Acid	Bis(2-ethylhexyl)phthalate	PCBs (Aroclor 1242)	Phenol	Methyl-phenols	Dibenzofuran	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Oil and Grease
Trench 1	ESP1-1	< 30	14							ND			< 200		< 30		< 30			
Trench 1	ESP1-3	< 30	< 10							ND			< 200		< 30		< 30			5620000
Trench 2	ESP2-1	< 30	ND							< 300			< 2000		< 300		< 300			65400000
Trench 3	ESP3-1	< 30	ND							16000			< 200		< 30		< 30			
Trench 3	ESP3-2	83	ND							< 30			9200		< 30		< 30			
Trench 3	ESP3-3	< 30	ND							11000			< 200		< 30		< 30			
Trench 3	ESP3-4		ND																	
Trench 4	ESP4-1	< 30	ND							< 30			< 200		< 30		< 30			110000000
Trench 4	ESP4-3		ND																	
Trench 5	ESP5-1	< 30	55																	198000
Trench 5	ESP5-3	ND	ND																	
Landfill - Subsurface	BH-1-5												< 330	< 40	< 330	ND	< 330			
Landfill - Subsurface	BH-1-10												< 1600	< 40	< 1600	ND	< 1600			
Landfill - Subsurface	BH-1-20												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-1-40												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-1-61												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-1-70												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-1-88												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-2-6												< 16000	790	< 16000	ND	31000			
Landfill - Subsurface	BH-2-10												< 1600	< 40	1800	ND	< 1600			
Landfill - Subsurface	BH-2-21.5												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-1-41												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-2-61												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-2-80.5												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-3-6												< 330	< 40	< 330	ND	< 330			
Landfill - Subsurface	BH-3-11												ND	ND	ND	ND	630			
Landfill - Subsurface	BH-3-21												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-3-41												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-3-81												ND	ND	ND	ND	ND			
Landfill - Subsurface	BH-3-100												ND	ND	ND	ND	ND			
Landfill - Subsurface	831057-2																			
Landfill - Subsurface	831057-3																			
Landfill - Subsurface	831057-4		450	200	130			200	68		100							200	100	
Landfill - Subsurface	831057-5		71000	90000	1600	190	110	26000	8800			150000			4400			5500	12000	
Landfill - Subsurface	831057-6		2900	33000	670	65		9900	3500			4100					63000	1600	2300	
Landfill - Surface	G-1																			
Landfill - Surface	G-2																			
Landfill - Surface	G-3																			
Landfill - Surface	G-4																			
Foundary Sands	G-13												ND		ND	ND	ND			
Foundary Sands	G-14												ND		ND	ND	ND			
Downslope	G-15												ND		ND	ND	ND			
Downslope	G-16												ND		ND	ND	ND			
Downslope	G-17												ND		ND	ND	ND			

Sources: SCS Engineers (1990a), Harding Lawson Associates (1998b), and IT (2002)

A blank indicates that no result was reported.

ND: Not Detected

µg/kg: micrograms per kilogram

Table 3a
2005 Updated Risk Screening for East Slag Pile Landfill Area

Constituent[a]	Boring	Depth ft bgs	ESP Landfill Max. Conc. (mg/kg)	Ambient Comparison[b]		Industrial PRG (mg/kg)			Estimated Risk	Hazard Quotient[d]
				Ambient Mean + 2SD	Site > Ambient	2004 Value[c]	Toxicity Basis	Site Max > PRG		
Antimony	G-3	0.5	25	4.86	Yes	410	nc	No		0.06
Arsenic	G-3	0.5	44	10.39	Yes	1.6	carc	Yes	3.E-05	
Barium	G-2	0.5	150	175	No	67000	nc	No		0.002
Beryllium	G-3	0.5	4	<1	Yes	1900	carc	No	2.E-09	
Cadmium	G-2	0.5	35	0.25	Yes	450	nc	No		0.078
Chromium	ESP3-1	4	261	22.83	Yes	450	carc	No	6.E-07	
Cobalt	G-13	0.5	0.56	7.47	No	1900	carc	No	1.E-09	0.0003
Copper	G-3	0.5	380	22.47	Yes	41000	nc	No		0.009
Iron	ESP2-1	0.5	317000			100000	nc			
Lead	G-2	0.5	5330	24.64	Yes	800	nc	Yes		7
Mercury	G-2	0.5	1	<0.5	Yes	310	nc	No		0.003
Nickel	G-3	0.5	210	12.45	Yes	20000	nc	No		0.01
Selenium	BH-2-10	10	1	< 0.5	Yes	5100	nc	No		0.0002
Silver	BH-2-10	10	5	< 1	Yes	5100	nc	No		0.001
Vanadium	G-14	0.5	5.7	51	Yes	1000	nc	No		0.01
Zinc	G-2	0.5	12700	108	Yes	100000	max	No		
Cyanide	BH-2-10	10	270			12000	nc	Yes		0.02
4-Methyl-2-Pentanone	ESP3-2	6	0.083	Not Applicable		47000	nc	No		0.000002
Toluene	ESP5-1	1	0.055	Not Applicable		520	nc	No		0.0001
Di-n-butylphthalate	ESP3-1	4	16	Not Applicable		62000	nc	No		0.0003
Bis(2-ethylhexyl)phthalate	ESP3-2	6	9.2	Not Applicable		120	carc	No	8.E-08	
PCB (Aroclor 1242)	BH-2-6	6	0.79	Not Applicable		0.74	carc	Yes	1.E-06	
Phenol	BH-2-10	10	1.8	Not Applicable		100000	max	No		
Dibenzofuran	BH-2-6	6	31	Not Applicable		1600	nc	No		0.02

Table 3a
2005 Updated Risk Screening for East Slag Pile Landfill Area

Constituent[a]	Boring	Depth ft bgs	ESP Landfill Max. Conc. (mg/kg)	Ambient Comparison[b]		Industrial PRG (mg/kg)			Estimated Risk	Hazard Quotient[d]
				Ambient Mean + 2SD	Site > Ambient	2004 Value[c]	Toxicity Basis	Site Max > PRG		
Acenaphthylene	BH-2-6	6	53	Not Applicable		Not Established				
Acenaphthene	BH-1-10	10	6.1	Not Applicable		29000	nc	No		0.0002
Anthracene	BH-2-6	6	31	Not Applicable		100000	max	No		
Benzo(a)anthracene	ESP1-3	8	1.9	Not Applicable		2.1	carc	No	9.E-07	
Benzo(b)fluoranthene	BH-1-5	5	1.9	Not Applicable		2.1	carc	No	9.E-07	
Benzo(k)fluoranthene	ESP1-3	8	1.3	Not Applicable		1.3	carc	No	1.E-06	
Benzo(g,h,i)perylene	G-4	0.5	0.38	Not Applicable		Not Established				
Benzo(a)pyrene	ESP1-3	8	1.3	Not Applicable		0.21	carc	Yes	6.E-06	
Chrysene	BH-1-10	10	2.9	Not Applicable		13	carc	No	2.E-07	
Fluoranthene	BH-1-5	6	5.6	Not Applicable		22000	nc	No		0.0003
Fluorene	BH-2-6	6	39	Not Applicable		26000	nc	No		0.002
2-Methylnaphthalene	BH-1-10	10	3.6	Not Applicable		Not Established				
Naphthalene	BH-1-10	10	13	Not Applicable		4.2	carc	Yes	3.E-06	
Phenanthrene	BH-1-10	10	14	Not Applicable		Not Established				
Pyrene	G-3	6	6	Not Applicable		29000	nc	No		0.0002
Cumulative Risk									4.E-05	
Hazard Index[d]										6.9

mg/kg = milligrams per kilogram

[a] Any constituent reported as detected at least once in the following samples was included (only samples between the surface and 10 feet below the ground surface have been considered).

[b] Ambient results are for the mean and the 99% percentile of the distribution (mean plus 2 times the standard deviation [ambient mean + 2SD]
Ambient results are local soils from SCS (1995)

[c] 2004 Preliminary Remediation Goals (PRGs) from U.S. EPA Region 9; toxicity basis are carcinogenic risk (carc), noncarcinogenic health effects (nc), and maximum allowable level (max); and NS indicates that a PRG has not been set

[d] Hazard quotients reported as 0.000 indicate the quotient was <0.001. The hazard index is the sum of all hazard quotients except for lead. Lead has not been included in the hazard index since the PRG is based on a blood lead level rather than a reference dose

Table 3b
2005 Updated Risk Screening for Impacted Soils on West Slope of East Slag Pile Landfill Area

Constituent[a]	Flank Soil Conc Range		ESP Landfill Max. Conc. (mg/kg)	Ambient Comparison[b]		Industrial PRG (mg/kg)[c]		Max Estimated Risk	Max Hazard Quotient[e]
	Min (mg/kg)	Max (mg/kg)		Ambient Mean + 2SD	Site > Ambient	2004 Value[d]	Toxicity Basis		
Antimony	1.9	29	25	4.86	Yes	410	nc		0.07
Arsenic	2.1	130	44	10.39	Yes	1.6	carc	8.E-05	
Barium	44	420	150	175	No	67000	nc		0.01
Beryllium	3	3.4	4	<1	Yes	1900	carc	2.E-09	
Cadmium	nd	3.4	35	0.25	Yes	450	nc		0.01
Chromium	34	860	261	22.83	Yes	450	carc	2.E-06	
Cobalt	2	78	0.56	7.47	No	1900	carc	4.E-08	0.04
Copper	17	540	380	22.47	Yes	41000	nc		0.01
Lead	26	180	5330	24.64	Yes	800	nc		0.23
Mercury	0.0057	0.26	1	<0.5	Yes	310	nc		0.00
Molybdenum	110	140	Not Reported	Not Available	Yes				
Nickel	4.9	1300	210	12.45	Yes	20000	nc		0.07
Selenium	1.4	3.2	1	< 0.5	Yes	5100	nc		0.00
Vanadium	18	540	5.7	51	Yes	1000	nc		0.54
Zinc	3	2100	12700	108	Yes	100000	max		0.021
Benzene	0.2	90	Not Reported	Not Applicable		1.4	carc	6.E-05	
Ethylbenzene	0.13	1.6	Not Reported	Not Applicable		400	nc		0.00
Isopropylbenzene	ND	0.19	Not Reported	Not Applicable		Not Established			
n-Propylbenzene	ND	0.11	Not Reported	Not Applicable		Not Established			
Styrene	ND	0.072	Not Reported	Not Applicable		1700	sat		0.00
Toluene	0.45	71	0.055	Not Applicable		520	nc		0.14
1.2.4-Trimethylbenzene	0.2	5.5	Not Reported	Not Applicable		170	nc		0.03
1,3,5-Trimethylbenzene	0.1	12	Not Reported	Not Applicable		70	nc		0.17
Xylenes	0.268	34.8	Not Reported	Not Applicable		400	nc		0.09
Dibenzofuran	ND	63	Not Reported	Not Applicable		1600	nc		0.04
Phenol	ND	120	1.8	Not Applicable		100000	max		0.00

Table 3b
2005 Updated Risk Screening for Impacted Soils on West Slope of East Slag Pile Landfill Area

Constituent[a]	Flank Soil Conc Range: Min (mg/kg)	Flank Soil Conc Range: Max (mg/kg)	ESP Landfill Max. Conc. (mg/kg)	Ambient Comparison[b]: Ambient Mean + 2SD	Ambient Comparison[b]: Site > Ambient	Industrial PRG (mg/kg)[c]: 2004 Value[d]	Industrial PRG (mg/kg)[c]: Toxicity Basis	Max Estimated Risk	Max Hazard Quotient[e]
Acenaphthylene	ND	45	53	Not Applicable					
Acenaphthene	ND	100	6.1	Not Applicable		29000	nc		0.00
Anthracene	ND	110	31	Not Applicable		100000	max		
Benzo(a)anthracene	ND	200	1.9	Not Applicable		2.1	carc	1.E-04	
Benzo(b)fluoranthene	ND	330	1.9	Not Applicable		2.1	carc	2.E-04	
Benzo(k)fluoranthene	ND	250	1.3	Not Applicable		1.3	carc	2.E-04	
Benzo(g,h,i)perylene	ND	150	0.38	Not Applicable					
Benzo(a)pyrene	ND	250	1.3	Not Applicable		0.21	carc	1.E-03	
Chrysene	ND	290	2.9	Not Applicable		13	carc	2.E-05	
Fluoranthene	ND	390	5.6	Not Applicable		22000	nc	2.E-08	0.02
Fluorene	ND	90	39	Not Applicable		26000	nc	3.E-09	0.00
2-Methylnaphthalene	ND	36	3.6	Not Applicable					
Naphthalene	0.59	310	13	Not Applicable		4.2	carc	7.E-05	
Phenanthrene	ND	370	14	Not Applicable					
Pyrene	ND	120	6	Not Applicable		29000	nc		0.00
Cumulative Risk								2.E-03	
Hazard Index[e]									1.5

[a] Any constituent reported as detected at least once in the following samples was included (only samples between the surface and 10 feet below the ground surface have been considered).

mg/kg = milligrams per kilogram

[b] Ambient results are for the mean and the 99% percentile of the distribution (mean plus 2 times the standard deviation [ambient mean + 2SD]
Ambient results are local soils from SCS (1995)

[c] 2000 Preliminary Remediation Goals (PRGs) from U.S. EPA Region 9; toxicity basis are carcinogenic risk (carc), noncarcinogenic health effects (nc), and maximum allowable level (max); and NS indicates that a PRG has not been set

[d] 2004 Preliminary Remediation Goals (PRGs) from U.S. EPA Region 9; toxicity basis are carcinogenic risk (carc), noncarcinogenic health effects (nc), and maximum allowable level (max); and NS indicates that a PRG has not been set

[e] Hazard quotients reported as 0.00 indicate the quotient was <0.01. The hazard index is the sum of all hazard quotients except for lead. Lead has not been included in the hazard index since the PRG is based on a blood lead level rather than a reference dose

Table 4
Applicable or Relevant and Appropriate Requirements

	Requirement	Prerequisites	Citation	ARAR Determination[a] (A, RA, or TBC)	Comments
East Slag Pile Landfill Area	**Chemical-Specific Applicable or Relevant and Appropriate Requirements**				
	Solid Waste Disposal Regulatory Reform Act (California Assembly Bill 1220 – Chapter 656, Statutes of 1993) *Regulated by the State Water Resources Control Board and the California Integrated Waste Management Board*				
	Concentrations of methane at a landfill boundary may not exceed 5% by volume in air, and concentrations in on-site structures may not exceed 1.25% percent by volume in air.	Methane at landfill	27 CCR 20921[a][1,2,3]	A	
	Clean Air Act (42 USC 7401-7671) *Regulated by the South Coast Air Quality Management District (SCAQMD)*				
	Primary and secondary national standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Air contamination affecting public health and welfare	40 CFR 50.4-50.12	A	SCAQMD standards from State Implementation Plan and California Air Resources Board are more restrictive.
	Resource Conservation and Recovery Act (42 USC 6901-6991[i]) *Regulated by the California Environmental Protection Agency, Department of Toxic Substances Control*				
	Defines RCRA hazardous waste. A solid waste is toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste	22 CCR 66261.21, 66261.22, 66261.23, 66261.24, 66261.100	A	Applicable only for any excavated material that requires management off-site.
	Definition of "non-RCRA hazardous waste."	Waste	22 CCR 66261.22, 66261.24, 66261.101, 66261.3	A	Applicable for determining whether a waste is a non-RCRA hazardous waste.
	Safe Drinking Water Act (42 USC 300(f-j)–26) *Regulated by the California State Water Resources Control Board*				
	Maximum contaminant levels (MCLs) for organic and inorganic chemicals of concern in drinking water. – Potential MCLs that are ARARs are0.01 mg/L arsenic, 2 mg/L barium, 0.1 mg/L chromium, and 1.3 mg/L copper	Public water system	40 CFR 141.61 (a, b), 141.62(b), & 141.11	RA	Leachate from the landfill may impact groundwater that has a designated beneficial use as municipal water, thus MCLs are relevant and are appropriate
	Non-zero Maximum contaminant level goals (MCLGs) for organic and inorganic chemicals of concern in drinking water - Potential MCLGs are 2 mg/L barium, 0.1 mg/L chromium, and 1.3 mg/L copper	Public water system	40 CFR 141.50 & 141.51	RA	Leachate from the landfill may impact groundwater that has a designated beneficial use as municipal water, thus MCLGs are relevant and are appropriate
	California Safe Drinking Water and Toxic Enforcement Act (California Health & Safety Code 25249.5-25249.13) *Regulated by the California State Water Resources Control Board*				
	Primary maximum contaminant levels (MCLs) for inorganic chemicals of concern in drinking water – 0.05 mg/L arsenic, 1 mg/L barium, 0.05 mg/L chromium, and 1 mg/L nickel – and secondary MCLs – 1.0 mg/L copper, 0.3 mg/L iron, 5.0 mg/L zinc, and 500 mg/L Total Dissolved Solids	Source of drinking water	22 CCR 64431, & 64449	RA	Leachate from the landfill may impact groundwater that has a designated beneficial use as municipal water, thus MCLGs are relevant and are appropriate
	Public Health Goals for inorganic chemicals in drinking water – 0.000004 mg/L arsenic, 2 mg/L barium, 170 mg/L copper, 2 mg/L lead, and 12 mg/L nickel	Source of drinking water	Health and Safety Code 116365	TBC	Guideline values established by the Office of Environmental Health Hazard Assessment based solely on health considerations
	Motor Vehicles (California Code of Regulations 1956.8 and 2423) *Regulated by the California Air Resources Board*				
	Exhaust emission standards for heavy-duty engines and vehicles on highways - 0.40 g of NOx per mile (applied to haul trucks)	Air contaminants	13 CCR 1956.8	RA	Restrictive NOx emission standards for on-road haul vehicles are necessary to meet SCAQMD threshold value for project
	Exhaust emission standards for off-road compression-ignition engines - 1.39 lbs of NOx per hour (applied to dozers)	Air contaminants	13 CCR 2423	RA	Restrictive NOx emission standards for dozers are necessary to meet SCAQMD threshold value for project
	Location-Specific Applicable or Relevant and Appropriate Requirements				
	No location-specific ARARs were identified for the ESP Landfill Area. The site is not located in a sensitive or protected area.				
	Action-Specific Applicable or Relevant and Appropriate Requirements				
	Porter-Cologne Water Quality Control Act (California Water Code, Division 7) *Regulated by the State Water Resources Control Board and the Santa Ana Regional Water Quality Control Board*				

Table 4 (Continued)
Applicable or Relevant and Appropriate Requirements

	Requirement	Prerequisites	Citation	ARAR Determination[a] (A, RA, or TBC)	Comments
	Any activity, such as containment of contaminated soil, that could affect water quality must not result in water quality parameters exceeding appropriate beneficial use water quality objectives.	Contaminants affecting waters of the state	Santa Ana River Basin Water Quality Control Plan	A	Groundwater protection standards are set at most stringent levels consistent with beneficial use identified for the area.
	State antidegradation policy applicable to both surface water and groundwater requiring that discharges to waters of the State shall be regulated to achieve the “highest water quality consistent with maximum benefit to the people of the State.”	Contaminants affecting waters of the state	Santa Ana River Basin Water Quality Control Plan	A	Groundwater protection standards are set at most stringent levels consistent with beneficial use identified for the area.
East Slag Pile Landfill Area	Requires that quality of waters of the state that is better than needed to protect all beneficial uses be maintained unless certain findings are made. Discharges to high-quality waters must be treated using best practicable treatment or control necessary to prevent pollution or nuisance and to maintain the highest quality water. Requires cleanup to background water quality or to lowest concentrations technically and economically feasible to achieve. Beneficial uses must, at least, be protected.	Contaminants affecting waters of the state	SWRCB Res. 68-16	A	Groundwater protection standards are set at most stringent levels consistent with beneficial use identified for the area.
	California Hazardous Waste Control Laws *Regulated by the California Environmental Protection Agency, Department of Toxic Substances Control*				
	Person who generates waste shall determine if that waste is a hazardous waste.	Waste	22 CCR 66262.10 & 66262.11	A	ESP Landfill materials were found to be mostly nonhazardous, but may contain hazardous constituents. Applicable to alternatives where excavation will occur and generate wastes.
	Owners and operators of a RCRA surface impoundment, waste pile, land treatment unit, or landfill shall conduct a monitoring and response program for each regulated unit.	Landfill for which constituents in or derived from waste may pose a threat to human health or the environment	22 CCR 66264.91	NA	RCRA action requirements are relevant, but neither applicable nor appropriate. Therefore, they do not apply. See Appendix F to the RI/FS (Shaw, 2006) for discussion.
	Requirements for monitoring groundwater, surface water, and the vadose zone.	Hazardous waste treatment, storage, or disposal facility	22 CCR 66264.97	NA	RCRA action requirements are relevant, but neither applicable nor appropriate. Therefore, they do not apply. See Appendix F to the RI/FS (Shaw, 2006) for discussion.
	Design and construction requirements for the foundation, earth-barrier, and vegetation-support layers of the final cover.	Discharge of hazardous waste to land after 7/18/97 for treatment, storage or disposal	22 CCR 66264.228	NA	RCRA action requirements are relevant, but neither applicable nor appropriate. Therefore, they do not apply. See Appendix F to the RI/FS (Shaw, 2006) for discussion.
	Requires that hazardous wastes be covered at closure by a low-permeability cover of specified properties. The cover will prevent the downward entry of water to the closed landfill for at least 100 years. Provides for post-closure care and maintenance of the cover and related components. Toxic or flammable gas or vapor must be controlled. Gas or vapor control must continue for as long as the gas or vapor is emitted from the site.	Discharge of hazardous waste to land after 7/18/97 for treatment, storage or disposal	22 CCR 66264.310	NA	RCRA action requirements are relevant, but neither applicable nor appropriate. Therefore, they do not apply. See Appendix F to the RI/FS (Shaw, 2006) for discussion.
	Solid Waste Disposal Regulatory Reform Act (California Assembly Bill 1220 – Chapter 656, Statutes of 1993) *Regulated by the State Water Resources Control Board and the California Integrated Waste Management Board*				
	Waste dischargers are responsible for accurate characterization of waste. Defines designated nonhazardous solid waste and inert waste.	Discharge of nonhazardous and inert waste to land after 7/18/97 for treatment, storage or disposal	27 CCR 20220(b, c, d) & 20230(b)	A	Waste is not classed as hazardous (but has some hazardous constituents), so cover design standards for permitted Class III landfills apply.
	Requires detection monitoring. Once a significant release has occurred, evaluation or corrective action monitoring is required.	Discharge of waste to land after 7/18/97	27 CCR 20385 (a)(1) & (a)(2)	A	Water quality monitoring required for closed units, unless they are clean-closed. Includes unpermitted discharges of waste to land.
	Defines a water quality protection standard (list of constituents of concern, concentration limits, and point-of-compliance and monitoring points) that applies during active life, closure, and postclosure maintenance periods. Concentration limits will be set at background or at concentrations greater than background for corrective action where achieving background water quality is technically or economically infeasible.	Discharge of waste to land after 7/18/97	27 CCR 20390, 20395, & 20400	A	Water quality protection standards in waste discharge requirements must be met as demonstrated in detection monitoring program.
	Establishes requirements for landfill gas monitoring and controls as related to closure and post-closure of landfills	Discharges of waste to land after 7/18/79	27 CCR 20921 to 20937	A	Landfill gas monitoring required for closed units
	Point of compliance to be defined, hydraulically downgradient from the area where waste was discharged to land. Requires monitoring for compliance with remedial action objectives for 3 years after cleanup. Requires general soil, surface water, and groundwater monitoring.	Discharge of waste to land after 7/18/97	27 CCR 20405, 20410, & 20415	A	Waste discharge requirements will specify the monitoring locations.
	Requires submittal of closure and postclosure maintenance plans showing that the facility will meet performance standards and demonstrating its ability to comply with waste containment and precipitation and drainage control.	Discharge of waste to land after 7/18/97	27 CCR 20950	A	Closure requirements apply because facility was a permitted Class III landfill.

Table 4 (Continued)
Applicable or Relevant and Appropriate Requirements

	Requirement	Prerequisites	Citation	ARAR Determination[a] (A, RA, or TBC)	Comments
	Gives design requirements for final cover slopes, foundation layer, low-hydraulic conductivity layer, and erosion-resistant layer and mandates cover maintenance plan and annual cost estimates. Also provides for engineered alternatives to prescriptive cover design.	Discharge of waste to a landfill after 7/18/97	27 CCR 21090	A	Applicable to closure requirements because this was a permitted Class III landfill.
	Requires access control limits, site protection, and identification signs during closure and postclosure periods.	Discharge of waste to a landfill after 7/18/97	27 CCR 21135	A	Relevant and appropriate to site closure; not applicable because facility is not an operating landfill.
East Slag Pile Landfill Area	Sets criteria for the design of final covers for landfills.	Discharge of waste to a landfill after 7/18/97	27 CCR 21140	A	Applicable; ESP landfill was a permitted Class III landfill.
	Requires monitoring and analysis of differential settlement in postclosure period.	Discharge of waste to a landfill after 7/18/97	27 CCR 21142	A	Applicable; ESP landfill was a permitted Class III landfill.
	Requires analysis for stability of final landfill face under static and seismic loadings, with a minimum required factor of safety of 1.5 under both loadings.	Discharge of waste to a landfill after 7/18/97	27 CCR 21145 & 21750	A	Applicable; ESP landfill was a permitted Class III landfill.
	Requires postclosure maintenance of the final cover and environmental control systems for not less than 30 years. The 30 year period begins when closure of the entire landfill is complete. Maintenance and monitoring includes, but is not limited to, site security and gas monitoring and control system maintenance. Nonliquid wastes exposed during maintenance may be returned to the landfill if the integrity of the final cover is maintained. Provide copies of maps and reports describing the amount of differential settlement to the CIWMB and LEA.	Discharge of waste to a landfill after 7/18/97	27 CCR 21180	A	Applicable; ESP landfill was a permitted Class III landfill.
	Postclosure land uses shall protect public health and safety, prevent damage to closed landfill, and prevent public contact with waste.	Discharge of waste to a landfill after 7/18/97	27 CCR 21190(a)	A	Applicable; ESP landfill was a permitted Class III landfill.
	Clean Air Act (42 USC 7401-7671) *Regulated by the South Coast Air Quality Management District*				
	Limits visible emissions from a single source to less than Ringlemann No. 1 or 20 percent opacity fo 3 minutes in any hour.	Air emissions	SCAQMD Rule 401	A	Applicable for construction activities.
	Prohibits discharge of materials (including odorous compounds) that cause injury, detriment, nuisance, or annoyance to the public; or endanger the comfort, repose, health, or safety of the public; or cause or have a natural tendency to cause injury or damage to business or property.	Air emissions	SCAQMD Rule 402	A	Applicable for construction activities.
	Shall not cause or allow the emissions of fugitive dust such that the presence of such dust remains visible in the atmosphere beyond the property line of the emission source and shall not cause or allow PM_{10} levels to exceed 50 micrograms per cubic meter when determined, by simultaneous sampling, as the difference between upwind and downwind samples.	Generation of fugitive dust	SCAQMD Rule 403	A	Applicable for construction activities.
	Prohibits discharge into the atmosphere of particulate matter in excess of specified concentrations.	Generation of particulates	SCAQMD Rule 404	A	Applicable for construction activities.
	Limits equipment from discharging particulate emissions in escess of 0.99 to 30 pounds per hour, based on a given process weight.	Generation of particulates	SCAQMD Rule 405	A	Applicable for construction activities.
	Limits carbon monoxide and sulfur dioxide emissions from any equipment other than that used for mobile equipment propulsion or stationary equipment engines.	Air contaminant sources except mobile equipment or stationary engines	SCAQMD Rule 407	A	Applicable for construction activities.
	Prohibits building, erecting, installing, or using any equipment which reduces or conceals an emission otherwise constituting a violation.	Air emissions	SCAQMD Rule 408	A	Applicable for construction activities.
	Limits particulate emissions from the exhaust of a combustion source (other than an internal combustion engine) to 0.23 grams/cubic meter at 12% CO_2 averaged over 15 minutes.	Combustion sources except internal combustion engines	SCAQMD Rule 409	A	Applicable for construction activities.
	Limits emissions of sulfur compounds from gaseous fuels to no more than 40 parts per million, 0.05 percent by weight (liquid fuels), and 0.56 pounds of sulfer per million BTUs (solid fossil fuels).	Combustion sources using liquid or solid fossil fuels	SCAQMD Rules 431.1, 431.2, 431.3	A	Applicable for construction activities.
	Limits concentration of oxides of nitrogen from any non-mobile fuel-burning equipment , averaged over 15 minutes, to a rage of 125 to 300 parts per million (gaseous fuels) and 225 to 400 parts per million (liquid and solid fuels), depending on equipment size.	Non-mobile equipment using gaseous, liquid, or solid fuels	SCAQMD Rule 474	A	Applicable for construction activities.
	Specifies emissions testing, monitoring procedures, or handling or hazardous pollutants such as beryllium, benzene, mercury, vinyl chloride, and asbestos.	Hazardous air polllutants	SCAQMD Reg. X NESHAPS	A	Applicable for construction activities.

Table 4 (Continued)
Applicable or Relevant and Appropriate Requirements

	Requirement	Prerequisites	Citation	ARAR Determination[a] (A, RA, or TBC)	Comments
	Sets emission standards for nitrous oxides, volatile organic compounds, and carbon monoxide from gaseous and liquid fueled portable engines.	Portable engines used on construction site	SCAQMD Rule 1110-2	A	Applicable for construction activities.
	Requires person excavating a landfill to identify mitigation measures to ensure that a public nuisance does not occur.	Excavation of inactive landfill	SCAQMD Rule 1150	A	Applicable for construction activities.
East Slag Pile Landfill Area	Limits volatile organic compound emissions from contaminated soil to less than 50 parts per million. For higher emissions, an approved mitigation plan, describing removal methods and mitigation measures, must be obtained. Uncontrolled spreading of conatminated soil banned.	Volatile organic compounds in soil being excavated	SCAQMD Rule 1166	A	Applicable for construction activities.
	All new sources of air pollution that may result in a net emission increase of any nonattainment air contaminant or any halogenated hydrocarbons are to employ Best Available Control Technology. Limits emissions of nonmethane organic compounds to less than 1 pound/day.	Nonattainment contaminant or halogenated hydrocarbon	SCAQMD Rule 1303	A	Applicable for construction activities.
	Requires equipment to be constructed with Best Available Control Technology. Non-attainment emission increases must be offset and substantiated with modeling that the equipment will not significantly increase concentrations of non-attainment emissions.	New / modified equipment which may cause issuance of a non-attainment contaminant	SCAQMD Reg. XII New Source Review	A	Applicable for construction activities.
	Defines health risk assessment methodology; exempts nonmethane organic compounds from controls if the health risk is less than 1 in 1 million.	Nonmethane organic compounds	SCAQMD Rule 1401	A	
	Clean Water Act (33 USC 1251-1387) and Porter-Cologne Water Quality Control Act (California Water Code, Division 7) *Regulated by the State Water Resources Control Board and the Santa Ana Regional Water Quality Control Board*				
	Waste management units undergoing final closure, with 1 acre of disturbance or more, must comply with substantive requirements for eliminating most nonstormwater discharges, developing and implementing a stormwater pollution prevention plan, and monitoring stormwater discharges.	Construction activity on site larger than 1 acre	SWRCB Order 99-08-DWQ; SWRCB Res. 2001-046	A	Site exceeds 1 acre; substantive requirements under the Statewide General Construction NPDES permit must be met, including stormwater pollution prevention plan & sampling.
	Requires incorporation of permanent Best Management Practices to control storm water runoff pollution after completion of project. Requires monitoring, sampling, and analysis of storm water discharges under specified circumstances.	Long-term operation and maintenance of site	SARWQCB Order R8-2002-0012	A	Stormwater pollution controls required for long-term maintenance under the Statewide General Industrial NPDES permit.
	Miscellaneous State Provisions for Institutional Controls				
	Provides conditions under which land-use restrictions will apply to successive owners of land.	Transfer site to new owner	California Civil Code 1471	A	Institutional controls apply to future uses of the ESP Landfill site.
	Prohibits certain uses of land containing hazardous waste without a specific variance.	Hazardous waste property	California Health & Safety Code 25232(b)(1)(A-E)	RA	Materials in ESP are not hazardous wastes nor is the landfill a Class I facility. However conditions of the closed ESP are sufficiently similar to a closed hazardous waste landfill that this requirement is considered relevant and appropriate

Abbreviations:
ARAR – applicable or relevant and appropriate requirement
CCR – California Code of Regulations
CFR – Code of Federal Regulations
ESP – East Slag Pile
PM_{10} – particulate matter with aerodynamic diameter less than 10 microns
RCRA – Resource Conservation and Recovery Act
SARWQCB – Santa Ana Regional Water Quality Control Board
SCAQMD – South Coast Air Quality Management District
SWRCB – State Water Resources Control Board
USC – United States Code

[a] *Determination Codes:*
A – applicable
RA – relevant and appropriate
TBC – to be considered

Table 5
Post-Closure Land-Use Scenarios

Scenario Title	Parking Lot for Light Vehicles	Heavy Laydown or Storage Yard
Scenario Description	Provide all-weather, open-air parking space for attendees of Speedway races and other events. Use space for compatible purposes when not needed for parking. Includes access route to and from local streets.	Provide storage and parking space for tractor-trailers, shipping containers, and heavy freight. Allow for continuous usage by heavy forklifts and other hoisting equipment. Includes heavy-vehicle access route to and from local streets and highways.
Design Requirements	Expect settlement rates of up to several inches per year, and total settlements of up to several ft locally. • Traffic surface will carry conventional automobile and light truck loads under all-weather conditions. • The surface should not generate dust or mud. • Design or maintain the surface so that settlement will not create significant ponding or drainage reversals. • Keep landfill-gas exposure within regulatory, human-health limits. • Cap non-paved areas with a final cover system per Title 27 or as approved by DTSC.	With deep dynamic compaction, expect settlement rates of less than 1 inch per year, and total settlements of inches to perhaps feet locally. • Surface will support loaded semi trailers, intermodal shipping containers, and similar loads, plus heavy truck and tractor traffic. • Traffic lanes will also undergo traffic and turning loads from heavy forklifts and loading/unloading equipment. • The surface should not generate dust or mud. • Design or maintain the surface so that settlement will not create significant ponding or drainage reversals. • Limit grades for safe and efficient parking, loading, and unloading. • Keep landfill-gas exposure within regulatory, human-health limits. • Cap non-paved areas with a final cover system per Title 27 or as approved by DTSC.
Scenario Components	• Excavation of trenches possibly in waste for landfill gas extraction system • Two-lane (minimum) paved access roadway to San Bernardino Avenue, with shoulders. • Heavy proof-rolling of subgrades under pavement. • High-modulus geogrid reinforcement in soil, one layer. • Aggregate base course layer, 8" thick, compacted. • Asphalt concrete layer, 5" thick, compacted. • Lane markings, perimeter berms, and guard rails. • Drainage gutters to downdrains at site perimeter. • Suitable monitoring and venting system for landfill gas. • Maintenance program to repair and periodically regrade and repave settled parts of the parking area.	• Excavation of trenches possibly in waste for landfill gas extraction system • Two-lane (minimum) paved access roadway to San Bernardino Avenue, with shoulders; grades limited to 8% maximum. • Regrade top deck to form a continuous pad with 3% maximum slope gradient. • Deep dynamic compaction of existing landfill debris and uncompacted fill to reduce risk of unconstrained settlement. • Grade dynamic compaction area; compact subgrade under yard.. • Aggregate base course layer, 12" thick, compacted. • Asphalt concrete pavement, 8" thick. • Lane markings, perimeter berms, and guard rails. • Drainage gutters to downdrains at site perimeter. • Suitable monitoring and venting system for landfill gas. • Maintenance program to repair settled parts of the yard.

Table 6
Detailed Analysis of Alternatives for the East Slag Pile Landfill Area

CERCLA/NCP Evaluation Criteria	RAA 1 No Action	RAA 2 Prescriptive Cover (Title 27) on Slopes with Postclosure Development on the Top Deck	RAA 3 Monolithic Cover (Title 27 Alternative) on Slopes with Postclosure Development on the Top Deck	RAA 4 Enhanced Monolithic Cover on Slopes with Postclosure Development on the Top Deck	RAA 5 Prescriptive Cover (Title 22) on Slopes with Postclosure Development on the Top Deck
Overall Protection of Human Health and the Environment	Will not be protective of human health and the environment. Waste could migrate via wind or storm-water erosion. Direct contact of waste could occur.	Will provide adequate protection from direct exposure, limit contaminants from migrating via wind or storm-water erosion, and control infiltration to groundwater.	Will provide adequate protection from direct exposure, limit contaminants from migrating via wind or storm-water erosion, and control infiltration to groundwater.	Will better provide protection from direct exposure, limit contaminant migration via wind or storm-water erosion, and control infiltration to groundwater.	Will best provide protection from direct exposure, limit contaminant migration via wind or storm-water erosion, and control infiltration to groundwater.
Compliance with ARARs	Will not comply with ARARs.	Will comply with ARARs.	Will comply with ARARs.	Will comply with ARARs.	Will comply with ARARs, plus CCR Title 22.
Long-Term Effectiveness and Permanence	Does not provide long-term effectiveness or permanence.	Gives long-term effectiveness and permanence if the cover and gas control system are maintained. Income from site reuse can be applied to maintenance. There are concerns that the clay layer could dry and crack over time, reducing its effectiveness.	Gives long-term effectiveness and permanence if the cover and gas control system are maintained. Income from site reuse can be applied to maintenance.	Gives long-term effectiveness and permanence if the cover and gas control system are maintained. Income from site reuse can be applied to maintenance.	Gives long-term effectiveness and permanence if the cover and gas control system are maintained. Income from site reuse can be applied to maintenance. There are concerns that the clay layer could dry and crack over time, reducing its effectiveness.
Reduction of Toxicity, Mobility, and Volume	No reduction of mobility, toxicity, or volume of contaminants of concern in the waste.	Reduces mobility, but not volume or toxicity, of metals in shallow soil.	Reduces mobility, but not volume or toxicity, of metals in shallow soil.	Reduces mobility, but not volume or toxicity, of metals in shallow soil.	Reduces mobility, but not volume or toxicity, of metals in shallow soil.
Short-Term Effectiveness	No short-term effects occur as part of this alternative.	Short-term effects are construction related, involving the chance of contact with contaminated waste. Effects can be mitigated through standard health and safety procedures. The time for implementation is moderately long, on the order of 6 months.	Short-term effects are construction related, involving the chance of contact with contaminated waste. Effects can be mitigated through standard health and safety procedures. The time for implementation is moderately long, on the order of 6 months.	Short-term effects are construction related, involving the chance of contact with contaminated waste. Effects can be mitigated through standard health and safety procedures. The time for implementation is moderately long, on the order of 6 months.	Short-term effects are construction related, involving the chance of contact with contaminated waste. Effects can be mitigated through standard health and safety procedures. The time for implementation is moderately long, on the order of 6 months.
Implementability	Readily implementable.	Readily implemented, technically and administratively. All equipment and materials are available. Alternative has been successfully implemented in the past. **Parking Lot** • Ongoing settlement monitoring and maintenance required. • Landfill gas collection and venting required. **Storage** • Ongoing settlement monitoring and maintenance required. • Landfill gas collection and venting required. • Wider access road and more robust pavement section compared to Parking Lot scenario.	Readily implemented, technically and administratively. All equipment and materials are available. Alternative has been successfully implemented in the past. **Parking Lot** • Ongoing settlement monitoring and maintenance required. • Landfill gas collection and venting required. **Storage** • Ongoing settlement monitoring and maintenance required. • Landfill gas collection and venting required. • Wider access road and more robust pavement section compared to Parking Lot scenario.	Readily implemented, technically and administratively. All equipment and materials are available. Alternative has been successfully implemented in the past. **Parking Lot** • Ongoing settlement monitoring and maintenance required. • Landfill gas collection and venting required. **Storage** • Ongoing settlement monitoring and maintenance required. • Landfill gas collection and venting required. • Wider access road and more robust pavement section compared to Parking Lot scenario.	Readily implemented, technically and administratively. All equipment and materials are available. Alternative has been successfully implemented in the past. **Parking Lot** • Ongoing settlement monitoring and maintenance required. • Landfill gas collection and venting required. **Storage** • Ongoing settlement monitoring and maintenance required. • Landfill gas collection and venting required. • Wider access road and more robust pavement section compared to Parking Lot scenario.
State Acceptance	State would likely reject this alternative as not protective of human health and the environment.	State is unlikely to accept alternative due to concerns about drying and cracking of low-permeability layers as a result of the dry climate at nearby sites.	State would likely accept this alternative.	State would very likely accept this alternative.	State agencies would likely differ on the acceptability of the alternative. RWQCB may not accept it due to the use of synthetic materials and concerns about drying and cracking of the low-permeability soil layer.
Community Acceptance	Community would likely reject this alternative as not protective of human health and the environment. This alternative limits reuse of the site.	Community would likely accept this alternative.	Community would likely accept this alternative.	Community would likely accept this alternative.	Community would likely accept this alternative.
Cost (Net Present Worth)	$ 0	$ 10,216,176 to $ 12,712,742	$ 10,808,791 to $ 13,295,397	$ 12,079,632 to $ 14,544,879	$ 13,654,215 to $ 16,091,825

ARAR – applicable or relevant and appropriate requirement

Appendix A
Administrative Record List

California Code of Regulations (CCR) Title 27, Section 20919.5, *Explosive Gases Control*.

CCR Title 27, Section 21090, *Closure and Post-Closure Maintenance Requirements for Solid Waste Landfills*.

CCR Title 27, Section 21190, *Postclosure Land Use*.

CCR Title 22, Section 66264 *Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, & Disposal Facilities*.

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SCS, 1990c, *Sampling and Testing of Landfill Waste, East Slag Pile, KSR Fontana, California*, unpublished letter report to Kaiser Steel Resources, Inc., August.

SCS, 1990d, *Draft Phase 2 Remedial Investigation Report, Kaiser Steel Resources Facility, Fontana, California*, unpublished report to Kaiser Steel Resources, Inc., September.

SCS, 1991, *Draft Preliminary Risk Assessment, East Slag Pile Landfill*, unpublished report to Kaiser Steel Resources, Inc., March.

SCS, 1994, *Interim Closure Report, ChemWest Lower Facility*, unpublished report to Kaiser Steel Resources, Inc., July.

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Appendix B
Statement of Reasons and Nonbinding Preliminary Allocation of Responsibility

Department of Toxic Substances Control

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Linda S. Adams
Secretary for
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Governor

STATEMENT OF REASONS FOR FORMER KAISER STEEL MILL – EAST SLAG PILE LANDFILL AREA REMEDIAL ACTION PLAN

Pursuant to California Health and Safety Code (HSC), section 25356.1(d), the California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC) has prepared this Statement of Reasons as part of the attached Remedial Action Plan (RAP) for the Former Kaiser Steel Mill – East Slag Pile Landfill Area at 13425 San Bernardino Avenue, Fontana, San Bernardino County, California.

The RAP presents a summary of the Remedial Investigation (RI) to address landfilled industrial wastes such as sludge from various mills and treatment processes, lime neutralized waste pickle liquor, waste oil, ash, and asbestos. Constituents of potential concern (COPCs) include: metals such as arsenic, lead, zinc, chromium, and vanadium; semi-volatile organic compounds (SVOCs) such as polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs); cyanide; total petroleum hydrocarbons (TPH); volatile organic compounds (VOCs) such as benzene and toluene, and methane. These constituents of potential concern have been detected in soil and/or soil gas at the East Slag Pile Landfill Area. The RAP summarizes the results of five (5) risk assessments performed to determine the potential risks to public health and the environment associated with the COPCs listed above. The RAP also provides a discussion of the feasible remedial alternatives that were evaluated in the Feasibility Study (FS). The RAP recommends a remedial alternative that will meet the objectives of protecting public health and the environment. The RAP proposes remediation of soil by placing an engineered cap over the East Slag Pile (ESP) Landfill Area. The RAP also includes measures for controlling landfill gas (LFG) by placing an active LFG collection system under the cap.

DTSC believes that the attached RAP complies with the law as specified in the California Health and Safety Code, section 25356.1. Section 25356.1(e) requires that RAPs "shall include the basis for the remedial action selected." "The plan shall also include an evaluation of the consistency of the selected remedial action with the requirements of the federal regulations and the factors specified in subdivision (d)…" Subdivision (d) specifies six factors against which the remedial alternatives in the RAP must be evaluated. The proposed remedial action is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (the National Contingency Plan "NCP"), the federal Superfund regulations. The attached RAP has addressed all these factors in detail. A brief summary of each factor follows. The statement of reasons also includes the Nonbinding Preliminary Allocation of Responsibility (NBAR) as required by HSC section 25356.1(e).

1. Health and Safety Risks – Section 25356.1(d)(1)

The chemicals of concern identified for this site are: metals such as arsenic, lead, zinc, chromium, and vanadium; semi-volatile organic compounds (SVOCs) such as polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs); cyanide; total petroleum hydrocarbons (TPH); volatile organic compounds (VOCs) such as benzene and toluene, and methane. These constituents of potential concern have been detected in soil and/or soil gas at the ESP Landfill Area.

Five risk assessments were completed between 1991 and 2005 for the ESP Landfill Area. The following summary describes the scenarios considered and the pathways which represent a possible health risk.

- The initial 1991 risk assessment is considered a draft preliminary study since it was mostly qualitative and was based on a limited data set and now obsolete toxicity and exposure parameters. This initial risk assessment concluded that health issues of potential concern existed for direct-exposure pathways.

- The 1995 Baseline Risk Assessment (BRA) studied five (5) receptor groups and exposure pathways, namely: current on-site workers; future on-site workers; current off-site workers; future off-site workers; and future on-site residents. Pathways considered soil ingestion, soil dermal contact, inhalation of wind-eroded soil, inhalation of VOCs from below the surface, and ingestion of groundwater from the site.

- The 2002 study updated the previous BRA by using the original data to see if advances in the understanding of toxicity and exposure would change the conclusions of the initial assessment or the identified COPCs. Similar exposure pathways were determined for this study and concluded that the 1995 risk assessment was appropriate.

- The 2003 study updated the previous BRA by using data from soil gas sampling performed in 2003. The inhalation of VOCs was considered a potentially complete exposure pathway for future off-site workers. Supplemental assessments were performed to evaluate potential exposures for on-site residents and both on-site and off-site workers.

- The 2005 study evaluated the maximum detected concentration of each chemical screened against 2004 U.S. EPA Region IX Preliminary Remediation Goals (PRGs) to assess potential impacts of changes between 1995 and 2004. It was concluded that the 1995 risk assessment was appropriate in identifying exposure pathways and subsequent risks; however, inhalation of VOCs from LFG was recognized as an additional exposure pathway which represents a possible health risk.

2. Beneficial Uses of the Site Resources – Section 25356.1(d)(2)

The project site is located in an industrialized area of the county within an area zoned as commercial/industrial. The ESP Landfill Area is located on the East Slag Pile, a man-made hill approximately 100 high and composed of slag. The project site is heavily disturbed from many years of industrial activity and does not contain an undisturbed plant community. There are no parks, recreational areas or other scenic areas in the vicinity. The nearest industrial/commercial operations are a warehouse located approximately 100 feet to the west of the site constructed in 2004.

Storm-water runoff flows from the project site to the County maintained San Sevaine Channel to the west and to Mulberry Ditch to the east. These drainage features are typically dry for most of the year. Surface water discharge from the project site is under the jurisdiction of the Santa Ana Regional Water Quality Control Board (SARWQCB) and there is an existing National Pollution Discharge Elimination System permit for storm-water discharges to these channels. There are no vernal pools, wetlands, or marshes present at or in close proximity to the project site.

The SARWQCB Basin Plan has identified the project site as within the Chino No. 1 unit of the upper Santa Ana River basin. The groundwater within the Chino No. 1 unit has been designated as having Municipal and Domestic Supply, Agricultural Supply, Industrial Service Supply, and Industrial Process beneficial uses.

3. Effect of the Remedial Actions on Groundwater Resources

The RAP recommends a remedial alternative that will meet the objectives of protecting public health and the environment. The RAP proposes remediation of soil by placing an engineered cap over the East Slag Pile Landfill Area. The RAP also includes measures for controlling landfill gas (LFG) by placing an active LFG collection system under the cap. The placement of an engineered cap over the impacted materials within the landfill will minimize the infiltration of precipitation through the waste and subsequent generation of leachate which could transport contamination into the vadose zone and possibly to the regional groundwater aquifer. The proposed remedial alternative will result in protection of future and existing beneficial uses of groundwater (listed in previous section).

4. Site-Specific Characteristics – Section 25356.1(d)(4)

Chemicals in soil beneath the project site have been adequately characterized to evaluate remedial alternatives. Limited groundwater characterization has been performed, although the monitoring wells used were not specifically designed or located to evaluate water quality directly down gradient of the landfill. There are indications that relatively high concentrations of iron and zinc were found in surface soils south of the project site. These elevated levels could be the result of runoff from the landfill. The background pH level of the soil beneath the ESP landfill is alkaline. This condition is expected to hinder the transport of most metals in through the soil column. Methane and benzene have been detected in soil vapor within the landfill. Methane concentrations which exceed the lower explosive limit are confined within the boundary of the landfill. Perched groundwater conditions have been identified at various locations within the ESP. The presence of these zones may increase the potential for contaminant leaching and transport into deeper portions of the subsurface and possibly to the regional groundwater aquifer.

5. Cost-Effectiveness of Alternative Remedial Action Measures – Section 25356.1(d)(5)

The proposed remedial action alternative of capping the ESP Landfill Area was determined to be the most cost-effective alternative to meet the cleanup objectives.

6. Potential Environmental Impacts of Remedial Actions – Section 25356.1(d)(6)

The proposed remedial alternative will not create any significant environmental impacts. Because of this, a Negative Declaration was proposed pursuant to the California Environmental Quality Act (CEQA) for the recommended remedial alternative. An Initial Study was completed for the East Slag Pile Landfill Area which discussed potential environmental impacts of the recommended remedial alternative, as well as actions that will be taken to reduce or eliminate these potential environmental impacts during implementation. The CEQA Initial Study and proposed Negative Declaration are being distributed (under separate cover) for a 30-day public comment period.

7. Preliminary Nonbinding Allocation of Financial Responsibility – Section 25356.1(e)

The RAP must include a "nonbinding preliminary allocation of responsibility [NBAR] among all identifiable potentially responsible parties at a particular site, including those parties which may have been released, or may otherwise be immune, from liability…" (Health and Safety Code Section 25356.1(e). The current NBAR for the East Slag Pile Landfill Area, as issued by the DTSC, is presented on the next page.

Appendix C
Responsiveness Summary

Appendix D
Final CEQA Documents