# APPENDIX I

# ECOLOGICAL RISK ASSESSMENT

## LIST OF TABLES



## LIST OF FIGURES



## LIST OF ATTACHMENTS

## I.1 OBJECTIVES AND SCOPE

The purpose of an ecological risk assessment (ERA) is to provide decision makers with an understanding of the potential risks to the environment posed by current constituent concentrations in the absence of remedial action. A risk assessment can be used to support a proposal for no further action at a site or to identify areas of concern for ecological receptors to focus risk management decisions.

Because the site is located in a highly developed commercial/industrial/residential area of Los Angeles, the findings of the scoping level assessment performed for the May 19, 2005 Draft Risk Assessment for the site indicated that a quantitative ERA was not warranted due to a lack of sensitive habitats or special status species. However, the open grassy area located along the southern boundary of the site was identified as having a potential to serve as a habitat for raptors that are drawn to disturbed, urbanized environments, as was noted by EPA during a November 17, 2005 site walk. A single American kestrel (*Falco sparverius*) was observed on a utility pole in the Los Angeles Department of Water and Power (LADWP) utility corridor that transverses the southern end of the site from east to west on that day. This sighting prompted EPA to recommend a more quantitative assessment to consider common species that may reside at the site, even though EPA acknowledged that the habitat value is limited in terms of supporting viable populations of wildlife species, and that special status species are not likely to be present. Therefore, the primary objective of this ERA is to address concerns regarding common, resident species of raptors that occupy disturbed habitats, as represented by the kestrel.

A tiered approach that is consistent with EPA and DTSC guidance for ERAs (EPA, 1997, 1998; DTSC, 1996 a and b) was used to assess the potential for risk to ecological receptors. Information gathered during the initial Scoping Assessment, which entailed an evaluation of current site-related activities, the distribution of constituent concentrations, data obtained during a site reconnaissance performed by a biologist from Dames & Moore in 2001, and potential exposure scenarios, demonstrated that potentially complete exposure pathways were present for the kestrel. Therefore, a two-tiered Screening Assessment was conducted.

The Tier 1 ERA is a screening-level analysis used to quantify the potential for risk to ecological receptors based on very conservative assumptions. Analytes detected in environmental media at a frequency greater than 5% are referred to as constituents of interest (COIs) and are retained for the Tier 1 ERA. If inorganic compounds are detected in site media above a 5% detection frequency, data for these analytes are also compared to background concentrations during the identification of COIs. In the Tier 1 ERA, worst-case assumptions are typically used to allow a high level of confidence to be placed in results that indicate that no further evaluation is necessary based on the low potential for risk. If a potential for risk from exposure to COIs is indicated through the Tier 1 ERA, the next tier is performed. The Tier 2 ERA is a refined analysis in which more realistic assumptions specific to actual site conditions are incorporated.

No additional data were collected for the Tier 2 evaluation. Instead, the assumptions regarding exposure and effects were refined using the same data as Tier 1 along with more site-specific information from the literature. Specifically, there are two differences between the Tier 1 and Tier 2 ERA for this project:

- The ecologically relevant exposure depth is assumed to be 0 to 6 feet below ground surface (bgs) in Tier 1 and 0 to 1.5 feet bgs in Tier 2.

- Generic toxicity reference values (TRVs; described in Section I.5.2) recommended for use by EPA and DTSC in the State of California are applied in Tier 1, while TRVs based on studies specific to the kestrel are selected for some chemicals in Tier 2.

The following sections describe each step of the ERA process: Problem Formulation, Identification of COIs, Exposure Assessment, Effects Assessment, Uncertainty Assessment, Risk Characterization, and Summary and Conclusions. An effort was made to be as consistent as possible with the approach used in the HHRA, but this was not appropriate for all aspects of the ERA. Differences between the two risk assessments are noted herein.

## I.2 PROBLEM FORMULATION

Problem formulation is the initial step in an ERA and, in this phase, the potential ecological stressors are identified. Based on information in the site characterization and biological characterization, the possible exposure scenarios are considered. Target receptors are selected to be protective of the most sensitive and ecologically valued organisms at the site. Assessment endpoints are established to protect these valued organisms, and these endpoints define the objectives of the ERA.

Potentially complete exposure pathways originating from known or suspected sources of contamination are illustrated on a conceptual site model (CSM). The exposure routes and possible magnitude of exposure by each target receptor are assessed to determine which may warrant inclusion in a quantitative evaluation. Finally, the available analytical data are gathered and evaluated for their usability in the risk assessment. The refined dataset is subjected to a statistical analysis and the COIs are identified through a phased screening process.

### I.2.1 Site Characterization

The site consists primarily of a business park developed with commercial and light industrial facilities (see Figure 2 in the main report). Site structures are mostly single-story concrete tilt-up type structures, with some 10- to 20-story commercial office buildings and a hotel. Portions of the site not developed with structures are either paved for parking, developed with landscaped material consisting of ornamental trees, lawns, and shrubs, or undeveloped with weeds or bare ground characterizing the surface. Land use adjacent to the site is mixed residential, light industrial, and commercial and transportation (large streets and freeways). The Dominguez Channel is located approximately 0.2 miles to the east of the site. Within one mile of the site, a few scattered, small vacant lots persist, although they are either paved with asphalt or kept free of vegetation in accordance with local weed abatement and fire clearance regulations. In addition, four recreational parks and three developed school facilities are located within one mile of the site. These are paved or landscaped with grasses and other nursery stock.

The "Total Habitat" identified for the kestrel by EPA is located along the southern boundary of the former rubber plant site, and consists of an undeveloped "Onsite Habitat" of approximately 15 acres, and an adjacent undeveloped offsite area consisting of approximately 9 acres (previous private residential development). The onsite area includes parcels 7351-034-077, 7351-034-078, 7351-034-901, and the eastern half of parcel 7351-034-070. Other adjacent on- and offsite areas are covered by structures and do not provide significant resources for the kestrel; however, there are other nearby areas of undeveloped land which may provide resources for the kestrel.

### I.2.2 Biological Characterization

A site reconnaissance was conducted on March 30, 2001 by a qualified biologist from Dames & Moore to survey the site and surrounding area and identify the types of habitats present. The site and vicinity have been developed for commercial, light- and heavy-industrial, and residential use for more than 60 years, and previous surveys (Dames & Moore, 1991) indicated that no native habitat or sensitive, endangered, or threatened species were present. The findings of the 2001 survey were used to update previous investigations.

A URS biologist visited the site on January 25, 2006 to confirm the presence of the kestrel sighted by EPA during the November 17, 2005 site walk. The biologist observed a kestrel within the same general area noted by EPA and verified that the kestrel remained in this area for the approximately four hours the biologist was at the site.

### I.2.3 Wildlife Habitat

Native wildlife habitat does not exist within one mile of the site. The Roosevelt Memorial Park, Dominguez Golf Course, Victoria Golf Course, and Victoria Park are located within a mile of the site. These open areas do not provide native habitat for wildlife, although urban-adapted bird species utilize the park habitats. During bird migratory or dispersal movements, individuals of sensitive bird species may on infrequent occasions visit the parks as transitory birds. Most of the native organisms in the vicinity, and specifically those formerly present on the site were replaced with those typical of highly developed urban areas many decades ago. Such sites typically become occupied by hardy, exotic plant species when left fallow. Small populations of low ruderal (weedy) species occur on the few remaining vacant parcels at the site. These parcels include a utility corridor (Parcels 7351-033-900 [which is paved] and 7351-034-901), an undeveloped parcel (Parcel 7351-034-070), and the two parcels that comprise the Del Amo Waste Pit Area (Parcels 7351-034-077 and 7351-034-078). The remaining parcels at the site are developed with commercial/light industrial structures.

Vegetation present at the site includes such species as Bermuda Grass (*Cynodon dactylon*), Russian Thistle (*Salsola tragus*), Cheeseweed (*Malva parviflora*), Western Ragweed (*Ambrosia psilostachya*), Filaree (*Erodium* spp.), Black Mustard (*Brassica nigra*), and Dandelion (*Taraxacum officinale*). Numerous non-native, ornamental grasses, shrubs, and trees are additionally located on the site. Habitat supporting sensitive species is found neither on the site nor within a mile of the site. However, many common rodents and gophers inhabit the Waste Pit Area and adjacent open space parcels, and common birds also reside in the trees.

Small, remnant populations of urban-adapted amphibian and reptile species may be present in nearby residential areas, especially where gardens and landscape ground cover, such as ivy, are maintained. These species include the Western Toad (*Bufo boreas*), California Slender Salamander (*Batrachoseps attenuatus*), Western Fence Lizard (*Sceloporus occidentalis*), Southern Alligator Lizard (*Gerrhonotus multicarinatus*), and Common Garter Snake (*Thamnophis sitalis*). These are common species and none is poisonous or listed as threatened or endangered.

A few bird species typical of urban areas were observed using the site at the time of the survey, including Mourning Dove (*Zenaida macroura*), Rock Dove (*Columba livia*), Common Raven (*Corvus corax*), European Starling (*Sternus vulgaris*), Brewer's Blackbird (*Euphagus cyanocephalus*), House Sparrow (*Passer domesticus*), and House Finch (*Carpodacus mexicanus*). Depending upon the character of landscaped areas that may be developed on the site, other urban-adapted bird species can be expected to utilize the site. These include Anna's Hummingbird (*Calypte anna*), Northern Mockingbird (*Mimus plyglottos*), and American Robin (*Turdus migratorius*), among others. Although not noted in the 2001 survey, the kestrel has been observed at the site on several occasions in 2006 on the utility lines located in the southern portion of the site. However, no endangered or threatened species are expected to utilize the site or have been observed at the site.

Urban-adapted mammals may also be present in the vicinity. These include the Norway Rat (*Rattus norvegicus*), House Mouse (*Mus musculus*), Botta's Pocket Gopher (*Thomomys bottae*), and California Ground Squirrel (*Spermophilus beecheyi*). None of these species is threatened or endangered.

**I.2.4 Special Status Species and Resources**

Information on special status species and resources in the vicinity were developed from several sources, including the California Department of Fish and Game's Natural Diversity Data Base (RAREFIND, CNDDB), U.S. Fish and Wildlife Service's List of Threatened and Endangered Plants and Animals for Los Angeles County, California Native Plant Society's Electronic Inventory of Rare and Endangered Vascular Plants of California, California Statewide Wildlife Habitat Relations System, and existing files at URS Corporation (Santa Ana Office). These data indicate that observations of sensitive resources have been: (1) recorded only from areas that are more than one mile from the site, and in most cases, many miles from the site, or (2) were recorded early in this century within the Torrance USGS 7.5-minute Quadrangle in areas more than one mile from the site or in presently urbanized habitats that no longer support populations of the species.

No impact from constituents in soil is expected on any sensitive biological resources since the natural habitat for state or federal endangered or threatened species is lacking within one mile of the site.

**I.2.5 Identification of Receptors of Interest**

The identification of potential ecological receptors was performed by evaluating the type and quality of the habitats in the vicinity of the site, the current and future land uses at and near the site, the amount of time a potential receptor may be present in the vicinity of the site, the COIs, and physical characteristics of the site-related analytes. The potential presence of protected species and sensitive habitats was also considered because, if these species occur at the site, they would typically be selected as a target receptor.

Based on concurrence with EPA (personal communication with Dr. Ned Black, January 2006), the kestrel was identified as the only target receptor for this ERA. Due to the highly urbanized setting and lack of special status plant or animal species at the site or near vicinity, lower trophic level organisms present (e.g., primary producers and consumers, such as the plant community and herbivorous insects, rodents, and birds) were not identified as target receptors.

The kestrel is the smallest, most abundant, and most widespread North American falcon. It is attracted to anthropogenically-altered habitats, such as pastures and parkland, and often is found in heavily developed urban areas. The kestrel requires open areas typically covered by short ground vegetation where it hunts from perches, such as utility wires, trees, and telephone poles. It feeds on arthropods and other soil and airborne invertebrates, as well as small vertebrates. Some specific dietary items include grasshoppers, crickets, beetles, dragonflies, butterflies, small mammals, sparrows and other small birds, reptiles and amphibians. Unlike other falcons, the kestrel often catches its prey on the ground, but also captures insects and small birds in flight (Smallwood and Bird, 2002). It hovers over its prey and then drops down on it.

The kestrel is a common resident in California, and in the Los Angeles area it has been reported to defend territories approximately 25 acres in size (California Department of Fish and Game [CDFG], 2003). This is basically equivalent to the size of the identified Total Habitat; therefore, it is speculated that the Total Habitat has the potential capacity to support one kestrel. Although no home range size is available that pertains to urbanized areas, it is likely that the home range size is larger than the territory size, especially during the breeding season in which kestrels of migratory populations (especially juveniles) may travel south into Mexico or even farther into Central and South America. In less urbanized open areas, winter home ranges reported in a California study varied from 380 to 1,117 acres (smaller in "productive" areas) (CDFG, 2003). The breeding season occurs from April through August, with peaks in May and June, and is the period when these birds abandon their solitary lifestyle to mate. While kestrels are classified as a migratory species, kestrels in southern California may or may not migrate. Migratory behavior is suspected to be dependent on local weather conditions, which dictate the availability (and visibility) of prey (Smallwood and Bird, 2002).

### I.2.6 Assessment Endpoints

Assessment endpoints are explicit expressions of the actual environmental value to be protected, and may be perceived as an environmental characteristic, which if found to be significantly affected, can trigger further action. These endpoints are typically defined as: (1) the protection of non-threatened and endangered species from adverse effects on growth, survival, and reproduction at the population level, and (2) the protection of threatened and endangered species from adverse effects at the individual level. Based on this approach, the assessment endpoint relevant to the kestrel and the potential for exposure to soil-related COIs is as follows:

*Protection of resident top-level predatory birds, represented by the American kestrel, with no unacceptable effects on reproduction, growth, or development on a population level due to constituents in soil and soil invertebrates.*

### I.2.7 Conceptual Site Model

An exposure pathway is considered complete when all four of the following elements are present:

- A site-related source of a chemical constituent;
- A chemical release mechanism from the source to the environment;
- A transport mechanism from the chemical source to the receptor exposure point; and
- An exposure route by which the receptor is exposed to the chemical.

The CSM (Figure I-1) illustrates the potential exposure scenario relevant to the kestrel. The CSM depicts site-specific exposure pathways and available site information, and professional judgment was used to determine the completeness and significance of these pathways. The importance of each exposure route in the figure is represented by a solid circle for potentially complete and significant pathways, by a hollow circle for potentially complete but minor pathways, and by the letters "IC" for incomplete pathways. The predominant exposure pathways for the site originate from COIs in soil.

**Assessment of Pathways**

Although several potentially complete exposure pathways may exist at a site, not all pathways are comparable in magnitude or significance. The significance of a pathway as a mode of exposure depends on the identity and nature of the chemicals present and the magnitude of the likely exposure dose. For upper trophic level ecological receptors like the kestrel, ingestion is usually the most significant exposure pathway. Food web exposures become significant only for chemicals with a tendency to bioaccumulate or biomagnify.

A quantitative analysis was performed for the potentially complete and significant exposure pathways identified for the kestrel. These pathways are the same for the Onsite Habitat and Total Habitat areas and include ingestion of soil invertebrates and incidental ingestion of soil. No surface water bodies are present at the site and, therefore, exposure through drinking water was not included. Other pathways that are potentially complete, but minor, include inhalation of particulates or volatile compounds originating from soil and dermal contact with soil. These pathways are usually only considered to be important for burrowing animals that reside in confined spaces below the soil surface with reduced air flow, where they are in continuous, intimate contact with soil.

Soil invertebrates are assumed to be the sole prey item for this ERA, as agreed to by EPA (personal communication with Dr. Ned Black, January 2006). This is reasonable based on a study that demonstrated the following breakdown of the kestrel's diet: 74% invertebrates, 16% mammals, 9% birds, and 1% reptiles (Smallwood and Bird, 2002).

**Exposure Depth Intervals**

The exposure depth interval for the Tier 1 evaluation was 0 to 6 feet bgs. This interval was judged to be conservative, and was selected for two main reasons:

- Burrowing rodents are known to be present in the total habitat area that could transport subsurface soils to the surface, resulting in kestrel exposure to subsurface COIs; and

- Surface data were not available for all sampling locations where subsurface COIs were known to be present.

According to DTSC's EcoNote No. 1 (1998), burrowing animals should be assumed to burrow down to six feet bgs. Although the kestrel is not assumed to ingest mammals that could burrow to this depth, and soil invertebrates are most likely exposed to surface soils or those just below the surface, this exposure depth interval was assumed for the conservative phase of the assessment based on the potential for the kestrel to incidentally ingest subsurface soil that has been transported to the surface and invertebrates exposed to these soils.

A more realistic, but still likely conservative, exposure depth interval of 0 to 1.5 feet bgs was assumed for the Tier 2 evaluation. This depth interval is more appropriate for the small rodent populations observed at the site. With the exception of the California ground squirrel, the rodents listed in Attachment 1 of DTSC's EcoNote No. 1 that may burrow deeper than roughly two feet, such as the San Joaquin antelope squirrel (*Ammospermophilus nelsoni*) and Fresno kangaroo rat (*Dipodomys nitratoides exilis*), are not expected to occur at the site. The mean burrowing depth for the ground squirrel listed in the table is 38.1 inches bgs (or about 3 feet). However, the portion of the Total Habitat covered by subsurface soils from dug burrows is very small.

## I.3 IDENTIFICATION OF CONSTITUENTS OF INTEREST

The identification of COIs was based on site history and environmental data collected from the Onsite Habitat and Total Habitat. Soil sample analytes with a detection frequency greater than 5% and applicable avian toxicity data were considered for inclusion as COIs. Various inorganics, pesticides, and Polychlorinated Biphenyls (PCBs) were also included as COIs. Analytes that were excluded due to a lack of avian toxicity data included antimony, beryllium, cobalt, silver, thallium, methoxychlor, toxaphene, polycyclic aromatic hydrocarbons (PAHs), and herbicides (SW-846, method 8151). Section I.7.2 provides a discussion of the uncertainty introduced in the ERA from not evaluating these analytes.

### I.3.1 Constituent of Interest Analytical Data

Analytical data from the following sources were utilized in the ERA:

1. 2001 LA County investigation of residential area (broad spectrum analyses)
2. 2002 LA County investigation of residential area (lead only)
3. 2002 DTSC oversight of LA County (metals)
4. 2002 C2REM report, "Final Environmental Mitigation Closure Report, Neighborhood Park Project (metals, DDT)
5. 1999 laboratory analytical reports for two Waste Pit Area fill samples collected by Parsons Engineering Science, Inc (broad spectrum analyses)
6. URS Soil and NAPL RI samples for parcels 7351-034-901 and 7351-034-070

The ERA dataset is distinct from the data set for the human health risk assessment since the ERA considers the Total Habitat Area (both on- and offsite portions) and not the entire former rubber plant site. The ERA data set is presented in Attachment I-1 and sample locations are presented on Figure I-2.

### I.3.2 Analytes Detected in Soil above a 5% Detection Frequency

Identifying analytes in soil with a detection frequency greater than 5% is the first step to preparing the list of COIs. All organics detected in greater than 5% of the samples were considered for inclusion as COIs. For inorganics, a comparison to background levels was also performed (Section I.3.3).

Tier 1 and Tier 2 analytes passing the 5% detection screen for the on-and offsite habitat areas are identified in Tables I-1, I-2, I-3, and I-4.

### I.3.3 Comparison to Background Levels for Inorganic Analytes

Maximum concentrations of inorganic analytes detected in soil were compared with site-specific background concentrations, where background is defined as naturally occurring concentrations from reference areas. The purpose of this comparison is based on the understanding that concentrations of naturally occurring inorganic constituents need not be remediated to levels lower than their background concentrations. Organic analytes were not compared against ambient concentrations because such chemicals were assumed to be anthropogenic in origin.

The background level screen was completed using site-specific background concentrations previously developed for the HHRA (see Appendix B). Additionally, mean California background values from the Kearney Foundation report (Bradford et. al, 1996) were utilized as necessary.

**Potential Tier 1 COIs**

Inorganics detected in the Onsite Habitat with maximum concentrations above the corresponding background levels included: arsenic, cadmium, lead, manganese, nickel, and vanadium. For the Total Habitat, inorganics with maximum concentrations above the corresponding background levels included: arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, selenium, vanadium, and zinc.

**Potential Tier 2 COIs**

Potential Tier 2 COIs were the same as for Tier1 except that barium was omitted for the Total Habitat.

### I.3.4 Bioaccumulation Potential

Bioaccumulation is a process by which constituents accumulate in biological tissues through exposure to environmental concentrations, which results from preferential uptake and retention in adipose and organ tissues. Bioaccumulation occurs as living organisms retain and concentrate constituents both directly from their surrounding environment (i.e., from soil or water) and indirectly from media that transfer constituents into dietary components, such as plant or animal tissues. Biomagnification is a form of bioaccumulation in which the constituent concentrations in a higher trophic level organism (e.g., bird, mammal, or reptile) is greater than the concentration in the food that this organism consumes.

Bioaccumulation and biomagnification are of primary interest in ERAs because of the potential for constituent transfer through the food web, as top-level predatory species feed on prey that may have high tissue residues of bioaccumulative constituents. Thus, biota that are not directly exposed to constituents in soil or water may still be adversely affected because of their indirect exposure to these constituents through consumption of prey items. Bioaccumulation of nonpolar organic constituents is generally related to their hydrophobicity or lipophilicity and is approximately estimated by their octanol-water partition coefficient (log $K_{ow}$). Bioaccumulative constituents are generally defined as those with a log $K_{ow}$ exceeding 3.5 (with an optimum range between 3.5 to 5.5) or a bioconcentration factor that is greater than 300 (Suter, 1993). Documentation supporting the Hazardous Waste

Identification Rule (EPA, 1999a) also identifies constituents that are recognized as having a low, medium, or high potential for bioaccumulation. For bioaccumulation in terrestrial systems, rankings were determined using bioaccumulation factors (BAFs) for earthworms, plants, or vertebrates, or log $K_{ow}$ values for organic constituents that do not readily metabolize. According to this EPA document, bioaccumulation potential is defined as follows:

| **Bioaccumulation Potential** | **BAF** |
|---|---|
| High | BAF > 1.0 |
| Medium | 1.0 ≥ BAF > 0.1 |
| Low | BAF ≤ 0.1 |

According to the criteria discussed above, with the exception of vanadium, all COIs (detected in soil above a 5% detection frequency and above background for inorganics), have a medium or high bioaccumulation potential in terrestrial environments and were, therefore, included in the evaluation for the kestrel.

### I.3.5 Final List of COIs

Tables I-1 through I-4 present the COIs identified in Tier 1 and Tier 2 and their summary statistics for the Onsite and Total Habitats. These COIs were evaluated for their potential to affect higher trophic level receptors (i.e., the kestrel), which may incur significant exposure through their diet.

**Tier 1 COIs (Soil 0 to 6 ft bgs)**
The COIs retained in the Tier 1 ERA for the Onsite Habitat include: arsenic, cadmium, lead, manganese, nickel, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and endosulfan (Table I-1).

The COIs retained in the Tier 1 ERA for the Total Habitat include: arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, selenium, zinc, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, endosulfan, and Aroclor 1260 (Table I-2).

**Tier 2 COIs (0 to 1.5 ft bgs)**
The COIs retained in the Tier 2 ERA for the Onsite Habitat include: arsenic, cadmium, lead, manganese, nickel, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and endosulfan (Table I-3).

The COIs retained in the Tier 2 ERA for the Total Habitat include: arsenic, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, selenium, zinc, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and endosulfan (Table I-4).

## I.4 EXPOSURE ASSESSMENT

The potential magnitude of exposure is estimated in the exposure assessment phase, for the various potentially complete and significant pathways identified in the CSM.

### I.4.1 Exposure Point Concentrations

Exposure point concentrations (EPCs) are defined as the concentration of a chemical in a specific environmental medium at the point of contact for a receptor. For higher trophic level receptors, like predatory birds, the exposure dose is estimated as a function of the COI concentration in relevant environmental media and several other parameters related to biotransfer through the food web and the manner in which the receptors use the site (e.g., dietary composition, feeding strategy, food ingestion rate, length of time the receptors are expected to forage/nest at the site based on their home range size and seasonal behavior). For these receptors, the lower of the maximum and 95% UCL average concentration is typically used as the EPC. This value provides a conservative estimate of the concentration that mobile terrestrial wildlife may be exposed to in the subject area.

The available COI data included some analytical results where the analyte was non-detect but had elevated detection limits; that is, the detection limit exceeded two-times the maximum detected concentration. These results were judged to be of poor quality and were found to significantly skew (bias high) the associated EPC calculation. For this reason, non-detect results with the described elevated detection limits were deleted from the EPC calculations. The analytes for which some results were eliminated are as follows:

| Analyte | Non-Detect Results Eliminated (mg/kg) |
|---|---|
| Arsenic | <50 |
| Selenium | <10 |
| PCB1260 | <20 and <30 |
| 4, 4’-DDE | <1 and <2 |
| Endosulfan | <1 and <2 |

The following section provides a description of the methods used to calculate exposure doses for the kestrel.

### I.4.2 Estimation of Average Daily Dose (ADD)

Exposure doses, or average daily doses (ADDs), for the kestrel were calculated using: (1) the EPCs identified for soil, and (2) receptor-specific exposure parameters. The ADD is a component of the hazard quotient (HQ), which is described in Section I.6, and represents the average amount of a COI that an individual member of a receptor population ingests under the assumption that the population forages primarily at the site. The ADD is a function of a receptor's foraging behavior and therefore depends on the life history strategies of the receptor, such as home range size, dietary preferences, food ingestion rates, and seasonal behavior.

Direct exposure to COIs was assessed for the kestrel by estimating the daily intake of soil through incidental ingestion. Incidental ingestion of soil is assumed to occur through grooming or preening and consumption of food items. Indirect exposure to the COIs that have accumulated in food items (e.g., soil invertebrates) is the remaining, and usually the most important, component of the oral dose equation.

The general equation for calculation of an ADD, for "i" food types, is:

$$ADD = \frac{\left( IR_{food} \sum_{i=1}^{n_i} \left( C_{food_i} \times df_i \right) + \left( IR_{soil} \times C_{soil} \right) \right) \; x \; AUF \; x \; SF}{BW}$$

where:

| | | |
|---|---|---|
| ADD | = | Average daily dose of a constituent to a kestrel that forages at the site (mg of constituent ingested per kg of body weight per day) |
| $IR_{food}$ | = | Ingestion rate of food (kg of food [dry weight] ingested per day) |
| $n_i$ | = | Number of food types |
| $C_{foodi}$ | = | Concentration of constituent in food type i (mg of constituent per kg of food type i [dry weight]) |
| $df_i$ | = | Dietary fraction (proportion in the diet) of food type i (unitless; $\Sigma i = 1$) |
| $IR_{soil}$ | = | Ingestion rate of soil (kg of soil [dry weight] ingested per day) |
| $C_{soil}$ | = | Concentration of constituent in soil (mg of constituent per kg of soil [dry weight]) |
| BW | = | Body weight of the receptor (kg) |
| AUF | = | Area Use Factor, site area size ÷ home range size (unitless) |
| SF | = | Seasonality Factor, as a fraction of one year (unitless) |

The receptor-specific exposure parameters ($IR_{food}$, $IR_{soil}$, BW, AUF, SF) used in the ADD equation for the kestrel are presented in Table I-5. As kestrels are tolerant of very arid climates and often meet their daily water intake requirements through their food, the drinking water pathway was not included in the ADD. In addition, no permanent surface water bodies exist at the site.

Exposure to constituents as they transfer through the food web was assessed by evaluating their bioaccumulation potential ($C_{foodi}$) in the food source (soil invertebrates) for the kestrel.

The estimated COI concentrations in these dietary items were used to evaluate exposure by the kestrel. The literature-based bioconcentration factors (BCFs) for soil invertebrates, represented by earthworms, that were applied to the equation used to calculate concentrations in these tissues (described below) in Tier 1 for the Onsite and Total Habitats are presented in Table I-6. The BCFs applied in Tier 2 are presented in Table I-7. The ADDs calculated for the kestrel in this evaluation based on the Tier 1 assumptions are presented in Tables I-8 and I-9 for the Onsite Habitat and Total Habitat, respectively. The ADDs calculated for the kestrel based on the Tier 2 assumptions are presented in Tables I-10 and I-11 for Onsite Habitat and Total Habitat, respectively.

Exposures by wildlife species are a function of the size of the impacted area (i.e., the site) and the foraging behavior of the organism. The smaller the site as compared to the foraging area required by the organism (especially if the habitat quality is low), the less likely the animal is to encounter the site during normal feeding activities. The AUF is the ratio of the site size to the home range size of the target species and provides a way of accounting for a receptor's estimated site usage in the ADD.

An AUF of 1.0 was assumed for the kestrel for conservative purposes because the original concern raised by EPA was in regard to the presence of an individual kestrel observed at the site. It is possible that the site contains enough resources to support at least one kestrel; therefore, it is possible that a single kestrel may forage at the site most of the time during the non-breeding season (6 to 8 months of the year).

The above approach is somewhat inconsistent with the assessment endpoint that was selected for this ERA that expresses protection of the kestrel, a non-listed species, at the population level as the ultimate goal. Because the site does not contain the resources to support a population of kestrels, use of an AUF of 1.0 is expected to result in an overestimate of risk based on the assessment endpoint. The presence of larger tracts of grassy, open space located near the site, some approximately 100 acres in size, is another reason to believe that the kestrel population occupies a much greater area than the 24-acre site. The uncertainty this approach introduces in the ERA is described in further detail in Section I.7.1.

A seasonality factor (SF) of 1.0 was assumed for the kestrel, because it is a resident species and could feasibly be in the area of the site throughout the year. It is unknown whether or not the population of kestrels in the vicinity of the site is migratory or sedentary; therefore, the latter was assumed for conservative purposes. Studies have shown that the mild weather conditions in the southern range of the kestrel's geographic distribution decrease the need to migrate. Individuals from the north migrate to California for the winter, and residents often maintain pair bonds throughout the year (CDFG, 2003).

### I.4.3 Exposure Point Concentrations in Dietary Items

The EPCs in soil invertebrate tissue for the diet of the kestrel were estimated from EPCs in soil and appropriate BCFs. The *Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs)* (EPA, 2005a) is the primary source of BCFs, or uptake equations, used to estimate concentrations in soil invertebrates. A combination of regression derived, median, and log $K_{ow}$-based BCFs were selected for use in this ERA, as recommended for each COI in soil in the Eco-SSL guidance (EPA, 2005a). The BCFs presented in the EPA Eco-SSL guidance were preferred over values from all other sources. The Eco-SSLs are risk-based screening levels developed from conservative assumptions and parameters, and these levels were designed for application at hazardous waste sites.

A means of deriving BCFs for plants and invertebrates, and BAFs for small mammals that includes tissue- and constituent-specific regression models or median BCFs and BAFs based on empirical data is presented in Attachment 4-1 (Tables 4a and 4b) of the Eco-SSL guidance. This guidance provides constituent-specific slopes and intercepts, which were incorporated into a standard regression equation. Regression models based on the log $K_{ow}$ were used to develop soil invertebrate BCFs for endosulfan in the absence of empirical data.

The regression-based approach is preferred because it provides a more site-specific prediction of a constituent concentration in a certain dietary tissue, as it incorporates the site EPC. The majority of dietary tissue concentrations were estimated through the following log-linear regression equation:

$$\ln[tissue_{dry\,weight}] = B0 + B1(\ln[soil_{dry\,weight}])$$

where:

| | | |
|---|---|---|
| $\ln[tissue_{dry\,weight}]$ | = | Natural logarithm of the tissue concentration (mg constituent per kg tissue dry weight); |
| B0 | = | Constituent-specific intercept based on tissue type; |
| B1 | = | Constituent-specific slope based on tissue type; and |
| $\ln[soil_{dry\,weight}]$ | = | Natural logarithm of the constituent concentration detected in site soils, i.e., EPC (mg constituent per kg soil dry weight) |

This equation was used in conjunction with the slopes and intercepts provided in the Eco-SSL guidance to estimate dry weight COI concentrations in invertebrates for arsenic, cadmium, lead, manganese, selenium, zinc, and the DDTs. The dry weight tissue concentrations calculated in the above equation (transformed from the natural log) were then divided by the soil EPC to estimate the final dry weight BCFs presented for the Onsite and Total Habitats in Tier 1 (Table I-6) and Tier 2 (Table I-7).

The slopes and intercepts from the ORNL (Sample et al., 1998) were applied in the absence of chemical-specific slopes and intercepts for mercury and Aroclor 1260 from the Eco-SSL guidance. Log-linear regression models are not available for barium, chromium, copper, and nickel; therefore, the median BCFs provided in the Eco-SSL guidance were used. A default BCF of 1.0 was used for molybdenum in the absence of a literature-based value.

The log $K_{ow}$-based regression equation established by Jager (1998), and recommended in the Eco-SSL guidance was used to estimate a BCF for endosulfan since no regression model or median BCF developed from empirical data was available. This equation was developed with the understanding that biotransfer of an organic compound is directly proportional to its specific log $K_{ow}$:

$$\log(BCF_{organics}) = -2.00 + 0.87 * (\log K_{ow}) / (Koc * foc)$$

where:

| | | |
|---|---|---|
| $\log(BCF_{organics})$ | = | Base-10 logarithm of the estimated bioconcentration factor for an organic chemical and earthworm tissue (unitless); and |
| $\log K_{ow}$ | = | Base-10 logarithm of the octanol:water partitioning coefficient for an organic chemical (L of water per L of octanol). |
| Koc | = | Water to soil organic carbon partitioning coefficient for an organic chemical (L of water per kg of organic carbon) |
| foc | = | Fraction of organic carbon, assumed to be 0.01 (EPA, 2005a) |

Subsequent to estimating the BCFs for all COIs, the following equation was used to estimate concentrations in soil invertebrates based on the lower of the maximum and 95% UCL concentration in soil:

$$C_{invertebrate}\ (\text{mg/kg-dw}) = C_{soil}\ (\text{mg/kg}) \times BCF$$

where:

| | | |
|---|---|---|
| $C_{invertebrate}$ | = | Estimated constituent concentration in soil invertebrates, as represented by earthworms (mg of constituent per kg of invertebrate [dry weight]); |
| $C_{soil}$ | = | EPC in soil (mg of constituent per kg of soil [dry weight]); and |
| BCF | = | Bioconcentration factor for earthworms from the literature (unitless). |

## I.5 EFFECTS ASSESSMENT

The effects assessment phase involves the identification of potentially adverse effects and chronic toxicity thresholds resulting from exposure to COIs. A qualitative and quantitative description of the relationships between EPCs and ADDs and the nature of possible effects elicited in exposed populations is discussed in this section. The goal of the effects assessment is to identify TRVs that are appropriate for the kestrel.

### I.5.1 Measurement Endpoint

The assessment endpoint relevant to the kestrel was presented in Section I.2.6. Assessment endpoints must have measurable characteristics that allow an evaluation of whether or not the ecological resource is being sufficiently protected. Measurement endpoints are measurable changes in an attribute of the assessment endpoint. The measurable attributes of the selected assessment endpoint are the survival, growth, and reproduction of resident populations of predatory birds. These attributes are represented in the endpoints measured in the TRV studies used for each COI.

### I.5.2 Toxicity Reference Values

Toxicity reference values (TRVs) are dietary-based benchmarks protective of birds and mammals, and are expressed as a daily dose normalized to body weight (mg of constituent per kg of body weight per day). Because EPA is the lead agency for the Del Amo site, the DTSC Biological Technical Assistance Group (BTAG) TRVs (BTAG TRVs; DTSC, 2000) for birds were used secondarily to the TRVs that were selected to develop the EPA Interim Eco-SSLs (2005b). Low and High TRVs were used in both tiers of the evaluation that correspond to chronic no-observable-adverse-effect levels and lowest-observable-adverse-effect levels (NOAELs and LOAELs) typically derived from reproductive or developmental endpoints.

Currently, there is no specific state or federal guidance document that discusses the relationship between Low and High TRVs and protection afforded to individuals versus populations. As stated in the EPA (1999b) Superfund Ecological Risk Assessment Guidance Memorandum from October 1999, “Levels that are expected to protect local populations and communities can be estimated by extrapolating from effects on individuals and groups of individuals using a lines of evidence approach.” Consequently, effects on populations can be estimated by using TRVs that are based on individual effects. Typically, TRVs derived from chronic NOAELs (i.e., Low TRVs) are representative of a sensitive endpoint, such as reproduction, are appropriate for protection of individuals. Depending on the study, TRVs derived from chronic LOAELs (i.e., typically the High TRVs) may be adequately protective of populations.

**Tier 1 TRVs**

The avian TRVs in the Interim Eco-SSL reports represent the geometric mean of the NOAELs presented in reliable studies based on EPA's review. When only a few studies were identified for a chemical, the lowest NOAEL was selected. Only NOAEL-based TRVs were used to calculate the Eco-SSLs; therefore, these TRVs are only relevant to the Low TRVs used in this ERA. The BTAG Low TRVs were selected in the absence of Interim Eco-SSL TRVs, and the BTAG High TRVs were used for all COIs, when available.

The BTAG TRVs are chronic toxicity benchmarks for wildlife that were originally developed by an interagency group, the BTAG, on behalf of the U.S. Navy (Engineering Field Activity, West, 1998) for potential general use in ERAs in California. The NOAEL-based TRVs are intended for screening use, and if estimated ADDs are less than this value, no adverse effects are expected. The High TRVs selected from the BTAG values are actually representative of a mid-range level of effects derived from studies that established LOAELs or effects levels.

The EPA and DTSC TRVs represent generally conservative values drawn from a review of the toxicological literature. Rather than selecting TRVs from individual toxicological studies that are relevant to the ecological receptors, food webs, and exposure routes at a particular site, these TRVs represent a more general approach whereby a single representative TRV is selected for all avian target receptors. Based on direction from EPA, these sources of generic avian TRVs were used in the Tier 1 ERA for the kestrel. Table I-12 presents the Tier 1 and Tier 2 TRVs and the sources from which each TRV was derived.

**Tier 2 TRVs**

The same TRVs as described above for the Tier 1 ERA were also used in Tier 2, with the exception of those for DDT and its metabolites (collectively, "DDTs"). The avian BTAG TRVs for DDTs are associated with studies on piscivorous birds because these species are expected to be the most sensitive based on available toxicity studies for pesticides. Many of the studies evaluated by the BTAG are provided in EPA's *Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife* (1995). One study discussed in this EPA report provides a NOAEL and LOAEL for kestrels derived from eggshell thinning observations attributed to 4,4'-DDE exposure. Since 4,4'-DDE has been demonstrated to be the most toxic of the DDTs for birds, the Low and High TRVs (i.e., NOAEL and LOAEL) from the kestrel-specific study were used in the Tier 2 ERA for all DDTs. As these Tier 2 TRVs are more representative of the potential for adverse effects to the kestrel than the generic BTAG TRVs, more confidence is placed in the risk estimates generated from the Tier 2 TRVs. Therefore, the risk estimates based on the Tier 2 TRVs will be emphasized in the risk interpretation section, which will carry forward to the risk management decisions.

## I.6 RISK CHARACTERIZATION

The risk characterization phase of the ERA involves the integration of the results of the exposure assessment and effects assessment to describe the nature and likelihood of the adverse effects associated with exposure to COIs in Tier 1 and Tier 2.

### I.6.1 Calculation of Hazard Quotients

The equation used to derive risk estimates for the kestrel is presented below:

$$HQ = \frac{ADD}{TRV}$$

where:

| | | |
|---|---|---|
| HQ | = | Hazard quotient for a specific COI and receptor (unitless) |
| ADD | = | Average daily dose of a COI to the receptor (mg of constituent ingested per kg of body weight per day) |
| TRV | = | Toxicity reference value representing a safe exposure concentration or dose (units consistent with ADD) |

The HQ provides a mathematically derived index that expresses the relationship between the predicted exposure dose (ADD) and a representative acceptable dose. If the HQ is greater than one, that is, exposure is greater than the toxicity-related threshold, risks to the kestrel may exist at the site. If the HQ is less than or equal to one, then exposure is equivalent to or less than the level at which, adverse effects may not be expected (depending on the type of TRV used). The magnitude of the HQ provides a general indication of the potential for ecological risk for a constituent if a reasonable level of confidence exists in the estimated ADD and the corresponding TRV.

The potential for adverse effects due to cumulative exposure to multiple constituents is evaluated by summing the HQs for individual constituents to generate a hazard index (HI). Additive risks are developed for groups of constituents with similar molecular structures, those that are from the same chemical class, or those that have the potential to affect similar target organs through similar modes of action. The following constituent groups were included in HI calculations:

- Inorganics – cadmium, lead, and mercury; and
- Pesticides and PCBs.

This grouping is consistent with those presented in the Edwards Air Force Base (AFB) Predictive Ecological Risk Assessment (PERA; Tetra Tech, 2004) and is also the approach recommended by DTSC for Travis and Beale AFBs.

Although synergistic or antagonistic effects may also occur when the receptor is exposed to multiple constituents, insufficient data are available to quantitatively estimate these effects. Therefore, only additive effects were quantified.

### I.6.2 Results of Risk Screening

Tables I-13 and I-14 present the results of the Tier 1 and Tier 2 evaluations, respectively.

**Tier 1 Evaluation**

The following table summarizes the COIs with elevated HQs or HIs (above one) based on the Tier 1, Low TRV evaluation for the Onsite and Total Habitats:

| Analyte Class | COI | Onsite Habitat HQ or HI | Total Habitat HQ or HI |
|---|---|---|---|
| Inorganics | Cadmium | 4 | 9 |
| | Chromium | (not a COI) | 6 |
| | Lead | 3 | 7 |
| | Mercury | (not a COI) | 2 |
| | Molybdenum | (not a COI) | 3 |
| | Nickel | 4 | 35 |
| | Zinc | (not a COI) | 5 |
| | Cadmium + Lead + Mercury | 7 | 19 |
| Pesticides/ PCBs | 4,4'-DDD | 81 | 40 |
| | 4,4'-DDE | 314 | 91 |
| | 4,4'-DDT | 783 | 325 |
| | Total Pesticides/PCBs | 1,178 | 457 |

The following table summarizes the COIs with elevated HQs or HIs based on the Tier 1, High TRV evaluation for the Onsite and Total Habitats:

| Analyte Class | COI | Onsite Habitat HQ or HI | Total Habitat HQ or HI |
|---|---|---|---|
| Inorganics | Chromium | (not a COI) | 3 |
| | Cadmium + Lead + Mercury | HI ≤ 1 | 3 |
| Pesticides/ PCBs | 4,4'-DDE | 5 | HQ ≤ 1 |
| | 4,4'-DDT | 5 | 2 |
| | Total Pesticides/PCBs | 10 | 4 |

As indicated in the summary tables above, HQs for inorganics tended to be greater for the Total Habitat compared to the Onsite Habitat, while HQs for pesticides were greater for the Onsite Habitat.

**Tier 2 Evaluation**

The following table summarizes the COIs with elevated HQs or HIs based on the Tier 2, Low TRV evaluation for the Onsite and Total Habitats:

| Analyte Class | COI | Onsite Habitat HQ or HI | Total Habitat HQ or HI |
|---|---|---|---|
| Inorganics | Cadmium | 4 | 3 |
| | Chromium | (not a COI) | 2 |
| | Lead | 3 | 3 |
| | Mercury | (not a COI) | 2 |
| | Nickel | 4 | 13 |
| | Zinc | (not a COI) | 4 |
| | Cadmium + Lead + Mercury | 7 | 9 |
| Pesticides/ PCBs | 4,4'-DDD | 7 | 5 |
| | 4,4'-DDE | 21 | 14 |
| | 4,4'-DDT | 67 | 44 |
| | Total Pesticides/PCBs | 95 | 62 |

The following table summarizes the COIs with elevated HQs or HIs based on the Tier 2, High TRV evaluation for the Onsite and Total Habitats:

| Analyte Class | COI | Onsite Habitat HQ or HI | Total Habitat HQ or HI |
|---|---|---|---|
| Inorganics | Cadmium + Lead + Mercury | HI ≤ 1 | 2 |
| Pesticides/PCBs | 4,4'-DDE | 2 | HQ ≤ 1 |
| | 4,4'-DDT | 7 | 4 |
| | Total Pesticides/PCBs | 9 | 6 |

### I.6.3 Risk Interpretation

The Tier 2 HQs were estimated for analytes detected in soil samples collected from 0 to 1.5 feet bgs, while the data from the 0 to 6 feet bgs depth interval were used for the Tier 1 HQs. Exposure of the kestrel to soils containing COI concentrations originating from below 1.5 feet bgs is expected to be very limited. Ground squirrels and other burrowing rodents are present at the site. However, the actual potential for kestrel exposure to subsurface soil COI concentrations that have accumulated in soil invertebrates (mainly insects) is expected to be low because many insects, including grasshoppers (an important dietary component), reside on the soil surface. Airborne insects are also prey for kestrels. In addition, soil from burrows is not expected to cover a large portion of the site. Therefore, more emphasis is placed on the results of the Tier 2 evaluation.

The highest Tier 2 HQs are for the DDT metabolites. The HQs for DDTs are higher for the Onsite Habitat compared to the Total Habitat. The source of the DDT is inferred to be the neighboring Montrose Superfund Site (outside and west of the Total Habitat), where DDT was formerly manufactured. DDTs are not known to have been used at the former synthetic rubber plant.

The HQs for inorganics are generally significantly lower for the Onsite Habitat than for the Total Habitat. With the exception of mercury, risk-driving inorganic detections (the area of maximum concentrations) occurred in a limited off-site area within the Total Habitat. This area is located within approximately 13 feet of sampling location P1-G (see Figure I-2). For example, if the detections of nickel in the P1-G area were omitted from the Tier 2 risk evaluation, the Total Habitat Tier HQs based on the Low TRV would decrease from 13 to 4. While not accounted for in the risk calculations, this limited area in which elevated inorganic concentrations typically occur further reduces the likelihood of significant exposure by the kestrel, since the majority of kestrel foraging area contains significantly lower concentrations of inorganics.

## I.7 UNCERTAINTY ASSESSMENT

This section discusses the uncertainties associated with the assumptions made in this ERA and whether these uncertainties could over- or under-estimate the potential for risk to the kestrel.

The risk screening process unavoidably involves assumptions and uncertainties that may underestimate or overestimate the potential for adverse effects. However, in general, the process is more likely to overestimate risk. This tendency is intentional, especially for a screening level risk assessment. The sources of uncertainty occur during each phase of the screening process.

### I.7.1 Uncertainty with Exposure Assessment

Risk is most likely overestimated in the exposure assessment because the selected EPCs are the maximum concentrations or 95% UCLs from the site data. It is unlikely that most receptors would be consistently exposed to the maximum or an upper-bound estimate of the average concentration (i.e., the 95 percent UCL) for long periods. However, use of these EPCs is intentionally conservative and follows regulatory guidelines.

As discussed in Section I.4.2, another source of uncertainty in the ERA originates from use of an AUF of 1.0 for the kestrel. The site provides limited foraging resources based on its geographic location and small size in comparison to the acreage needed to support populations of predatory, but opportunistic, birds. Through an on-line search engine ("Google Maps"), aerial footage revealed at least four open, grassy parcels that are located within 1.5 miles east of the site; two are estimated to be 30 acres in size and the other two are roughly 100 acres each. Two of these four areas are believed to be golf courses, while the other two appear to be undeveloped land, but the use is unknown. The total size of the four open areas is approximately 260 acres, which means the Total Habitat (about 24 acres) only comprises about 10% of the total available habitat for predatory birds within this 1.5-mile stretch. Based on this information, it is likely that kestrels in the area forage at numerous locations, even though one individual may spend the majority of its time at the site. Therefore, use of an AUF of 1.0 is expected to overestimate risk (i.e., result in higher HQs) to the local kestrel population.

Use of a SF of 1.0 was additionally assumed for the kestrel, because it is a resident species and could feasibly be at or near the site throughout the year. However, during the breeding season, even an individual that may defend the Total Habitat and primarily forage there throughout most of the year could leave to breed, as adequate breeding habitat does not appear to be available at the site. The assumption of 100% site use for the entire year likely leads to an overestimate of risk (i.e., result in higher HQs), even to an individual kestrel.

### I.7.2 Uncertainty with Effects Assessment

The selected TRVs are conservative threshold doses developed from the primary literature; therefore, they may also contribute to the overestimation of risk. Numerous factors that may reduce the potential for effects are not considered at all or are assumed to operate at minimum levels in the derivation of TRVs (e.g., the assumption of 100 percent bioavailability of the accumulated intake, no consideration of egestion and elimination mechanisms, and no consideration of detoxification or metabolic mechanisms). Therefore, given the inherent conservatism of the exposure estimation process, it is questionable whether adverse effects would be observed even if site-related dose exceeds a lowest-observable-adverse-effects level (LOAEL)-based TRV for a particular chemical. Also, uncertainties may be introduced by a lack of similarity and relevance in applicability between the study upon which the TRV is based and the actual conditions at the site (and target species).

As discussed in Section I.3, analytes without avian toxicity data were excluded from the quantitative evaluation and include the following: antimony, beryllium, cobalt, silver, thallium, methoxychlor, toxaphene, PAHs, and herbicides (SW-846, method 8151). Lack of an evaluation for these analytes could lead to an underestimate of risk to the kestrel, but this uncertainty is recognized by EPA and this approach was approved prior to performing the ERA.

### I.7.3 Uncertainty with Risk Characterization

The risk characterization process also incorporates uncertainties that may overestimate risk. The exceedance of a TRV by the corresponding site concentration for a chemical does not necessarily mean that there is a threat to the referenced receptor. It means only that the potential for adverse effects may exist, but the likelihood of over- or under-estimating risk may be further explored to gain a better understanding of the confidence placed in the assumptions (exposure and effects) used to calculate risk.

## I.8 SUMMARY AND CONCLUSIONS

A tiered approach was used to assess the potential for risk to the local kestrel population based on the sightings of an individual kestrel inferred to be residing within an approximately 24-acre undeveloped area within and adjacent to the southern boundary of the Del Amo Superfund site referred to as the Total Habitat. Approximately 15 acres of the Total Habitat area are located within the Superfund site and referred to as the Onsite Habitat with the balance of the area located immediately south of the Superfund site. The kestrel was assumed to consume soil invertebrates and incidentally ingest soil exclusively from the Onsite and Total Habitats.

Conservative assumptions were incorporated into the Tier 1 ERA regarding the soil depth to which kestrels could be exposed (0 to 6 feet bgs), and avian TRVs not specific to the kestrel were used for all COIs. In Tier 2, these types of assumptions were refined such that exposure was assumed to be limited to soils from ground surface to 1.5 feet bgs. The Tier 2 ERA also used kestrel-specific TRVs for DDT metabolites. The results of the Tier 2 ERA are judged to be more representative of actual site conditions and are, therefore, preferred over the Tier 1 results.

Low and High TRVs were applied in both Tier 1 and 2 to generate a range of HQs for each COI. These TRVs correspond to chronic NOAELs and LOAELs, or a mid-range level of effects in the case of the BTAG High TRVs. Typically, TRVs derived from chronic NOAELs representative of a sensitive endpoint, such as reproduction, are appropriate for protection of individuals. Depending on the study, TRVs derived from chronic LOAELs may be adequately protective of populations. Because the kestrel was the only target receptor included in the evaluation and this bird is not a state or federally threatened or endangered species, the assessment endpoint for this ERA focuses protection at the population level. Based on this objective, emphasis may be placed on the HQs calculated from the High TRVs (in Tier 2) during risk management decisions for the site.

The following table summarizes the COIs with elevated HQs or HIs based on the Tier 2, High and Low TRV evaluations for the Onsite and Total Habitats:

| Analyte Class | Chemical of Interest | HQ or HI (Low TRV) | | HQ or HI (High TRV) | |
|---|---|---|---|---|---|
| | | Onsite Habitat | Total Habitat | Onsite Habitat | Total Habitat |
| Inorganics | Cadmium | 4 | 3 | HQ ≤ 1 | HQ ≤ 1 |
| | Chromium | (not a COI) | 2 | (not a COI) | HQ ≤ 1 |
| | Lead | 3 | 3 | HQ ≤ 1 | HQ ≤ 1 |
| | Mercury | (not a COI) | 2 | (not a COI) | HQ ≤ 1 |
| | Nickel | 4 | 13 | HQ ≤ 1 | HQ ≤ 1 |
| | Zinc | (not a COI) | 4 | (not a COI) | HQ ≤ 1 |
| | Cadmium + Lead + Mercury | 7 | 9 | HI ≤ 1 | 2 |
| Pesticides/ PCBs | 4,4'-DDD | 7 | 5 | HQ ≤ 1 | HQ ≤ 1 |
| | 4,4'-DDE | 21 | 14 | 2 | HQ ≤ 1 |
| | 4,4'-DDT | 67 | 44 | 7 | 4 |
| | Total Pesticides/PCBs | 95 | 62 | 9 | 6 |

The highest Tier 2 HQs are for DDT metabolites and the DDT HQs are higher for the Onsite Habitat compared to the Total Habitat. DDT is not known to have been used at the former synthetic rubber plant.

The HQs for inorganics are generally lower for the Onsite Habitat than for the Total Habitat. With the exception of mercury, risk-driving inorganic detections (the area of maximum concentrations) occurred in a limited off-site area within the Total Habitat. This area is approximately 13 feet in diameter and is associated with location P1-G. As discussed in Section I.6.3, if the detections of nickel in the P1-G area were omitted from the Tier 2 risk evaluation, the Total Habitat Tier HQs based on the Low TRV would decrease from 13 to 4. While not accounted for in the risk calculations, this limited area in which elevated inorganic concentrations typically occur further reduces the likelihood of significant exposure by the kestrel, since the majority of kestrel foraging area contains significantly lower concentrations of inorganics.

Due to the conservative assumptions primarily related to the exposure assessment, including use of an AUF and SF of 1.0, the results of the ERA likely demonstrate an overestimate of risk. The available foraging resources present at the site are limited by the relatively small size of the open area and highly urbanized setting (located in Los Angeles) and surrounding area. The area is zoned for commercial/industrial/residential use and is covered with infrastructure and small residential lots. However, the Total Habitat may support at least one kestrel that could defend this small foraging area throughout most of the year, except possibly during the breeding season. Although adverse effects to an individual kestrel may occur from exposure to pesticides in surface soils from the Onsite Habitat, effects to the population are expected to be negligible. A less conservative assessment that incorporates more site-specificity regarding the actual bioavailability and bioaccumulation potential of constituents in soil, and site use and seasonal population variations, would reduce the risk estimates and would likely demonstrate a low potential for adverse effects to populations, and possibly even to individual kestrels. No further evaluation of the kestrel is expected to be necessary for the site.

## I.9 REFERENCES

Beyer, W.N., E.E. Connor, and S. Gerould. 1994. "Estimates of Soil Ingestion by Wildlife." *J. Wildland Management* 58(2): 375-382.

Bradford, G.R., A.C. Chang, A.L. Page, D. Bakhtar, J.A. Frampton, and H. Wright. 1996. *Background Concentrations of Trace and Major Elements in California Soils*. Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California Special Report, U.C. Riverside and Cal/EPA, DTSC.

CDFG. 2003. California Wildlife Habitat Relationships (CWHR) Software. Version 8.0. Sacramento, CA.

CDFG. 2005. Sensitive Species. California Department of Fish and Game. Habitat Conservation Planning Branch. Accessed January 2005. URL: http://www.dfg.ca.gov/hcpb/species/species.shtml.

Dames & Moore. 1991. 1Baseline Health Risk Characterization Del Amo Site, Los Angeles. April 1.

DTSC. 1996a. *Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities*, Part B, *Scoping Assessment.* California Environmental Protection Agency, Department of Toxic Substances Control, Human and Ecological Risk Division. Sacramento, CA, July 4.

DTSC. 1996b. *Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities,* Part A, *Overview.* California Environmental Protection Agency, Department of Toxic Substances Control, Human and Ecological Risk Division. Sacramento, CA, July 4.

DTSC, 1998. Ecological Risk Assessment Note, No. 1. Depth of soil samples used to set exposure point concentrations for burrowing mammals and burrow-dwelling birds in ecological risk assessments. Issue date May 15, 1998. Sacramento, CA; California

Environmental Protection Agency, Department of Toxic Substances Control, Human and Ecological Risk Division.

DTSC. 2000. Ecological Risk Assessment Note, No. 4 [EcoNote No. 4]. Use of Navy/U.S. Environmental Protection Agency (USEPA) Region 9 Biological Technical Assistance Group (BTAG) Toxicity Reference Values (TRVs) for Ecological Risk Assessment. Issue date December 8, 2000. California Environmental Protection Agency (DTSC), Human and Ecological Risk Division (HERD), Sacramento, CA.

Engineering Field Activity, West. 1998. *Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California*. Interim Final. ERA West, Naval Facilities Engineering Command, United States Navy, San Bruno, CA.

Jager, T. 1998. Mechanistic approach for estimating bioconcentration of organic chemicals in earthworms. *Environ. Toxicol. Chem*. 17:2080-2090.

Nagy, K.A. 2001. "Nutrition Abstracts and Reviews." *Livestock Feeds and Feeding*. 71(10):1R-3R,. October.

Oak Ridge National Laboratory (ORNL). 2005. Risk Assessment Information System (RAIS) database. Oak Ridge National Laboratory (ORNL). Accessed January 2005.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W. Suter, II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Earthworms. ES/ER/TM-220. Oak Ridge National Laboratory, Oak Ridge, Tennessee

Sample, B.E., D.M. Opresko and G.W. Suter. 1996. Toxicological benchmarks for wildlife, 1996 Revision. ES/ER/TM-86/R3. Oak Ridge National Laboratory, Oak Ridge, Tennessee. June.

Smallwood, J. A., and D. M. Bird. 2002. American Kestrel ( *Falco sparverius* ). *In* The Birds of North America, No. 602 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Suter, G.W. 1993. *Ecological Risk Assessment*. Chelsea, MI: Lewis Publishers.

Tetra Tech. 2004. *Final Predictive Ecological Risk Assessment (PERA) – Operable Unit (OU) 2, Edwards Air Force Base, CA.* Tetra Tech, Inc., January.

United States Environmental Protection Agency (USEPA). 1993. *Wildlife Exposure Factors*. Volumes I and II. U.S. Environmental Protection Agency, EPA/600/R-93/187a. ORD. Washington, D.C., December.

USEPA. 1995. Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife: DDT, Mercury, 2,3,7,8-TCDD, PCBs . EPA-820-B-95-008. USEPA, Office of Water, Washington, D.C. March.

USEPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments.* EPA 540-R-97-006. Interim final. U.S. Environmental Protection Agency, Washington, D.C.

USEPA. 1998. *Guidelines for Ecological Risk Assessment.* U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, D.C., EPA/630/R 95/002F, April.

USEPA. 1999a. Data Requirements and Confidence Indicators for Ecological Benchmarks Supporting Exemption Criteria for the Hazardous Waste Identification Rule (HWIR99), U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. October.

USEPA. 1999b. Issuance of Final Guidance: Ecological Risk Assessment and Management Principles for Superfund Sites. Memorandum from S.D. Luftig, Director, Office of Emergency and Remedial Response. OSWER Directive 9285.7-28 P. Office of Solid Waste and Emergency Response, Washington DC. October 7.

USEPA. 2005a. *Guidance for Developing Ecological Soil Screening Levels – Revised Draft.* OSWER Directive 9285.7-55, OSWER. February.

USEPA. 2005b. *Interim Ecological Soil Screening Levels (Eco-SSLs) - Revised.* OSWER Directive 9285.7-60 through 75, OSWER. March.

**Table I-1**
**Tier 1 Summary Statistics and Identification of COIs in Soil (0 to 6 feet bgs)**
**Onsite Habitat**
**Baseline Risk Assessment**
**Del Amo Site**

| Analytes | Number of Samples | Detection Frequency | Mean Concentration (mg/kg) [a] | Minimum Detected Concentration (mg/kg) | Maximum Detected Concentration (mg/kg) | Lower of Maximum and 95% UCL Concentration (mg/kg) | Site-specific Background Concentration (mg/kg) | Is Maximum Above Corresponding Background? [b] | Is COI Bioaccumulative in a Terrestrial Environment (USEPA 1999a)? | Retain as COI? |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | | | |
| **Arsenic** | **14** | **100%** | **8.96** | **1.00** | **30** | **17** | **10** | **Yes** | **Yes** | **Yes** |
| Barium | 14 | 100% | 168 | 140 | 212 | 189 | na | No [b] | NA | No |
| **Cadmium** | **14** | **100%** | **5.92** | **0.67** | **7.60** | **7.60** | **2** | **Yes** | **Yes** | **Yes** |
| Chromium | 14 | 100% | 36 | 19 | 49 | 49 | 60 | No | NA | No |
| Copper | 14 | 100% | 63 | 21 | 140 | 140 | 150 | No | NA | No |
| **Lead** | **14** | **100%** | **55** | **8.1** | **110** | **108** | **na** | **Yes [b]** | **Yes** | **Yes** |
| **Manganese** | **12** | **100%** | **463** | **350** | **550** | **550** | **450** | **Yes** | **Yes [c]** | **Yes** |
| Mercury | 14 | 64% | 0.16 | 0.061 | 0.35 | 0.35 | na | No [b] | NA | No |
| Molybdenum | 2 | 0% | -- | -- | -- | -- | -- | -- | NA | No |
| **Nickel** | **14** | **100%** | **25** | **12** | **45** | **39** | **25** | **Yes** | **Yes** | **Yes** |
| Selenium | 13 | 0% | -- | -- | -- | -- | -- | -- | NA | No |
| Vanadium | 14 | 100% | 71 | 37 | 160 | 130 | 65 | Yes | No | No |
| Zinc | 14 | 100% | 107 | 64 | 140 | 140 | 170 | No | NA | No |
| **Organics** | | | | | | | | | | |
| **4,4'-DDD** | **14** | **50%** | **0.70** | **0.011** | **2.70** | **2.00** | **na** | **NA** | **Yes** | **Yes** |
| **4,4'-DDE** | **8** | **75%** | **0.67** | **0.011** | **2.20** | **1.82** | **na** | **NA** | **Yes** | **Yes** |
| **4,4'-DDT** | **14** | **86%** | **3.61** | **0.18** | **9.10** | **7.87** | **na** | **NA** | **Yes** | **Yes** |
| **Endosulfan** | **6** | **33%** | **0.027** | **0.0025** | **0.099** | **0.099** | **na** | **NA** | **Yes** | **Yes** |
| Aroclor 1260 | 6 | 0% | -- | -- | -- | -- | -- | -- | NA | No |

Notes:
[a] Mean concentration calculated with half reporting limit for non-detects.
[b] No site-specific background concentration calculated; retained or not retained as COI based on statistical background analysis presented in Appendix B.
[c] Retained due to lack of bioaccumulative information (USEPA 1999a).
mg/kg = milligram per kilogram
COI = Chemical of interest
UCL = Upper confidence limit of the mean
NA = Not applicable
na = Not available

**Table I-2**
**Tier 1 Summary Statistics and Identification of COIs in Soil (0 to 6 feet bgs)**
**Total Habitat**
**Baseline Risk Assessment**
**Del Amo Site**

| Analyte | Number of Samples | Detection Frequency | Mean Concentration (mg/kg) [a] | Minimum Detected Concentration (mg/kg) | Maximum Detected Concentration (mg/kg) | Lower of Maximum and 95% UCL Concentration (mg/kg) | Background Concentration | | Is Maximum Above Corresponding Background? [c] | Is COI Bioaccumulative in a Terrestrial Environment (USEPA 1999a)? | Retain as COI? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | On-Site (mg/kg) | Regional (mg/kg) [b] | | | |
| **Inorganics** | | | | | | | | | | | |
| **Arsenic** | **45** | **93%** | **7.65** | **1** | **51** | **13** | **10** | **not required** | **Yes** | **Yes** | **Yes** |
| **Barium** | **63** | **98%** | **188** | **72.6** | **778** | **246** | **na** | **509** | **Yes** | **Yes** | **Yes** |
| **Cadmium** | **63** | **46%** | **8.91** | **0.56** | **148** | **23** | **2** | **not required** | **Yes** | **Yes** | **Yes** |
| **Chromium** | **63** | **90%** | **165** | **19** | **1,700** | **356** | **60** | **not required** | **Yes** | **Yes** | **Yes** |
| **Copper** | **63** | **87%** | **163** | **21** | **2,950** | **406** | **150** | **not required** | **Yes** | **Yes** [d] | **Yes** |
| **Lead** | **95** | **96%** | **123** | **3.52** | **2,420** | **282** | **na** | **23.9** | **Yes** | **Yes** | **Yes** |
| **Manganese** | **12** | **100%** | **463** | **350** | **550** | **550** | **450** | **not required** | **Yes** | **Yes** [d] | **Yes** |
| **Mercury** | **46** | **63%** | **0.12** | **0.037** | **0.93** | **0.93** | **na** | **0.26** | **Yes** | **Yes** | **Yes** |
| **Molybdenum** | **51** | **31%** | **36** | **2.60** | **299** | **80** | **na** | **1.3** | **Yes** | **Yes** [d] | **Yes** |
| **Nickel** | **63** | **87%** | **150** | **12** | **1,400** | **318** | **25** | **not required** | **Yes** | **Yes** | **Yes** |
| **Selenium** | **44** | **23%** | **1.35** | **2.1** | **8.09** | **2.40** | **na** | **0.058** | **Yes** | **Yes** | **Yes** |
| Vanadium | 63 | 97% | 76 | 35 | 270 | 84 | 65 | not required | Yes | No | No |
| **Zinc** | **63** | **100%** | **190** | **64** | **1,810** | **360** | **170** | **not required** | **Yes** | **Yes** | **Yes** |
| **Organics** | | | | | | | | | | | |
| **4,4'-DDD** | **45** | **20%** | **0.26** | **0.011** | **2.70** | **0.73** | **na** | **na** | **NA** | **Yes** | **Yes** |
| **4,4'-DDE** | **39** | **18%** | **0.15** | **0.011** | **2.20** | **0.45** | **na** | **na** | **NA** | **Yes** | **Yes** |
| **4,4'-DDT** | **45** | **40%** | **1.15** | **0.12** | **9.10** | **2.86** | **na** | **na** | **NA** | **Yes** | **Yes** |
| **Endosulfan** | **27** | **7%** | **0.0068** | **0.0025** | **0.099** | **0.024** | **na** | **na** | **NA** | **Yes** | **Yes** |
| **Aroclor 1260** | **27** | **7%** | **0.10** | **0.55** | **0.95** | **0.29** | **na** | **na** | **NA** | **Yes** | **Yes** |

Notes:
[a] Mean concentration calculated with half reporting limit for non-detects. As an artifact of this approach, the mean is below the minimum detected concentration for selenium and Aroclor 1260.
[b] Bradford et al., 1996.
[c] Maximum detected concentrations were compared to regional background concentrations when on-site specific background concentrations were unavailable.
[d] Retained due to lack of bioaccumulative information (USEPA 1999a).
"not required" due to availability of site-specific background concentration.
mg/kg = milligram per kilogram
COI = Chemical of interest
UCL = Upper confidence limit of the mean
NA = Not applicable
na = not available

**Table I-3**
**Tier 2 Summary Statistics and Identification of COIs in Soil (0 to 1.5 feet bgs)**
**Onsite Habitat**
**Baseline Risk Assessment**
**Del Amo Site**

| Analytes | Number of Samples | Detection Frequency | Mean Concentration (mg/kg) [a] | Minimum Detected Concentration (mg/kg) | Maximum Detected Concentration (mg/kg) | Lower of Maximum and 95% UCL Concentration (mg/kg) | Site-specific Background Concentration (mg/kg) | Is Maximum Above Corresponding Background? [b] | Is COI Bioaccumulative in a Terrestrial Environment (USEPA 1999a)? | Retain as COI? |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | | | |
| **Arsenic** | 13 | **100%** | 9.58 | **5.30** | **30** | **18** | **10** | **Yes** | **Yes** | **Yes** |
| Barium | 13 | 100% | 170 | 140 | 212 | 178 | na | No [b] | NA | No |
| **Cadmium** | 13 | **100%** | 5.79 | **0.67** | **7.00** | **7.00** | **2** | **Yes** | **Yes** | **Yes** |
| Chromium | 13 | 100% | 37.1 | 19 | 49 | 47 | 60 | No | NA | No |
| Copper | 13 | 100% | 66.1 | 23 | 140 | 104 | 150 | No | NA | No |
| **Lead** | 13 | **100%** | 58.1 | **8.1** | **110** | **110** | **na** | **Yes [b]** | **Yes** | **Yes** |
| **Manganese** | 11 | **100%** | 473 | **360** | **550** | **550** | **450** | **Yes** | **Yes [c]** | **Yes** |
| Mercury | 13 | 69% | 0.171 | 0.061 | 0.35 | 0.32 | na | No [b] | NA | No |
| Molybdenum | 2 | 0% | -- | -- | -- | -- | -- | -- | NA | No |
| **Nickel** | 13 | **100%** | 25.5 | **12** | **45** | **34** | **25** | **Yes** | **Yes** | **Yes** |
| Selenium | 13 | 0% | -- | -- | -- | -- | -- | -- | NA | No |
| Vanadium | 13 | 100% | 72.8 | 37 | 160 | 136 | 65 | Yes | No | No |
| Zinc | 13 | 100% | 110 | 77 | 140 | 125 | 170 | No | NA | No |
| **Organics** | | | | | | | | | | |
| **4,4'-DDD** | **13** | **54%** | **0.75** | **0.011** | **2.70** | **2.14** | **na** | **NA** | **Yes** | **Yes** |
| **4,4'-DDE** | **13** | **38%** | **0.76** | **0.79** | **2.20** | **1.44** | **na** | **NA** | **Yes** | **Yes** |
| **4,4'-DDT** | **13** | **85%** | **3.84** | **0.18** | **9.10** | **8.3** | **na** | **NA** | **Yes** | **Yes** |
| **Endosulfan** | **5** | **40%** | **0.032** | **0.0025** | **0.099** | **0.099** | **na** | **NA** | **Yes** | **Yes** |
| Aroclor 1260 | 5 | 0% | -- | -- | -- | -- | -- | -- | NA | No |

Notes:
[a] Mean concentration calculated with half reporting limit for non-detects. As an artifact of this approach, the mean is below the minimum detected concentration for 4,4'-DDE.
[b] No site-specific background concentration calculated; retained or not retained as COI based on statistical background analysis presented in Appendix B.
[c] Retained due to lack of bioaccumulative information (USEPA 1999a).
mg/kg = milligram per kilogram
COI = Chemical of Interest
UCL = Upper confidence limit of the mean
NA = Not applicable
na = Not available

**Table I-4**
**Tier 2 Summary Statistics and Identification of COIs in Soil (0 to 1.5 feet bgs)**
**Total Habitat**
**Baseline Risk Assessment**
**Del Amo Site**

| Analyte | Number of Samples | Detection Frequency | Mean Concentration (mg/kg) [a] | Minimum Detected Concentration (mg/kg) | Maximum Detected Concentration (mg/kg) | Lower of Maximum and 95% UCL Concentration (mg/kg) | Background Concentration | | Is Maximum Above Corresponding Background? [c] | Is COI Bioaccumulative in a Terrestrial Environment (USEPA 1999a)? | Retain as COI? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | On-Site (mg/kg) | Regional (mg/kg) [b] | | | |
| **Inorganics** | | | | | | | | | | | |
| **Arsenic** | **24** | **100%** | **7.46** | **3.5** | **30** | **13** | **10** | **not required** | **Yes** | **Yes** | **Yes** |
| Barium | 33 | 100% | 171 | 97 | 252 | 182 | na | 509 | No | NA | No |
| **Cadmium** | **33** | **52%** | **3.44** | **0.56** | **14** | **6.03** | **2** | **not required** | **Yes** | **Yes** | **Yes** |
| **Chromium** | **33** | **91%** | **52.5** | **19** | **270** | **96** | **60** | **not required** | **Yes** | **Yes** | **Yes** |
| **Copper** | **33** | **88%** | **65.6** | **23** | **240** | **110** | **150** | **not required** | **Yes** | **Yes [d]** | **Yes** |
| **Lead** | **49** | **96%** | **75.7** | **7.5** | **450** | **110** | **na** | **23.9** | **Yes** | **Yes** | **Yes** |
| **Manganese** | **11** | **100%** | **473** | **360** | **550** | **550** | **450** | **not required** | **Yes** | **Yes [d]** | **Yes** |
| **Mercury** | **24** | **79%** | **0.12** | **0.037** | **0.35** | **0.22** | **na** | **0.26** | **Yes** | **Yes** | **Yes** |
| **Molybdenum** | **22** | **14%** | **11** | **2.60** | **6.6** | **23** | **na** | **1.3** | **Yes** | **Yes [d]** | **Yes** |
| **Nickel** | **33** | **85%** | **53.6** | **12** | **340** | **116** | **25** | **not required** | **Yes** | **Yes** | **Yes** |
| **Selenium** | **24** | **38%** | **1.54** | **2.1** | **4.7** | **2.90** | **na** | **0.058** | **Yes** | **Yes** | **Yes** |
| Vanadium | 33 | 97% | 66 | 35 | 160 | 93 | 65 | not required | Yes | No | No |
| **Zinc** | **33** | **100%** | **137** | **66** | **480** | **211** | **170** | **not required** | **Yes** | **Yes** | **Yes** |
| **Organics** | | | | | | | | | | | |
| **4,4'-DDD** | **24** | **29%** | **0.43** | **0.011** | **2.70** | **1.23** | **na** | **na** | **NA** | **Yes** | **Yes** |
| **4,4'-DDE** | **24** | **25%** | **0.44** | **0.13** | **2.20** | **0.92** | **na** | **na** | **NA** | **Yes** | **Yes** |
| **4,4'-DDT** | **24** | **63%** | **2.12** | **0.12** | **9.10** | **5.06** | **na** | **na** | **NA** | **Yes** | **Yes** |
| **Endosulfan** | **6** | **33%** | **0.027** | **0.0025** | **0.099** | **0.093** | **na** | **na** | **NA** | **Yes** | **Yes** |
| Aroclor 1260 | 6 | 0% | -- | -- | -- | -- | -- | -- | -- | NA | No |

Notes:
[a] Mean concentration calculated with half reporting limit for non-detects. As an artifact of this approach, the mean is below the minimum detected concentration for selenium.
[b] Bradford et al., 1996.
[c] Maximum detected concentrations were compared to regional background concentrations when on-site specific background concentrations were unavailable.
[d] Retained due to lack of bioaccumulative information (USEPA 1999a).
"not required" due to availability of site-specific background concentration.
mg/kg = milligram per kilogram
COI = Chemical of Interest
UCL = Upper confidence limit of the mean
NA = Not applicable
na = not available

# Table I-5
# Exposure Factors for the American Kestrel
# Onsite and Total Habitats
# Baseline Risk Assessment
# Del Amo Site

| Parameter | Units | American Kestrel | Reference |
|---|---|---|---|
| Habitat | -- | Terrestrial | DFG 2003 |
| Trophic Level | -- | Level 3-4 | DFG 2003 |
| Occurrence | -- | Resident | DFG 2003 |
| Status | -- | none | DFG 2005 |
| Area Use Factor (site use fraction) | -- | 1 | DTSC 1996a |
| Seasonailty Factor (site use fraction) | -- | 1 | DTSC 1996a |
| Body Weight [a] | kg | 0.124 | USEPA 1993 |
| Dietary Composition | -- | Soil-dwelling invertebrates | Site knowledge / professional judgement |
| Diet - Soil dwelling invertebrates (fraction) | -- | 1 | Site knowledge / professional judgement |
| Food Ingestion Rate (dry weight) [b] | kg/day | 0.017 | Nagy 2001 |
| Incidental Soil Ingestion Rate [c] | kg/day | 0.00034 | Beyer et al. 1994 |

**Notes:**

[a] Value representative of a breeding female.

[b] Allometric equation for all birds used (Nagy, 2001).

[c] Assuming 2% soil in diet, incidental soil ingestion rate calculated by multiplying percent soil with food ingestion rate (Beyer et al., 1994).

**Table I-6**
**Tier 1 Bioconcentration Factors for Soil Invertebrates**
**Onsite and Total Habitats**
**Baseline Risk Assessment**
**Del Amo Site**

| Chemical of Interest | $K_{oc}$ [a] (L/kg) | Log $K_{ow}$ [a] | Soil-Earthworm Bioconcentration Factor [b] | |
|---|---|---|---|---|
| | | | On-Site Habitat | Total Habitat |
| **Inorganics** | | | | |
| Arsenic | -- | -- | 0.10 | 0.11 |
| Barium | | | not a COI | 0.091 |
| Cadmium | -- | -- | 5.46 | 4.37 |
| Chromium | -- | -- | not a COI | 0.31 |
| Copper | -- | -- | not a COI | 0.52 |
| Lead | -- | -- | 0.33 | 0.27 |
| Manganese | -- | -- | 0.060 | 0.060 |
| Mercury | -- | -- | not a COI | 2.79 |
| Molybdenum [c] | -- | -- | not a COI | 1.00 |
| Nickel | -- | -- | 1.06 | 1.06 |
| Selenium | -- | -- | not a COI | 0.73 |
| Zinc | -- | -- | not a COI | 1.64 |
| **Organics** | | | | |
| 4,4'-DDD | -- | -- | 2.59 | 3.52 |
| 4,4'-DDE | -- | -- | 11 | 13 |
| 4,4'-DDT | -- | -- | 6.39 | 7.29 |
| Endosulfan | 22,000 | 3.83 | 0.61 | 0.61 |
| Aroclor 1260 | -- | -- | not a COI | 2.62 |

Notes:
[a] Log $K_{ow}$ and $K_{oc}$ values from the Risk Assessment Information System (RAIS) database, viewed January 2005.
Endosulfan BAF = $K_{ww}$ / $K_d$, where log $K_{ww}$ = 0.87 * log $K_{ow}$ - 2.0; $K_d$ = $f_{oc}$ * $K_{oc}$; $f_{oc}$ = 0.01 (USEPA 2005a).

[b] Values calculated from a regression equation, unless noted otherwise:
*Guidance for Developing Ecological Soil Screening Levels*, USEPA 2005a (Attachment 4-1) - all COIs except mercury, Aroclor 1260, and endosulfan.
*Development and Validation of Bioaccumulation Models for Earthworms*, Sample et al. 1998 - mercury and Aroclor 1260.

[c] Default of 1.0 - earthworms.

L/kg = liter per kilogram

COI = Chemical of interest

-- = not required because regression model available (USEPA 2005, Sample et. al. 1998)

# Table I-7
# Tier 2 Bioconcentration Factors for Soil Invertebrates
# Onsite and Total Habitats
# Baseline Risk Assessment
# Del Amo Site

| Chemical of Interest | $K_{oc}$ [a] (L/kg) | Log $K_{ow}$ [a] | Soil-Earthworm Bioconcentration Factor [b] | |
|---|---|---|---|---|
| | | | On-Site Habitat | Total Habitat |
| **Inorganics** | | | | |
| Arsenic | -- | -- | 0.10 | 0.11 |
| Cadmium | -- | -- | 5.56 | 5.73 |
| Chromium | -- | -- | not a COI | 0.31 |
| Copper | -- | -- | not a COI | 0.52 |
| Lead | -- | -- | 0.32 | 0.32 |
| Manganese | -- | -- | 0.060 | 0.060 |
| Mercury | -- | -- | not a COI | 2.96 |
| Molybdenum [c] | -- | -- | not a COI | 1.00 |
| Nickel | -- | -- | 1.06 | 1.06 |
| Selenium | -- | -- | not a COI | 0.70 |
| Zinc | -- | -- | not a COI | 2.35 |
| **Organics** | | | | |
| 4,4'-DDD | -- | -- | 2.54 | 3.00 |
| 4,4'-DDE | -- | -- | 11 | 12 |
| 4,4'-DDT | -- | -- | 6.34 | 6.77 |
| Endosulfan | 22,000 | 3.83 | 0.61 | 0.61 |

Notes:

[a] Log $K_{ow}$ and $K_{oc}$ values from the Risk Assessment Information System (RAIS) database, viewed January 2005.
Endosulfan BAF = $K_{ww}$ / $K_d$, where log $K_{ww}$ = 0.87 * log $K_{ow}$ - 2.0; $K_d = f_{oc} * K_{oc}$; $f_{oc}$ = 0.01 (USEPA 2005a).

[b] Values calculated from a regression equation, unless noted otherwise:
*Guidance for Developing Ecological Soil Screening Levels* , USEPA 2005a (Attachment 4-1) - all COIs except mercury and endosulfan.
Development and Validation of Bioaccumulation Models for Earthworms, Sample et al. 1998 - mercury.

[c] Default of 1.0 - earthworms.

L/kg = liter per kilogram

COI = Chemical of interest

-- = not required because regression model available (USEPA 2005, Sample et. al. 1998)

# Table I-8
## Tier 1 Average Daily Dose for the American Kestrel
## Ondite Habitat
## Baseline Risk Assessment
## Del Amo Site

| Chemical of Interest | Concentrations in Site Media: Soil [a] (mg/kg dry weight) | Concentrations in Site Media: Soil-dwelling Invertebrates Concentration (mg/kg dry weight) | Average Daily Dose - Dietary [b] (mg/kg-body weight/day) |
|---|---|---|---|
| **Inorganics** | | | |
| Arsenic | 17 | 1.81 | 0.30 |
| Cadmium | 7.60 | 42 | 5.83 |
| Lead | 108 | 35 | 5.22 |
| Manganese | 550 | 33 | 6.14 |
| Nickel | 39 | 41 | 5.90 |
| **Organics** | | | |
| 4,4'-DDD | 2.00 | 5.18 | 0.73 |
| 4,4'-DDE | 1.82 | 20 | 2.82 |
| 4,4'-DDT | 7.87 | 50 | 7.05 |
| Endosulfan | 0.099 | 0.057 | 0.0082 |

Notes:

[a] Lower of maximum and 95% UCL soil concentration (0 to 6 feet bgs).

[b] The ADD was calculated from the following equation:

$$ADD = \frac{IR_{food} \sum_{i=1}^{n_i} \left(C_{food_i} \times df_i\right) + \left(IR_{soil} \times C_{soil}\right)}{BW}$$

Using the exposure variables below:

| Parameter | Description | Value |
|---|---|---|
| BW | Body Weight (kg) | 0.124 |
| $IR_{food}$ | Food Ingestion Rate (kg dw/day) | 0.017 |
| $C_{food}$ | Concentration in food-type (mg/kg dw) | chemical-specific invertebrate concentration |
| df | Dietary Fraction of food-type | 1 |
| $IR_{soil}$ | Soil Ingestion Rate (kg-dw/day) | 0.00034 |
| $C_{soil}$ | Concentration in Soil (mg/kg-dw) | chemical-specific site concentration |

**Table I-9**
**Tier 1 Average Daily Dose for the American Kestrel**
**Total Habitat**
**Baseline Risk Assessment**
**Del Amo Site**

| Chemical of Interest | Concentrations in Site Media: Soil [a] (mg/kg dry weight) | Concentrations in Site Media: Soil-dwelling Invertebrates Concentration (mg/kg dry weight) | Average Daily Dose - Dietary [b] (mg/kg-body weight/day) |
|---|---|---|---|
| **Inorganics** | | | |
| Arsenic | 13 | 1.47 | 0.24 |
| Barium | 246 | 22 | 3.82 |
| Cadmium | 23 | 99 | 14 |
| Chromium | 356 | 109 | 16 |
| Copper | 406 | 209 | 30 |
| Lead | 282 | 76 | 11 |
| Manganese | 550 | 33 | 6.14 |
| Mercury | 0.93 | 0.67 | 0.094 |
| Molybdenum | 80 | 80 | 11 |
| Nickel | 318 | 337 | 48 |
| Selenium | 2.40 | 1.76 | 0.25 |
| Zinc | 360 | 590 | 83 |
| **Organics** | | | |
| 4,4'-DDD | 0.73 | 2.55 | 0.36 |
| 4,4'-DDE | 0.45 | 5.87 | 0.82 |
| 4,4'-DDT | 2.86 | 21 | 2.92 |
| Endosulfan | 0.024 | 0.014 | 0.0021 |
| Aroclor 1260 | 0.29 | 0.76 | 0.11 |

Notes:

[a] Lower of maximum and 95% UCL soil concentration (0 to 6 feet bgs).

[b] The ADD was calculated from the following equation:

$$ADD = \frac{IR_{food} \sum_{i=1}^{n_i} \left(C_{food_i} \times df_i\right) + \left(IR_{soil} \times C_{soil}\right)}{BW}$$

Using the exposure variables below:

| Parameter | Description | Value |
|---|---|---|
| BW | Body Weight (kg) | 0.124 |
| $IR_{food}$ | Food Ingestion Rate (kg dw/day) | 0.017 |
| $C_{food}$ | Concentration in food-type (mg/kg dw) | chemical-specific invertebrate concentration |
| df | Dietary Fraction of food-type | 1 |
| $IR_{soil}$ | Soil Ingestion Rate (kg-dw/day) | 0.00034 |
| $C_{soil}$ | Concentration in Soil (mg/kg-dw) | chemical-specific site concentration |

# Table I-10
## Tier 2 Average Daily Dose for the American Kestrel
## Onsite Habitat
## Baseline Risk Assessment
## Del Amo Site

| Chemical of Interest | Concentrations in Site Media | | Average Daily Dose - Dietary [b] (mg/kg-body weight/day) |
|---|---|---|---|
| | Soil [a] (mg/kg dry weight) | Soil-dwelling Invertebrates Concentration (mg/kg dry weight) | |
| **Inorganics** | | | |
| Arsenic | 18 | 1.87 | 0.31 |
| Cadmium | 7.00 | 39 | 5.46 |
| Lead | 110 | 36 | 5.30 |
| Manganese | 550 | 33 | 6.14 |
| Nickel | 34 | 36 | 5.14 |
| **Organics** | | | |
| 4,4'-DDD | 2.14 | 5.43 | 0.76 |
| 4,4'-DDE | 1.44 | 16 | 2.30 |
| 4,4'-DDT | 8.30 | 53 | 7.38 |
| Endosulfan | 0.099 | 0.060 | 0.0087 |

Notes:

[a] Lower of maximum and 95% UCL soil concentration (0 to 1.5 feet bgs).

[b] The ADD was calculated from the following equation:

$$ADD = \frac{IR_{food} \sum_{i=1}^{n_i} \left(C_{food_i} \times df_i\right) + \left(IR_{soil} \times C_{soil}\right)}{BW}$$

Using the exposure variables below:

| Parameter | Description | Value |
|---|---|---|
| BW | Body Weight (kg) | 0.124 |
| $IR_{food}$ | Food Ingestion Rate (kg dw/day) | 0.017 |
| $C_{food}$ | Concentration in food-type (mg/kg dw) | chemical-specific invertebrate concentration |
| df | Dietary Fraction of food-type | 1 |
| $IR_{soil}$ | Soil Ingestion Rate (kg-dw/day) | 0.00034 |
| $C_{soil}$ | Concentration in Soil (mg/kg-dw) | chemical-specific site concentration |

# Table I-11
## Tier 2 Average Daily Dose for the American Kestrel
## Total Habitat
## Baseline Risk Assessment
## Del Amo Site

| Chemical of Interest | Concentrations in Site Media: Soil [a] (mg/kg dry weight) | Concentrations in Site Media: Soil-dwelling Invertebrates Concentration (mg/kg dry weight) | Average Daily Dose - Dietary [b] (mg/kg-body weight/day) |
|---|---|---|---|
| **Inorganics** | | | |
| Arsenic | 13 | 1.44 | 0.24 |
| Cadmium | 6.03 | 35 | 4.85 |
| Chromium | 96 | 29 | 4.36 |
| Copper | 110 | 57 | 8.23 |
| Lead | 110 | 36 | 5.30 |
| Manganese | 550 | 33 | 6.14 |
| Mercury | 0.22 | 0.65 | 0.091 |
| Molybdenum | 23 | 23 | 3.21 |
| Nickel | 116 | 123 | 17 |
| Selenium | 2.90 | 2.02 | 0.29 |
| Zinc | 211 | 495 | 70 |
| **Organics** | | | |
| 4,4'-DDD | 1.23 | 3.69 | 0.52 |
| 4,4'-DDE | 0.92 | 11 | 1.55 |
| 4,4'-DDT | 5.06 | 34 | 4.80 |
| Endosulfan | 0.093 | 0.057 | 0.0082 |

Notes:

[a] Lower of maximum and 95% UCL soil concentration (0 to 1.5 feet bgs).

[b] The ADD was calculated from the following equation:

$$ADD = \frac{IR_{food} \sum_{i=1}^{n_i} \left(C_{food_i} \times df_i\right) + \left(IR_{soil} \times C_{soil}\right)}{BW}$$

Using the exposure variables below:

| Parameter | Description | Value |
|---|---|---|
| BW | Body Weight (kg) | 0.124 |
| $IR_{food}$ | Food Ingestion Rate (kg dw/day) | 0.017 |
| $C_{food}$ | Concentration in food-type (mg/kg dw) | chemical-specific invertebrate concentration |
| df | Dietary Fraction of food-type | 1 |
| $IR_{soil}$ | Soil Ingestion Rate (kg-dw/day) | 0.00034 |
| $C_{soil}$ | Concentration in Soil (mg/kg-dw) | chemical-specific site concentration |

**Table I-12**
**Tier 1 and Tier 2 Toxicity Reference Values (TRV) for the American Kestrel**
**Onsite and Total Habitats**
**Baseline Risk Assessment**
**Del Amo Site**

| Chemical of Interest | Avian TRV-Low (mg/kg - body weight/day)[a] | | Avian TRV-High (mg/kg - body weight/day)[b] | |
|---|---|---|---|---|
| | Tier 1 | Tier 2 | Tier 1 | Tier 2 |
| **Inorganics** | | | | |
| Arsenic | 2.24 | 2.24 | 22 | 22 |
| Barium | 20.8 | 20.8 | 41.7 | 41.7 |
| Cadmium | 1.47 | 1.47 | 10.4 | 10.4 |
| Chromium | 2.66 | 2.66 | 5 | 5 |
| Copper | 47 | 47 | 52.3 | 52.3 |
| Lead | 1.63 | 1.63 | 8.75 | 8.75 |
| Manganese | 77.6 | 77.6 | 776 | 776 |
| Mercury | 0.039 | 0.039 | 0.18 | 0.18 |
| Molybdenum | 3.5 | 3.5 | 35.3 | 35.3 |
| Nickel | 1.38 | 1.38 | 56.3 | 56.3 |
| Selenium | 0.23 | 0.23 | 0.93 | 0.93 |
| Zinc | 17.2 | 17.2 | 172 | 172 |
| **Organics** | | | | |
| 4,4'-DDD | 0.009 [c] | 0.11 [d] | 1.5 [c] | 1.1 [d] |
| 4,4'-DDE | 0.009 [c] | 0.11 [d] | 0.6 [c] | 1.1 [d] |
| 4,4'-DDT | 0.009 [c] | 0.11 [d] | 0.6 [c] | 1.1 [d] |
| Endosulfan | 10 | 10 | 100 [e] | 100 [e] |
| Aroclor 1260 | 0.09 | 0.09 | 1.27 | 1.27 |

Notes:

NOAEL = No observable adverse effect level

LOAEL = Lowest observable adverse effect level

[a] NOAEL TRV from DTSC (2000): Aroclor 1260, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Manganese, Mercury, Nickel, Selenium, and Zinc. NOAEL from Interim Eco-SSL Reports (EPA 2005): Arsenic, Cadmium, Chromium, and Lead. Estimated wildlife NOAEL for endpoint species (Red-tailed Hawk) from *Toxicological Benchmarks for Wildlife: 1996 Revision* (Sample et al. 1996): Barium, Copper, Endosulfan, and Molybdenum.

[b] Mid-range level of effects TRV from DTSC (2000): Aroclor 1260, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Arsenic, Cadmium, Copper, Lead, Manganese, Mercury, Nickel, Selenium, and Zinc. Estimated wildlife LOAEL for endpoint species (Red-tailed Hawk) from *Toxicological Benchmarks for Wildlife: 1996 Revision* (Sample et al. 1996): Barium, Chromium, and Molybdenum.

[c] NOAEL and mid-range level of effects TRVs from DTSC (2000) for Tier 1 only.

[d] NOAEL and LOAEL TRVs based on an American kestrel study cited in USEPA *Great Lakes Water Quality Initiative Criteria Documents* (USEPA, 1995) for Tier 2 only.

[e] Extrapolated from estimated wildlife NOAEL for endpoint species (Red-tailed Hawk) by multiplying NOAEL by a factor of 10 (i.e., NOAEL to LOAEL conversion factor). *Toxicological Benchmarks for Wildlife: 1996 Revision* (Sample et al. 1996).

# Table I-13
## Tier 1 Hazard Quotients for the American Kestrel Exposed to Surface and Subsurface Soil (0 to 6.0 feet bgs)
## Onsite and Total Habitats
## Baseline Risk Assessment
## Del Amo Site

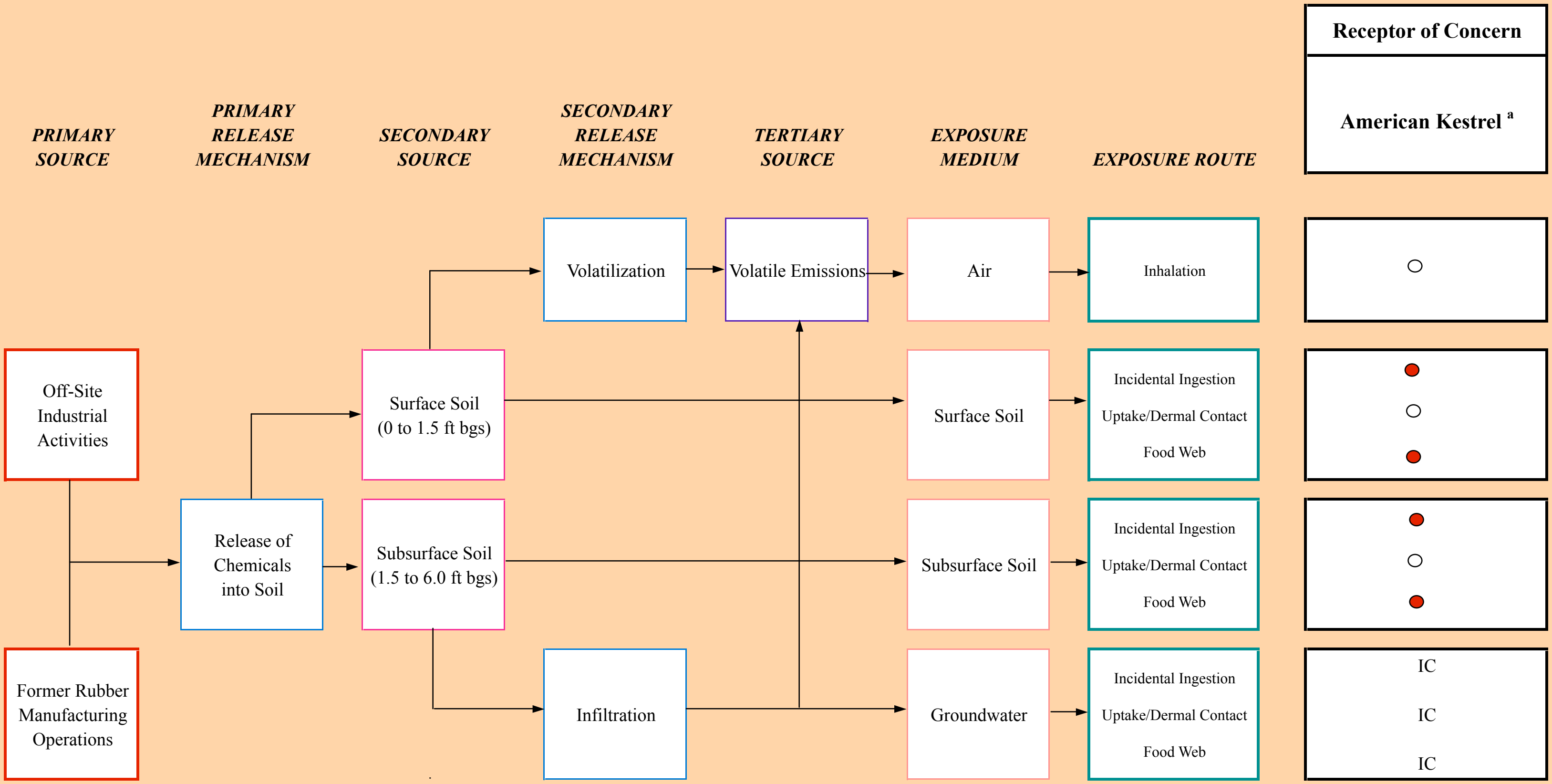
| Chemical of Interest | Lower of Maximum and 95% UCL Concentration (mg/kg) | | Site-Specific or Regional Background Concentration (mg/kg) | Hazard Quotients Based on Low TRV [a] | | Hazard Quotients Based on High TRV [a] | | For HQs ≥ 1.0: Is On-Site HQ ≥ Total HQ? |
|---|---|---|---|---|---|---|---|---|
| | Total Habitat | On-Site Habitat | | Total Habitat | On-Site Habitat | Total Habitat | On-Site Habitat | |
| **Inorganics** | | | | | | | | |
| Arsenic | 13 | 17 | 10 | 0 | 0 | 0 | 0 | HQs ≤ 1.0 |
| Barium | 246 | not a COI | 509 | 0 | -- | 0 | -- | HQs ≤ 1.0 |
| **Cadmium** | 23 | 7.6 | 2 | **9** | **4** | 1 | 1 | No |
| **Chromium** | 356 | not a COI | 60 | **6** | **--** | **3** | **--** | No |
| Copper | 406 | not a COI | 150 | 1 | -- | 1 | -- | HQs ≤ 1.0 |
| **Lead** | 282 | 108 | 23.9 | **7** | **3** | 1 | 1 | No |
| Manganese | 550 | 550 | 450 | 0 | 0 | 0 | 0 | HQs ≤ 1.0 |
| **Mercury** | 0.93 | not a COI | 0.26 | **2** | **--** | 1 | -- | No |
| **Molybdenum** | 80 | not a COI | 1.3 | **3** | **--** | 0 | -- | No |
| **Nickel** | 318 | 39 | 25 | **35** | **4** | 1 | 0 | No |
| Selenium | 2.40 | not a COI | 0.058 | 1 | -- | 0 | -- | HQs ≤ 1.0 |
| **Zinc** | 360 | not a COI | 170 | **5** | **--** | 0 | -- | No |
| Hazard Index (Summation of HQs) for Cadmium, Lead, and Mercury | | | | **19** | **7** | **3** | 1 | |
| **Organics** | | | | | | | | |
| **4,4'-DDD** | 0.73 | 2.00 | na | **40** | **81** | 0 | 0 | **Yes** |
| **4,4'-DDE** | 0.45 | 1.82 | na | **91** | **314** | 1 | **5** | **Yes** |
| **4,4'-DDT** | 2.86 | 7.87 | na | **325** | **783** | **2** | **5** | **Yes** |
| **Total DDTs** | | | | **456** | **1,178** | **4** | **10** | **Yes** |
| Endosulfan | 0.024 | 0.099 | na | 0 | 0 | 0 | 0 | HQs ≤ 1.0 |
| Aroclor 1260 | 0.29 | not a COI | na | 1 | -- | 0 | -- | HQs ≤ 1.0 |
| Hazard Index (Summation of HQs) for Pesticides and PCBs | | | | **457** | **1,178** | **4** | **10** | |

Notes:
[a] Hazard Quotient calculated by dividing Average Daily Dose by TRVs.
To be consistent with the HHRA, all HQs and HIs were rounded to the nearest whole number.
COI = Chemical of interest
mg/kg = milligrams per kilogram
na = not available
HQ = Hazard Quotient
TRV = Toxicity Reference Value
-- = not a COI for On-Site Habitat

**Table I-14**
**Tier 2 Hazard Quotients for the American Kestrel Exposed to Surface Soil (0 to 1.5 feet bgs)**
**Onsite and Total Habitats**
**Baseline Risk Assessment**
**Del Amo Site**

| Chemical of Interest | Lower of Maximum and 95% UCL Concentration (mg/kg) | | Site-Specific or Regional Background Concentration (mg/kg) | Hazard Quotients Based on Low TRV [a] | | Hazard Quotients Based on High TRV [a] | | For HQs ≥ 1.0: Is On-Site HQ ≥ Total HQ? |
|---|---|---|---|---|---|---|---|---|
| | Total Habitat | On-Site Habitat | | Total Habitat | On-Site Habitat | Total Habitat | On-Site Habitat | |
| **Inorganics** | | | | | | | | |
| Arsenic | 13 | 18 | 10 | 0 | 0 | 0 | 0 | HQs ≤ 1.0 |
| **Cadmium** | 6.03 | 7 | 2 | **3** | **4** | 0 | 1 | **Yes** |
| **Chromium** | 96 | not a COI | 60 | **2** | **--** | 1 | **--** | No |
| Copper | 110 | not a COI | 150 | 0 | **--** | 0 | **--** | HQs ≤ 1.0 |
| **Lead** | 110 | 110 | 23.9 | **3** | **3** | 1 | 1 | No |
| Manganese | 550 | 550 | 450 | 0 | 0 | 0 | 0 | HQs ≤ 1.0 |
| **Mercury** | 0.22 | not a COI | 0.26 | **2** | **--** | 1 | **--** | No |
| Molybdenum | 23 | not a COI | 1.3 | 1 | **--** | 0 | **--** | HQs ≤ 1.0 |
| **Nickel** | 116 | 34 | 25 | **13** | **4** | 0 | 0 | No |
| Selenium | 2.9 | not a COI | 0.058 | 1 | **--** | 0 | **--** | HQs ≤ 1.0 |
| **Zinc** | 211 | not a COI | 170 | **4** | **--** | 0 | **--** | No |
| Hazard Index (Summation of HQs) for Cadmium, Lead, and Mercury | | | | **9** | **7** | **2** | 1 | |
| Organics | | | | | | | | |
| **4,4'-DDD** | 1.23 | 2.14 | na | **5** | **7** | 0 | 1 | **Yes** |
| **4,4'-DDE** | 0.92 | 1.44 | na | **14** | **21** | 1 | **2** | **Yes** |
| **4,4'-DDT** | 5.06 | 8.30 | na | **44** | **67** | **4** | **7** | **Yes** |
| **Total DDTs** | | | | **62** | **95** | **6** | **9** | **Yes** |
| Endosulfan | 0.093 | 0.099 | na | 0 | 0 | 0 | 0 | HQs ≤ 1.0 |
| Hazard Index (Summation of HQs) for Pesticides and PCBs | | | | **62** | **95** | **6** | **9** | |

Notes:
[a] Hazard Quotient calculated by dividing Average Daily Dose by TRVs.
To be consistent with the HHRA, all HQs and HIs were rounded to the nearest whole number.
COI = Chemical of interest
mg/kg = milligrams per kilogram
na = not available
HQ = Hazard Quotient
TRV = Toxicity Reference Value
-- = not a COI for On-Site Habitat



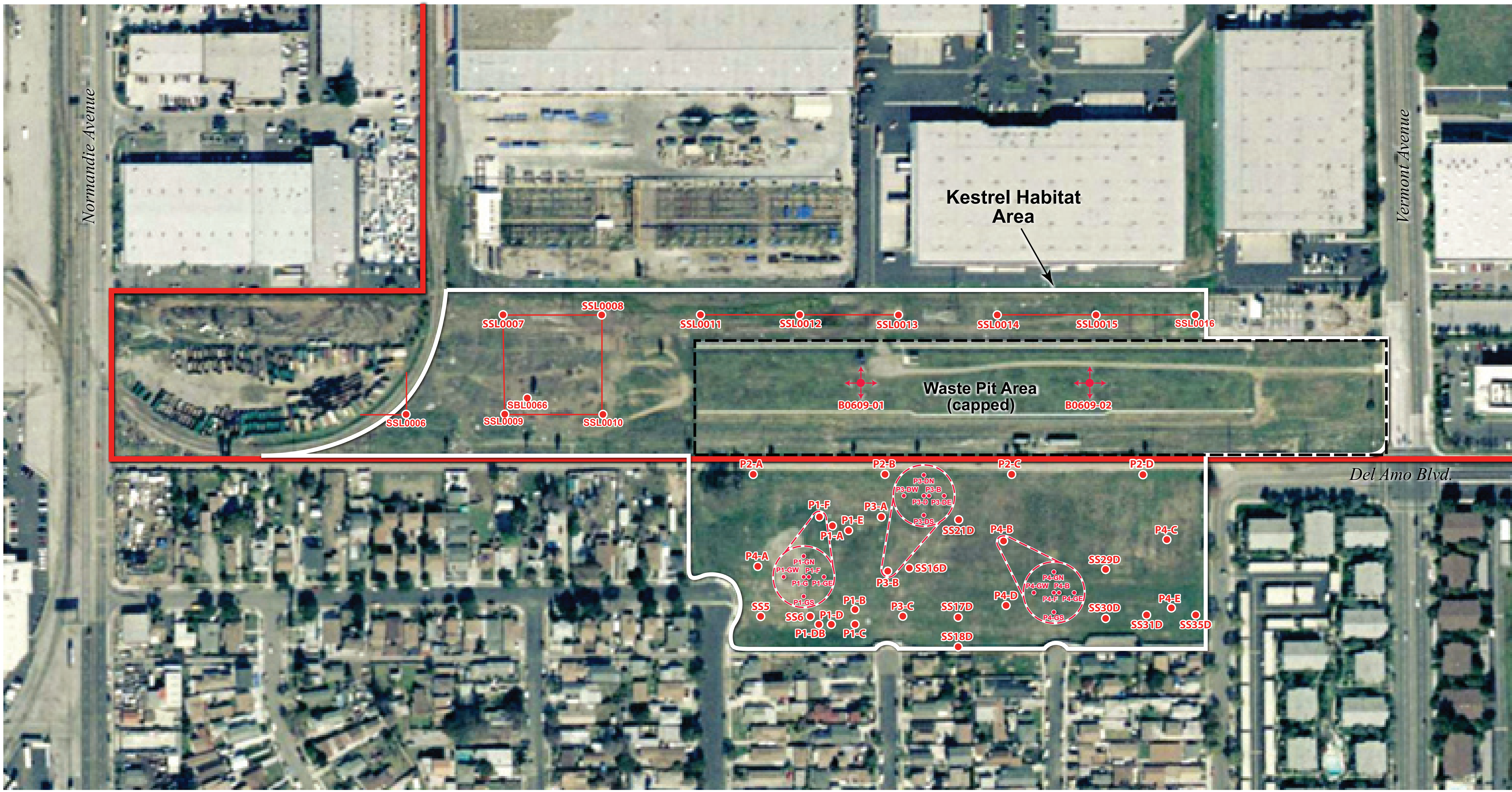

Legend:
- ● Potentially complete and significant pathway
- ○ Potentially complete, but minor, pathway
- IC Incomplete pathway

[a] Although the kestrel is not a burrowing animal and was assumed to only consume soil invertebrates, in the Tier 1 evaluation, this receptor was assumed to be exposed to subsurface soils that have been transported to the surface by burrowing mammals known to exist at the site. For Tier 2, the kestrel was assumed only to be exposed to surface soils.

**CONCEPTUAL SITE MODEL**
**ECOLOGICAL RISK ASSESSMENT**
**DEL AMO SUPERFUND SITE**

**Figure I-1**

T/Ladd/DelAmo/106-005




## Legend

P2-A ● Soil Sampling Location, 0-6 feet Below Ground Surface

Composite Soil Sample Location

Generic Soil Sample-Not Location Specific (applies to fill material at Waste Pit Area only)

Former Rubber Plant Boundary

Blow-up View for Indicated Location-Approximately 13' Diameter

N

0 200 400

Approximate Scale in Feet

FIGURE I-2

**KESTREL HABITAT AREA**

Ecological Risk Assessment
Del Amo Superfund Site

URS

# ATTACHEMENT I-1

# ECOLOGICAL RISK DATA SET

**ECOLOGICAL RISK DATA SET**
**Baseline Risk Assessment**
**Del Amo Site**


| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B0609-1 | B0609-2 | P1-G | P1-G | P1-G | P1-G | P1-G | P1-G | P1-GE | P1-GE |
| | | 0.0 | 0.0 | 0.5 | 0.6 | 1.0 | 1.1 | 3.0 | 3.9 | 0.5 | 0.6 |
| Metals | Antimony | ND (<7.0) | 0.41 | ND (<50) | | ND (<50) | | ND (<50) | | ND (<50) | |
| | Arsenic | 8.6 | 6.8 | ND (<50) | | ND (<50) | | ND (<50) | | ND (<50) | |
| | Barium | 186 | 212 | 130 | | 97 | | 180 | | 150 | |
| | Cadmium | 0.67 | 0.77 | ND (<5) | | ND (<5) | | ND (<5) | | ND (<5) | |
| | Chromium | 36.4 | 32.5 | 170 | | 85 | | 72 | | 200 | |
| | Copper | 38.3 | 36.3 | 240 | | 67 | | 67 | | 170 | |
| | Lead | 9.8 | 8.1 | 210 | 450 | 68 | 47 | 47 | 270 | 200 | 240 |
| | Manganese | | | | | | | | | | |
| | Mercury | 0.061 | 0.078 | | | | | | | | |
| | Molybdenum | ND (<4.6) | ND (<4.6) | ND (<50) | | ND (<50) | | ND (<50) | | ND (<50) | |
| | Nickel | 26.9 | 24.1 | 200 | | 95 | | 59 | | 330 | |
| | Selenium | ND (<5.8) | ND (<5.8) | ND (<10) | | ND (<10) | | ND (<10) | | ND (<10) | |
| | Vanadium | 66.2 | 65.7 | 59 | | ND (<50) | | 84 | | 66 | |
| | Zinc | 88.7 | 87.4 | 480 | | 170 | | 140 | | 460 | |
| Pest.PCBs | 4,4'-DDD | ND (<0.002) | 0.011 | | | | | | | | |
| | 4,4'-DDE | ND (<0.002) | ND (<0.0098) | | | | | | | | |
| | 4,4'-DDT | ND (<0.002) | ND (<0.0098) | | | | | | | | |
| | Endosulfan | 0.0025 | 0.099 | | | | | | | | |
| | PCB1260 | ND (<0.038) | ND (<0.038) | | | | | | | | |

| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P1-GE | P1-GE | P1-GE | P1-GE | P1-GN | P1-GN | P1-GN | P1-GN | P1-GS | P1-GS |
| | | 1.0 | 3.0 | 5.0 | 5.2 | 0.5 | 1.0 | 3.0 | 6.0 | 0.5 | 1.0 |
| Metals | Antimony | ND (<50) | ND (<50) | ND (<50) | | | | | | | |
| | Arsenic | ND (<50) | ND (<50) | ND (<50) | | | | | | | |
| | Barium | 120 | ND (<50) | 98 | | | | | | | |
| | Cadmium | 14 | 35 | 19 | | | | | | | |
| | Chromium | 270 | 1700 | 510 | | | | | | | |
| | Copper | 180 | 240 | 270 | | | | | | | |
| | Lead | 330 | 93 | 100 | 24 | 45 | 97 | 230 | 4.2 | 200 | 130 |
| | Manganese | | | | | | | | | | |
| | Mercury | | | | | | | | | | |
| | Molybdenum | ND (<50) | 250 | 74 | | | | | | | |
| | Nickel | 340 | 1400 | 900 | | | | | | | |
| | Selenium | ND (<10) | ND (<10) | ND (<10) | | | | | | | |
| | Vanadium | 66 | ND (<50) | 57 | | | | | | | |
| | Zinc | 260 | 130 | 170 | | | | | | | |
| Pest.PCBs | 4,4'-DDD | | | | | | | | | | |
| | 4,4'-DDE | | | | | | | | | | |
| | 4,4'-DDT | | | | | | | | | | |
| | Endosulfan | | | | | | | | | | |
| | PCB1260 | | | | | | | | | | |

| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P1-GS | P1-GS | P1-GW | P1-GW | P1-GW | P1-GW | P1A | P1B | P1C | P1D |
| | | 3.0 | 3.2 | 0.5 | 1.2 | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Metals | Antimony | ND (<50) | | | | | | 19.7 | ND (<3) | ND (<3) | ND (<3) |
| | Arsenic | ND (<50) | | | | | | ND (<2) | 8.73 | 8.64 | ND (<2) |
| | Barium | 93 | | | | | | 228 | 142 | 218 | 183 |
| | Cadmium | 23 | | | | | | 30.2 | ND (<0.50) | ND (<0.50) | 11.9 |
| | Chromium | 1300 | | | | | | 1240 | 128 | 45.9 | 507 |
| | Copper | 280 | | | | | | 958 | 89.7 | 58.1 | 294 |
| | Lead | 130 | 54 | 52 | 170 | 93 | 140 | 244 | 38.3 | 7.46 | 179 |
| | Manganese | | | | | | | | | | |
| | Mercury | | | | | | | 0.17 | 0.078 | 0.077 | 0.14 |
| | Molybdenum | 160 | | | | | | 299 | 14.5 | ND (<1.50) | 86.5 |
| | Nickel | 1300 | | | | | | 874 | 88.4 | 34.5 | 796 |
| | Selenium | ND (<10) | | | | | | ND (<1.50) | ND (<1.50) | ND (<1.50) | 8.09 |
| | Vanadium | 270 | | | | | | 115 | 100 | 113 | 106 |
| | Zinc | 120 | | | | | | 484 | 154 | 119 | 362 |
| Pest.PCBs | 4,4'-DDD | | | | | | | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) |
| | 4,4'-DDE | | | | | | | ND (<0.001) | ND (<0.001) | ND (<0.001) | ND (<0.001) |
| | 4,4'-DDT | | | | | | | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) |
| | Endosulfan | | | | | | | ND (<0.002) | ND (<0.002) | ND (<0.002) | ND (<0.002) |
| | PCB1260 | | | | | | | ND (<0.02) | ND (<0.02) | ND (<0.02) | ND (<0.02) |

# ECOLOGICAL RISK DATA SET
## Baseline Risk Assessment
## Del Amo Site


| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P1Db | P1E | P1F | P1F | P1G | P2A | P2B | P2C | P2D | P3-D |
| | | 5.0 | 5.0 | 3.0 | 5.0 | 1.0 | 5.0 | 5.0 | 5.0 | 5.0 | 0.5 |
| Metals | Antimony | ND (<3) | ND (<3) | 151 | 80.3 | ND (<3) | ND (<3) | ND (<3) | ND (<3) | ND (<3) | ND (<50) |
| | Arsenic | 6.64 | 6.61 | ND (<4.0) | 50.5 | 5.34 | 5.68 | 6.33 | 7.02 | 8.05 | ND (<50) |
| | Barium | 177 | 256 | 778 | 557 | 252 | 256 | 140 | 224 | 104 | 220 |
| | Cadmium | ND (<0.50) | ND (<0.50) | 126 | 148 | ND (<0.50) | ND (<0.50) | ND (<0.50) | ND (<0.50) | ND (<0.50) | ND (<5) |
| | Chromium | 31.4 | 35.5 | 743 | 453 | 48.5 | 35.9 | 30.6 | 52.5 | 32.3 | 50 |
| | Copper | 30.5 | 36.1 | 1690 | 2950 | 40.2 | 29.5 | 27.4 | 50.6 | 38 | 100 |
| | Lead | 4.23 | 4.93 | 2420 | 2340 | 16.7 | 4.5 | 3.52 | 47.8 | 4.24 | 26 |
| | Manganese | | | | | | | | | | |
| | Mercury | ND (<0.050) | ND (<0.050) | 0.93 | 0.7 | ND (<0.050) | ND (<0.10) | ND (<0.050) | 0.067 | ND (<0.050) | |
| | Molybdenum | ND (<1.50) | ND (<1.50) | 132 | 135 | 4.12 | ND (<1.50) | ND (<1.50) | 3.25 | ND (<1.50) | ND (<50) |
| | Nickel | 25.5 | 26.7 | 497 | 594 | 51.5 | 28.8 | 22.5 | 38.3 | 25 | ND (<50) |
| | Selenium | ND (<1.50) | ND (<1.50) | ND (<1.50) | ND (<1.50) | ND (<1.50) | ND (<1.50) | ND (<1.50) | ND (<1.50) | ND (<1.50) | ND (<10) |
| | Vanadium | 71.7 | 79.6 | 167 | 90 | 73.9 | 79.8 | 74.2 | 73.2 | 80.5 | 97 |
| | Zinc | 86.8 | 84.3 | 1810 | 1710 | 101 | 85.2 | 81.7 | 237 | 78 | 130 |
| Pest.PCBs | 4,4'-DDD | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) | 0.33 | ND (<0.003) | |
| | 4,4'-DDE | ND (<0.001) | ND (<0.001) | ND (<0.001) | ND (<0.001) | ND (<0.001) | ND (<0.001) | ND (<0.001) | ND (<0.001) | ND (<0.001) | |
| | 4,4'-DDT | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) | ND (<0.003) | 0.3 | ND (<0.003) | |
| | Endosulfan | ND (<0.002) | ND (<0.002) | ND (<0.002) | ND (<0.002) | ND (<0.002) | ND (<0.002) | ND (<0.002) | ND (<0.002) | ND (<0.002) | |
| | PCB1260 | ND (<0.02) | ND (<0.02) | 0.95 | 0.55 | ND (<0.02) | ND (<0.02) | ND (<0.02) | ND (<0.02) | ND (<0.02) | |

| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P3-D | P3-D | P3-DE | P3-DE | P3-DN | P3-DN | P3-DS | P3-DS | P3-DS | P3-DW |
| | | 3.0 | 3.2 | 0.5 | 3.0 | 0.5 | 3.0 | 0.5 | 3.0 | 3.2 | 0.5 |
| Metals | Antimony | ND (<50) | | | | ND (<50) | ND (<50) | ND (<50) | ND (<50) | | |
| | Arsenic | ND (<50) | | | | ND (<50) | ND (<50) | ND (<50) | ND (<50) | | |
| | Barium | 180 | | | | 230 | 270 | 210 | 210 | | |
| | Cadmium | ND (<5) | | | | ND (<5) | ND (<5) | ND (<5) | ND (<5) | | |
| | Chromium | 70 | | | | ND (<50) | ND (<50) | 66 | ND (<50) | | |
| | Copper | ND (<50) | | | | ND (<50) | ND (<50) | ND (<50) | ND (<50) | | |
| | Lead | 59 | 55 | 43 | 39 | 24 | 6.8 | 17 | ND (<50) | 150 | 55 |
| | Manganese | | | | | | | | | | |
| | Mercury | | | | | | | | | | |
| | Molybdenum | ND (<50) | | | | ND (<50) | ND (<50) | ND (<50) | ND (<50) | | |
| | Nickel | 75 | | | | ND (<50) | ND (<50) | ND (<50) | ND (<50) | | |
| | Selenium | ND (<10) | | | | ND (<10) | ND (<10) | ND (<10) | ND (<10) | | |
| | Vanadium | 76 | | | | 96 | 84 | 110 | 96 | | |
| | Zinc | 100 | | | | 120 | 77 | 140 | 100 | | |
| Pest.PCBs | 4,4'-DDD | | | | | | | | | | |
| | 4,4'-DDE | | | | | | | | | | |
| | 4,4'-DDT | | | | | | | | | | |
| | Endosulfan | | | | | | | | | | |
| | PCB1260 | | | | | | | | | | |

# ECOLOGICAL RISK DATA SET
## Baseline Risk Assessment
## Del Amo Site


| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P3-DW | P3A | P3B | P3C | P4-F | P4-F | P4-F | P4-F | P4-GE | P4-GE |
| | | 3.0 | 5.0 | 5.0 | 5.0 | 0.5 | 0.7 | 3.0 | 3.2 | 0.5 | 3.0 |
| Metals | Antimony | | 3.76 | 9.44 | ND (<3) | ND (<50) | | ND (<50) | | | |
| | Arsenic | | 6.85 | 6.79 | 5.54 | ND (<50) | | ND (<50) | | | |
| | Barium | | 200 | 171 | 244 | 170 | | 150 | | | |
| | Cadmium | | 1.65 | 1.1 | ND (<0.50) | ND (<5) | | ND (<5) | | | |
| | Chromium | | 67.2 | 71.2 | 37.9 | ND (<50) | | ND (<50) | | | |
| | Copper | | 98 | 63.6 | 42.8 | ND (<50) | | ND (<50) | | | |
| | Lead | 44 | 82.7 | 433 | 5.92 | ND (<50) | 7.5 | ND (<50) | 6.5 | 28 | 4.2 |
| | Manganese | | | | | | | | | | |
| | Mercury | | 0.06 | 0.059 | ND (<0.050) | | | | | | |
| | Molybdenum | | 8.23 | 12.5 | ND (<1.50) | ND (<50) | | ND (<50) | | | |
| | Nickel | | 58.2 | 113 | 29.9 | ND (<50) | | ND (<50) | | | |
| | Selenium | | ND (<1.50) | ND (<1.50) | ND (<1.50) | ND (<10) | | ND (<10) | | | |
| | Vanadium | | 73 | 59.3 | 74.9 | 70 | | 82 | | | |
| | Zinc | | 155 | 162 | 80.7 | 66 | | 88 | | | |
| Pest.PCBs | 4,4'-DDD | | ND (<0.003) | ND (<0.003) | ND (<0.003) | | | | | | |
| | 4,4'-DDE | | ND (<0.001) | ND (<0.001) | ND (<0.001) | | | | | | |
| | 4,4'-DDT | | ND (<0.003) | ND (<0.003) | ND (<0.003) | | | | | | |
| | Endosulfan | | ND (<0.002) | ND (<0.002) | ND (<0.002) | | | | | | |
| | PCB1260 | | ND (<0.02) | ND (<0.02) | ND (<0.02) | | | | | | |

| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P4-GN | P4-GN | P4-GN | P4-GS | P4-GS | P4-GW | P4-GW | P4A | P4B | P4C |
| | | 0.5 | 0.6 | 3.0 | 0.5 | 3.0 | 0.5 | 3.0 | 5.0 | 5.0 | 5.0 |
| Metals | Antimony | ND (<50) | | | | | | | ND (<3) | 8.35 | ND (<3) |
| | Arsenic | ND (<50) | | | | | | | 7.78 | 5.5 | 7.44 |
| | Barium | 180 | | | | | | | 140 | 299 | 126 |
| | Cadmium | ND (<5) | | | | | | | ND (<0.50) | 5.32 | ND (<0.50) |
| | Chromium | ND (<50) | | | | | | | 26.8 | 187 | 32.5 |
| | Copper | ND (<50) | | | | | | | 31.5 | 297 | 48.5 |
| | Lead | ND (<50) | 25 | 4.6 | 15 | 7.7 | 58 | 3.8 | 3.99 | 410 | 4.54 |
| | Manganese | | | | | | | | | | |
| | Mercury | | | | | | | | ND (<0.050) | 0.14 | ND (<0.050) |
| | Molybdenum | ND (<50) | | | | | | | ND (<1.50) | 25.5 | ND (<1.50) |
| | Nickel | ND (<50) | | | | | | | 22 | 179 | 25.2 |
| | Selenium | ND (<10) | | | | | | | ND (<1.50) | ND (<1.50) | ND (<1.50) |
| | Vanadium | 76 | | | | | | | 66.7 | 70.3 | 78.1 |
| | Zinc | 76 | | | | | | | 79 | 307 | 92.8 |
| Pest.PCBs | 4,4'-DDD | | | | | | | | ND (<0.003) | 1.3 | ND (<0.003) |
| | 4,4'-DDE | | | | | | | | ND (<0.001) | ND (<0.001) | ND (<0.001) |
| | 4,4'-DDT | | | | | | | | ND (<0.003) | 0.23 | ND (<0.003) |
| | Endosulfan | | | | | | | | ND (<0.002) | ND (<0.002) | ND (<0.002) |
| | PCB1260 | | | | | | | | ND (<0.02) | ND (<0.02) | ND (<0.02) |

**ECOLOGICAL RISK DATA SET**
**Baseline Risk Assessment**
**Del Amo Site**


| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P4D | P4E | SBL0066 | SS-16D | SS-17D | SS-18D | SS-21D | SS-29D | SS-30D | SS-31D |
| | | 5.0 | 5.0 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Metals | Antimony | ND (<3) | ND (<3) | ND (<10) | | | | | | | |
| | Arsenic | 5.17 | 7.13 | 1 | 5.8 | 5.4 | 6.4 | 4.7 | 4.2 | 4.1 | 3.5 |
| | Barium | 207 | 132 | 140 | 190 | 200 | 130 | 170 | 130 | 230 | 130 |
| | Cadmium | ND (<0.50) | ND (<0.50) | 7.6 | ND (<0.5) | ND (<0.5) | 1.2 | ND (<0.5) | 0.56 | ND (<0.5) | ND (<0.5) |
| | Chromium | 30.2 | 31 | 20 | 33 | 26 | 57 | 27 | 19 | 25 | 20 |
| | Copper | 30.6 | 30.2 | 21 | 39 | 29 | 130 | 27 | 26 | 28 | 23 |
| | Lead | 4.47 | 4.65 | 9.7 | 26 | 28 | 44 | 15 | 120 | 15 | 22 |
| | Manganese | | | 350 | | | | | | | |
| | Mercury | ND (<0.050) | ND (<0.050) | ND (<0.1) | 0.052 | 0.041 | 0.087 | 0.039 | 0.059 | 0.037 | 0.074 |
| | Molybdenum | ND (<1.50) | ND (<1.50) | | ND (<2) | ND (<2) | 6.6 | ND (<2) | ND (<2) | ND (<2) | ND (<2) |
| | Nickel | 24.1 | 26.4 | 12 | 39 | 21 | 76 | 21 | 18 | 20 | 17 |
| | Selenium | ND (<1.50) | ND (<1.50) | | 3 | 2.1 | 2.5 | 2.3 | 2.6 | 4.7 | ND (<2) |
| | Vanadium | 69.9 | 74.7 | 48 | 55 | 50 | 53 | 51 | 35 | 52 | 39 |
| | Zinc | 80.3 | 72.8 | 64 | 88 | 120 | 110 | 74 | 160 | 76 | 99 |
| Pest.PCBs | 4,4'-DDD | ND (<0.003) | ND (<0.003) | ND (<0.01) | ND (<0.10) | ND (<0.10) | ND (<0.10) | ND (<0.10) | ND (<0.10) | ND (<0.10) | ND (<0.10) |
| | 4,4'-DDE | ND (<0.001) | ND (<0.001) | 0.011 | ND (<0.10) | ND (<0.10) | ND (<0.10) | ND (<0.10) | ND (<0.10) | ND (<0.10) | ND (<0.10) |
| | 4,4'-DDT | ND (<0.003) | ND (<0.003) | 0.54 | ND (<0.10) | 0.12 | 0.15 | ND (<0.10) | ND (<0.10) | ND (<0.10) | 0.12 |
| | Endosulfan | ND (<0.002) | ND (<0.002) | ND (<0.002) | | | | | | | |
| | PCB1260 | ND (<0.02) | ND (<0.02) | ND (<0.3) | | | | | | | |

| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SS-35D | SS-5 | SS-6 | SSL0006 | SSL0007 | SSL0008 | SSL0009 | SSL0010 | SSL0011 | SSL0012 |
| | | 0.0 | 0.0 | 0.0 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Metals | Antimony | | | | ND (<10) | ND (<10) | ND (<10) | ND (<10) | ND (<10) | ND (<10) | ND (<10) |
| | Arsenic | 4.8 | 5.1 | 5.1 | 30 | 5.3 | 5.3 | 5.3 | 5.3 | 13 | 13 |
| | Barium | 170 | 160 | 170 | 140 | 170 | 170 | 170 | 170 | 170 | 170 |
| | Cadmium | ND (<0.5) | ND (<0.5) | 0.62 | 6.7 | 6.8 | 6.8 | 6.8 | 6.8 | 7 | 7 |
| | Chromium | 22 | 25 | 31 | 28 | 49 | 49 | 49 | 49 | 44 | 44 |
| | Copper | 36 | 30 | 40 | 60 | 59 | 59 | 59 | 59 | 140 | 140 |
| | Lead | 39 | 14 | 29 | 46 | 110 | 110 | 110 | 110 | 74 | 74 |
| | Manganese | | | | 360 | 550 | 550 | 550 | 550 | 520 | 520 |
| | Mercury | 0.15 | 0.052 | 0.064 | ND (<0.1) | 0.21 | 0.21 | 0.21 | 0.21 | 0.35 | 0.35 |
| | Molybdenum | ND (<2) | ND (<2) | 2.6 | | | | | | | |
| | Nickel | 20 | 24 | 39 | 25 | 21 | 21 | 21 | 21 | 45 | 45 |
| | Selenium | 4.5 | 3.2 | 2.2 | ND (<0.4) | ND (<0.4) | ND (<0.4) | ND (<0.4) | ND (<0.4) | ND (<0.4) | ND (<0.4) |
| | Vanadium | 44 | 50 | 50 | 37 | 46 | 46 | 46 | 46 | 160 | 160 |
| | Zinc | 190 | 78 | 110 | 140 | 130 | 130 | 130 | 130 | 120 | 120 |
| Pest.PCBs | 4,4'-DDD | ND (<0.10) | ND (<0.10) | ND (<0.10) | ND (<1) | ND (<0.5) | ND (<0.5) | ND (<0.5) | ND (<0.5) | 2.7 | 2.7 |
| | 4,4'-DDE | 0.13 | ND (<0.10) | ND (<0.10) | 2.2 | 0.79 | 0.79 | 0.79 | 0.79 | ND (<1) | ND (<1) |
| | 4,4'-DDT | 0.21 | ND (<0.10) | ND (<0.10) | 5.3 | 4.2 | 4.2 | 4.2 | 4.2 | 9.1 | 9.1 |
| | Endosulfan | | | | | | | | | | |
| | PCB1260 | | | | ND (<30) | ND (<20) | ND (<20) | ND (<20) | ND (<20) | ND (<30) | ND (<30) |

| Analyte Class | Analyte | Boring, Depth (ft) and Concentration (mg/kg) | | | |
|---|---|---|---|---|---|
| | | SSL0013 | SSL0014 | SSL0015 | SSL0016 |
| | | 0.5 | 0.5 | 0.5 | 0.5 |
| Metals | Antimony | ND (<10) | ND (<10) | ND (<10) | ND (<10) |
| | Arsenic | 13 | 6.3 | 6.3 | 6.3 |
| | Barium | 170 | 160 | 160 | 160 |
| | Cadmium | 7 | 6.3 | 6.3 | 6.3 |
| | Chromium | 44 | 19 | 19 | 19 |
| | Copper | 140 | 23 | 23 | 23 |
| | Lead | 74 | 9.8 | 9.8 | 9.8 |
| | Manganese | 520 | 360 | 360 | 360 |
| | Mercury | 0.35 | ND (<0.1) | ND (<0.1) | ND (<0.1) |
| | Molybdenum | | | | |
| | Nickel | 45 | 12 | 12 | 12 |
| | Selenium | ND (<0.4) | ND (<0.4) | ND (<0.4) | ND (<0.4) |
| | Vanadium | 160 | 38 | 38 | 38 |
| | Zinc | 120 | 77 | 77 | 77 |
| Pest.PCBs | 4,4'-DDD | 2.7 | 0.039 | 0.039 | 0.039 |
| | 4,4'-DDE | ND (<1) | ND (<2) | ND (<2) | ND (<2) |
| | 4,4'-DDT | 9.1 | 0.18 | 0.18 | 0.18 |
| | Endosulfan | | ND (<0.04) | ND (<0.04) | ND (<0.04) |
| | PCB1260 | ND (<30) | ND (<0.6) | ND (<0.6) | ND (<0.6) |