The Boeing Company
Santa Susana Field Laboratory
5800 Woolsey Canyon Road
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BOEING

Hand Delivered

May 1, 2009
In reply refer to SHEA-108614

Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Attention: Ms. Tracy Egoscue

Subject: Order Pursuant to Water Code §13304: To Perform Interim/Source Removal Action of Soil in areas of Outfalls 008 and 009 Drainage Areas, The Boeing Company, Santa Susana Field Laboratory, Unincorporated Ventura County, California (SCP No. 1111, Site ID No. 2040109)

Dear Ms. Egoscue:

Per the above-referenced order dated December 3, 2008, The Boeing Company (Boeing) hereby submits the attached Final Interim Source Removal Action (ISRA) Work Plan for review and approval. This submittal is the second of two documents that are required by the referenced order. The attached workplan will be posted within the next 10 days on the Boeing External website at the following address:
http://www.boeing.com/aboutus/environment/santa_susana/isra.html

If there are any questions, please contact Ms. Lori Blair at (818) 466-8741.

Sincerely,

Thomas D. Gallacher
Director, Santa Susana Field Laboratory
Environment, Health and Safety

LNB:bjc
Attachment: Final Interim Source Removal Action (ISRA) Work Plan, Santa Susana Field Laboratory, Ventura County, California

cc: Cassandra Owens, RWQCB
Peter Raftery, RWQCB
Allen Elliot, NASA
Norman Riley, DTSC
Gerard Abram, DTSC

FINAL
INTERIM SOURCE REMOVAL ACTION (ISRA) WORK PLAN
SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

May 2009

Prepared For:
The Boeing Company
The National Aeronautics and Space Administration

Prepared By:
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ABBREVIATIONS AND ACRONYMS

BBC	Brandeis-Bardin Campus
bgs	below ground surface
Boeing	The Boeing Company
BMPs	Best Management Practices
CAO	Cleanup and Abatement Order
CDFG	California Department of Fish and Game
COC	constituents of concern
CWA	Clean Water Act
cy	cubic yards
DTSC	Department of Toxic Substances Control
ELV	Expendable Launch Vehicle
GETS	groundwater extraction and treatment system
H&S	health and safety
HVS	Happy Valley South
ISRA	Interim Source Removal Action
LOX	liquid oxygen
mg/kg	milligrams per kilogram
MRCA	Mountains Recreation Conservancy Authority
NASA	National Aeronautics and Space Administration
NPDES	National Pollutant Discharge Elimination System
NWP	Nationwide Permit
PEA	preliminary evaluation area
PID	photo ionization detector
PPE	personal protection equipment
pg/g	picograms per gram
RBSL	risk-based screening level
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
ROC	reactive organic compounds
RUSLE2	Revised Universal Soil Loss Equation, Version 2

ABBREVIATIONS AND ACRONYMS (continued)

RWQCB	Los Angeles Regional Water Quality Control Board
SAA	Streambed Alteration Agreement
SMP	Soil Management Plan
SRGs	Soil Remediation Goals
SSFL	Santa Susana Field Laboratory
SWPPP	Stormwater Pollution Prevention Plan
TCDD TEQ	tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)
TCE	trichloroethene
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
ULSE	Universal Soil Loss Equation
USACE	United States Army Corp of Engineers
UXO	unexploded ordinance
VCAPCD	Ventura County Air Pollution Control District
WDR	Waste Discharge Requirement

1.0 INTRODUCTION

This Final Interim Source Removal Action (ISRA) Work Plan summarizes the results of the ISRA evaluation process conducted before May 1, 2009 and presents recommended remedial actions to control releases of constituents of concern (COCs) to surface water within areas of the Outfall 008 and Outfall 009 watersheds at the Santa Susana Field Laboratory (SSFL). This work plan provides additional implementation details and supplements the Preliminary ISRA Work Plan dated February 2009 (MWH, 2009), which presented the approach used to identify and control the release of COCs to surface water within the Outfall 008 and Outfall 009 watersheds. As described in this and the preliminary work plan, the ISRA project will be conducted in a phased manner with completion prior to the Fall 2012 rainy season. As such, this Final ISRA Work Plan may be supplemented with ISRA Work Plan Addenda to address additional ISRA Areas as new information becomes available (e.g., new data gap sampling results).

Both ISRA Work Plans were prepared by MWH and CH2M HILL on behalf of The Boeing Company (Boeing) and the National Aeronautics and Space Administration (NASA) pursuant to a California Water Code Section 13304 Cleanup and Abatement Order (CAO) issued by the Los Angeles Regional Water Quality Control Board (RWQCB) dated December 3, 2008 (RWQCB, 2008). The CAO, which is included in Appendix A, was issued by the RWQCB to achieve compliance with the Waste Discharge Requirements (WDR) for Outfalls 008 and 009 contained in Order No. R4-2004-0111, as amended by Order Nos. R4-2006-0008, R4-2006-0036, and R4-2007-0055. The CAO was issued to Boeing, and included provisions for Boeing to communicate and work cooperatively with NASA for the proposed ISRA necessary for the NASA property (item 6 of the CAO). This communication and coordination is ongoing and represented in this work plan and the previous Preliminary ISRA Work Plan. Further information regarding roles and responsibilities for the ISRA project is provided in Section 1.1.2.

1.1 PROJECT BACKGROUND

The SSFL is located approximately 29 miles northwest of downtown Los Angeles, California, in the southeast corner of Ventura County. Figure 1-1 shows the geographic location and property boundaries of the site, as well as surrounding communities. Currently, surface water discharges at the site are exclusively the result of storm water runoff, although the discharge of treated groundwater is permitted at a single location (Outfall 019). Historically, both storm water and industrial wastewater discharges occurred. All industrial wastewater discharges have ceased, with the exception of purged water and extracted groundwater, which are currently being contained and disposed of offsite following appropriate regulatory requirements. Once the new groundwater extraction and treatment system (GETS) is online and operational (late 2009), the purged water and extracted groundwater will be treated and then discharged onsite at Outfall 019, and monitored according to the National Pollutant Discharge Elimination System (NPDES) Permit requirements.

Stormwater discharges at the SSFL are intermittent following rain events and are monitored at 15 outfall locations. Treated groundwater discharges are monitored at one outfall location as described above. The 16 outfall locations are shown on Figure 1-2. Regional surface water drainage patterns and the overall locations of the Outfall 008 and 009 watersheds are shown in Figure 1-3. The Dayton Canyon watershed containing Outfall 008 is approximately 384 acres, while the portion of the watershed up-gradient of the Outfall 008 NPDES sample location encompasses 62 acres. Stormwater from Outfall 008 flows through an unnamed ephemeral drainage on the SSFL property to Dayton Canyon Creek, where a new residential community is planned. Dayton Canyon Creek merges with Chatsworth Creek and flows south to Bell Creek, southwest of the intersection of Shoup Avenue and Sherman Way in the West Hills community. Bell Creek subsequently flows east and merges with Calabasas Creek at the Los Angeles River near the intersection of Vanowen Street and Owensmouth Avenue in Canoga Park. Dayton Canyon Creek downgradient of Valley Circle Boulevard, Bell Creek, and the Los Angeles River are concrete-lined channels with highly urbanized watersheds.

The Northern Drainage watershed containing Outfall 009 encompasses approximately 536 acres both on SSFL property and in adjacent Sage Ranch and Brandeis Bardin properties. Stormwater from Outfall 009 flows northward through predominantly undeveloped land in an unnamed intermittent drainage tributary to Meier Canyon and subsequently to the Arroyo Simi (in the Simi Valley community), Arroyo Las Posas, and Calleguas Creek. Regional surface water patterns are shown on Figure 1-3.

1.1.1 NPDES Monitoring and Exceedance History

Currently, SSFL is regulated by NPDES Permit No. CA0001309 (NPDES Permit), issued as WDR Order No R4-2007-0055. Surface water discharges are monitored at 16 NPDES locations, shown on Figure 1-2. The current NPDES permit requires monitoring and sampling of surface water discharges at Outfalls 001 through 014, 018, and 019 (once the GETS system is online). Samples are collected and analyzed per the NPDES Permit requirements as indicated in Attachment T of the NPDES Permit, Monitoring and Reporting Program No. 6027.

Outfall 008 was established in August 2004 as the NPDES Permit monitoring location for the Happy Valley (Figure 1-4). Between 2004 and December 2008, a total of 20 samples have been collected from Outfall 008, some of which had concentrations of constituents that exceeded the NPDES permit limits/benchmarks. The constituents that were detected at concentrations that exceeded NPDES permit limits/benchmarks are considered the surface water COCs in the Outfall 008 watershed, and include: copper, lead, and dioxins[1]. Details of these sampling results are presented in Table 1-1.

Outfall 009 was established in August 2004 as the NPDES Permit monitoring location in the Northern Drainage (Figure 1-4). Between 2004 and December 2008, a total of 33 samples have been collected from Outfall 009, some of which had concentrations of constituents that exceeded NPDES permit limits/benchmarks. The constituents that were detected at concentrations that exceeded NPDES permit limits/benchmarks are considered the surface water COCs in the Outfall 009 watershed, and include: cadmium, copper, lead, mercury, dioxins, oil and grease, and pH. Details of these sampling results are presented in Table 1-1. However, as reported in the Preliminary ISRA Work Plan (MWH, 2009) the NPDES permit limit exceedances of oil and grease and pH occurred only once for each constituent, and are considered anomalies related to natural processes (vegetation, fires).

[1] The term ‘dioxins’ as used in this work plan represents the sum of 17 dioxin/furan congener results adjusted for toxicity, normalized to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD TEQ).

1.1.2 ISRA CAO

In response to the exceedances of NPDES permit limits and benchmarks at Outfall 008 and Outfall 009, the RWQCB issued a CAO to Boeing on December 3, 2008 (RWQCB, 2008). The CAO, which is included in Appendix A, requires the sources that are discharging the constituents that exceeded NPDES permit limits and benchmarks within the Outfall 008 and 009 watersheds to be addressed. Addressing the sources within Outfall 008 will be the responsibility of Boeing because the Outfall 008 watershed is entirely on property owned by Boeing. However, because the portion of the Outfall 009 watershed upgradient of the NPDES sample location includes property owned by Boeing as well as property owned by the federal government and administered by NASA, Boeing and NASA will each be responsible for addressing the sources on their respective property. Where appropriate, work plan, permitting, and/or reporting requirements will be combined by Boeing and NASA to streamline agency reviews and approvals.

As described above, constituents for which there have been NPDES permit limit and benchmark exceedances at Outfall 008 and Outfall 009 between 2004 and March 2008 include lead at Outfall 008; and copper, lead, dioxins, pH, and oil and grease at Outfall 009 (Boeing, 2005, 2006, 2007, and 2008). The objective of the ISRA RWQCB CAO is to improve surface water quality within the Outfall 008 and 009 watersheds by identifying, evaluating, and remediating areas of contaminated soil in order to eliminate the COCs that have resulted in exceedances of NPDES permit limits and benchmark limits. The CAO also requires that methods be used to minimize impacts to the streambed adjacent to habitat during cleanup activities, protect the water quality during and after cleanup activities, and restore the streambed and surrounding habitat following cleanup activities.

To accomplish this objective, two work plans are required as stipulated by the RWQCB CAO, a Preliminary ISRA Work Plan and a Final ISRA Work Plan. The Preliminary ISRA Work Plan, which was submitted to the RWQCB on February 13, 2009 (MWH, 2009), is described further in Section 1.1.3. This document is the Final ISRA Work Plan.

1.1.3 Preliminary ISRA Work Plan

Per the RWQCB CAO, a Preliminary ISRA Work Plan was prepared and submitted to the RWQCB on February 13, 2009 (MWH, 2009). The Preliminary ISRA Work Plan provides the site use, history, land ownership, existing site geologic and hydrologic conditions, and environmental programs at the SSFL, and specifically within the Outfall 008 and Outfall 009 watersheds. In addition, the Preliminary ISRA Work Plan describes the process used to recommend remedial actions within the Outfall 008 and Outfall 009 watersheds. This process includes (1) compiling the existing data set for evaluating potential sources to surface water, (2) identifying Preliminary ISRA Evaluation Areas (ISRA PEAs), (3) performing source delineation and data gap sampling, (4) identifying proposed ISRA Areas by evaluating each ISRA PEA using criteria presented in this work plan, and (5) performing a remedial alternative analysis for each proposed ISRA Area.

At the time the Preliminary ISRA Work Plan was submitted, the existing data set had been compiled and the ISRA PEAs identified. The ISRA PEAs represent areas with samples from the data set with concentrations of the ISRA COCs exceeding Department of Toxic Substances Control (DTSC)-approved background comparison concentrations (MWH, 2005). The Preliminary ISRA Work Plan identified three ISRA PEAs within the Outfall 008 watershed (Figure 1-5), four ISRA PEAs within the eastern portion of the Outfall 009 watershed (Figure 1-6), and seven ISRA PEAs within the western portion of the Outfall 009 watershed (Figure 1-7). DTSC-approved soil background comparison concentrations (MWH, 2005) were used in the identification of ISRA PEAs, but it should be noted that soil background concentrations for chemicals are under review by DTSC, and the 2005 background comparison concentrations may be modified in the future. When the revised soil background data set is approved by DTSC, this comparison step for potential ISRA soil source areas will be reviewed and ISRA Area recommendations will be amended as warranted.

The Preliminary ISRA Work Plan also included an implementation schedule for the remaining work to be performed to complete the ISRA effort. The schedule included data gap sampling, permitting submittal requirements, and preparation of other supporting plans for implementation, as well as performance monitoring requirements following plan implementation. The proposed

ISRA schedule accounted for phasing of implementation to allow completion of ongoing work within the Outfall 009 watershed (Northern Drainage cleanup and stormwater maintenance activities) and to accommodate federal funding constraints for work to be performed on NASA property. The introduction to Section 4 includes a brief description of the Northern Drainage and stormwater maintenance programs, and work performed, in progress, and planned as part of the ISRA project. Phase I implementation is scheduled for 2009 and includes the Outfall 008 area and a portion of the Outfall 009 watershed. Phase II implementation would occur in 2010/2011, with completion of the project prior to the Fall 2012 rainy season.

The DTSC submitted Preliminary ISRA Work Plan comments to the RWQCB in March 2009 (DTSC, 2009). The RWQCB submitted a letter to Boeing dated April 20, 2009 with comments on the Preliminary ISRA Work Plan, and indicated conditional approval of the approach presented for identifying ISRA Areas and selecting remedial technologies for them (RWQCB, 2009). Both of these letters are included in Appendix A. The comments and conditional approval requirements presented in these two letters have been incorporated into the Final ISRA Work Plan. After reviewing the RWQCB conditional approval letter, Boeing has submitted a letter to the RWQCB dated April 30, 2009 clarifying a few items from the RWQCB comment letter (Boeing, 2009). This letter is also included in Appendix A.

1.2 FINAL ISRA WORK PLAN SCOPE

This Final ISRA Work Plan supplements the Preliminary ISRA Work Plan by completing the ISRA Area identification and remedial planning process for the Outfall 008 area and one portion of the Outfall 009 watershed, describing remedial alternatives considered for both watersheds, and identifying the procedures to complete ISRA remedial plans in the remainder of Outfall 009. As described in the Preliminary ISRA Work Plan and further in Section 4 below, finalization of ISRA Areas in Outfall 009 are pending completion of ongoing Northern Drainage cleanup actions, and federal funding constraints as described above.

The CAO directs ISRA activities to eliminate the COCs that have resulted in exceedances of NPDES permit limits and benchmarks (RWQCB, 2008). The ISRA PEAs in the Preliminary Work Plan, and subsequent ISRA Areas in this Final Work Plan are based on areas where soil concentrations of ISRA COCs are present above background comparison levels. ISRA recommendations do not ignore and proposed remedial actions do address other types of soil contamination if that contamination is collocated with ISRA COCs. However, remedial action recommendations for other areas of contamination are not included in this plan since that cleanup is not directed by the CAO and is being addressed under DTSC oversight as part of the Resource Conservation and Recovery Act (RCRA) Corrective Action Program.

This work plan includes eight sections and five appendices:

- Section 1 presents project background information and describes the scope and objectives of the ISRA project.
- Section 2 describes the ISRA Area identification and remedial planning process, including evaluation criteria, remedial action alternatives, and soil remediation goals (SRGs).
- Section 3 presents the results of the ISRA Area evaluation process and recommended ISRAs for Outfall 008.
- Section 4 provides an overview of the status of ongoing Northern Drainage cleanup and storm water maintenance activities and proposed actions in 2009, and the results of the ISRA Area evaluation process and recommended ISRAs for Outfall 009.
- Section 5 describes remedial action implementation activities for four preferred alternatives. Also included are description of site preparation activities, confirmation soil and ISRA performance sampling requirements and procedures, and site restoration activities.
- Section 6 summarizes additional remedial action planning activities required for ISRA implementation.
- Section 7 presents the ISRA implementation schedule and ISRA reporting requirements.
- Appendix A provides copies of correspondence regarding the ISRA CAO.
- Appendix B present modeling results considered in ISRA Area identification process.
- Appendix C provides remedial construction plans for the Outfall 008 ISRA Area recommendations presented in this work plan.
- Appendix D provides remedial construction plans for the Outfall 009 ISRA Area recommendations presented in this work plan.

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2.0 ISRA AREA IDENTIFICATION AND REMEDIAL PLANNING PROCESS

This section describes the ISRA Area identification and remedial planning process applied to the ISRA PEAs identified in the Preliminary ISRA Work Plan. ISRA PEAs were refined and evaluated using additional sampling results, source evaluation criteria, and soil erosion modeling results, resulting in the identification of ISRA Areas. The remedial planning process for the ISRA Areas included both the identification and screening of remedial action alternatives, and development of SRGs. The results of the ISRA Area identification and remedial planning processes are presented in Section 3 for the Outfall 008 watershed, and in Section 4 for the Outfall 009 watershed.

2.1 ISRA AREA IDENTIFICATION PROCESS

Prior to beginning the ISRA PEA evaluation process to identify ISRA Areas, source delineation and data gap sampling was performed at each ISRA PEA, with results incorporated into the existing ISRA database (as described below, some source delineation and data gap sampling is ongoing). The additional data were used to refine the estimated extent and nature of the soil COC areas within each ISRA PEA, and identify new ISRA PEAs if data gap samples collected outside the identified ISRA PEAs exceeded background comparison concentrations. Then, each ISRA PEA entered the evaluation process. The criteria for this evaluation were developed with the goal of highlighting those areas with the greatest chance of discharging ISRA COCs to surface water drainages. The following contaminant migration criteria were used in the evaluation process:

- The concentration of ISRA COCs compared to background comparison concentrations;
- The concentration of non-ISRA COCs identified based on RCRA Facility Investigation (RFI) risk assessment results using the entire RFI site dataset (RCRA risk drivers and contributors);
- An estimate of contaminant mass (volume) within the site;
- The depth of background comparison concentration exceedances, prioritizing sites with shallower impacts over sites with deeper impacts;
- Physical and geochemical parameters that contribute to potential contaminant transport associated with a specific area, including

  - Soil texture, prioritizing fine textured soils over medium and coarse textured soils since contaminants tend to sorb into fine grained materials, and fine grained materials are more easily transported by stormwater;
  - Length of slope and percent slope, prioritizing sites with steeper and longer slopes over shorter and less steep slopes;
  - Type of vegetation and percent coverage, prioritizing sites with less vegetation and bushes over more coverage and grasses;
  - Surface roughness, prioritizing sites that contain little or no obstruction to sheet or rill flow over sites containing natural berms, furrows, depressions, etc.; and
  - Depth to groundwater, prioritizing sites with shallow groundwater over sites with deep groundwater.
- The proximity of background comparison concentration exceedances to surface water drainage features, prioritizing sites closest to drainages; and
- The presence of impervious surfaces, prioritizing sites with no impervious cover over sites with roads, buildings, etc.

The criteria listed above include additional details considered in the ISRA evaluation process and expands on the initial criteria list provided in the Preliminary ISRA Work Plan, with additional consideration included for physical and geochemical parameters. Each of the refined and newly identified ISRA PEAs was evaluated using these contaminant migration criteria. Excluding physical and geochemical parameter site criteria, the evaluation process included ranking an ISRA PEA for each of the criteria on a scale of 0 to 5, with 0 representing the lowest potential for soil COCs to migrate to surface water and 5 representing the highest potential. The physical and geochemical parameter criterion has an overall scale of 0 to 7 because it consists of seven sub-criteria, each with a scale of 0 to 1. The criteria ranking values were summed and a Total Rank calculated for each ISRA PEA. The Total Rank scores for the ISRA PEAs within a watershed were then evaluated to help identify a priority for ISRA PEAs within the watershed, and to evaluate the sites in regard to other ongoing programs or requirements (e.g., North Drainage cleanup activity).

In addition, a ranking of ISRA PEAs within a particular watershed was also conducted based on the results of sediment transport modeling. The estimated annual transport of ISRA COCs in sediment within each of the ISRA PEAs was performed by Geosyntec Consultants (Geosyntec) (Appendix B) using the National Resource Conservation Service's Revised Universal Soil Loss

Equation, Version 2 (RUSLE2) (Geosyntec, 2009). RUSLE2 is revision to the Universal Soil Loss Equation (ULSE), an empirical method developed by the United States Department of Agriculture (USDA) extensively used for quantifying the erosion potential of agricultural soils. Although originally developed for application to agricultural land uses, the RUSLE2 is now believed to be applicable wherever numerical values of its factors are available (Geosyntec, 2009). The RUSLE2 allows the use of parameters that were not available when the USLE was developed, including principles of soil loss due to raindrop impact, overland flow, and rill-erosion processes (Geosyntec, 2009).

RUSLE2 estimates long-term annual average soil loss (A) from raindrop splash and runoff from based on five parameters, including rainfall-runoff erosivity (R), soil erodibility (K), slope length-steepness (LS), cover management (C), and support practice (P).

$$A = R * K * LS * C * P$$

An average annual ISRA COC yield associated with the average annual sediment yield for a particular ISRA PEA was conservatively calculated by assigning a COC concentration equal to the greatest concentration of ISRA COCs within an ISRA PEA. An average annual ISRA COC yield was calculated for each ISRA COC that exceeded the background comparison concentration within a refined or new ISRA PEA. In addition, an average annual ISRA COC yield was calculated using this process for the entire watershed, assuming a concentration equal to the background comparison concentration for each ISRA COC. The average annual ISRA COCs yield for each ISRA PEA was then compared to the average annual ISRA COC yield for the entire watershed to better understand the degree of reduction in annual yield of ISRA COCs from the watershed if a remedial action was performed on a particular ISRA PEA. The RUSLE modeling results were then used to identify and prioritize recommendations of ISRA Areas within the watersheds.

2.2 REMEDIAL ALTERNATIVES EVALUATION

Each ISRA Area identified underwent a remedial alternatives evaluation. Potential source removal remedial alternatives were identified and evaluated for the ISRA project to achieve remedial objectives and requirements of the CAO. The CAO requires remediating areas of contaminated soil in order to eliminate the COCs that have resulted in exceedances of NPDES permit limits and benchmarks. In addition, the CAO requires that remedial action implementation utilize methods that minimize impacts to the streambed adjacent habitat during cleanup activities, protect the water quality during and after cleanup activities, and restore the streambed and surrounding habitat following cleanup. An initial screening of the identified remedial alternatives was also performed to eliminate alternatives that would not meet ISRA project requirements regarding schedule, or that could potentially result in degradation of surface water quality without significant mitigation measures. The remedial action alternatives evaluation and screening process are described below.

2.2.1 Remedial Action Alternatives

General response actions are broad categories of remedial actions that are considered to achieve remedial goals, and typically include institutional, containment, treatment, excavation, disposal or some combination of these actions. The general response actions identified for the ISRA project include:

- No action
- Removal
- Containment
- Treatment

Remedial action alternatives were developed under each of these general response categories by selecting remedial options which may be effective in achieving the remedial action objectives of controlling contaminant releases to surface water. Remedial action alternatives identified for the ISRA project include:

- **No action**
- Removal
    - **Excavation**
- Containment
    - Capping
        - **Low Permeability Soil (Clay) Cap**
        - **Geomembrane Cap**
        - **Asphalt Cap**
    - Surface Controls
        - **Diversion/Collection**
        - **Chemical Addition**

- Treatment
    - **Solidification/Stabilization**

The potential remedial action alternatives (highlighted in bold above) are described briefly below:

No Action. No further action would be taken.

Excavation. Excavation involves the removal of a potential ISRA Area, and disposal of the removed soils at an offsite permitted disposal facility. The potential source area would be removed to a point where remaining soil COC concentrations will be consistent with SRGs.

Low Permeability Soil (Clay) Cap. Capping involves covering the potential ISRA Area with a low hydraulic conductivity soil layer, typically of clay. The clay cap would consist of a layer of clean, cohesive soil placed over the ISRA Area and compacted. The clay cap would isolate COCs from stormwater.

Geomembrane Cap. The geomembrane cap would isolate COCs from stormwater by covering the ISRA Area with an impermeable geomembrane. The geomembrane would be protected with a layer of clean soil or gravel. Revegetation could be accomplished if top soil is used.

Asphalt Cap. The ISRA Area would be paved with asphalt to isolate COCs from stormwater. Materials and methods used to place the asphalt cap are similar to conventional road paving.

Diversion / Collection Surface Controls. Stormwater would be diverted around the ISRA Area and any stormwater falling on the ISRA Area would be collected and treated. It is anticipated that treatment to remove suspended solids would be necessary to remove COCs that may be mobilized in surface water from the ISRA Area. Treatment would be accomplished onsite using settling basins and/or filtration.

Chemical Surface Controls. Soil stabilization involves mixing a chemical additive to the ISRA Area soil such as a liquid polymer emulsion to bind soil particles and reduce erosion. The liquid polymer would be applied to the disturbed ground surface and allowed to soak in.

Solidification/Stabilization. The soil in the ISRA Area would be stabilized using a Pozzolan/Portland cement process. Portland cement chemically reacts with water to form a solid cementitious matrix which results in a mixture that can be compacted to form a highly dense mass which gains strength and reduces permeability and decreases the mobility of COCs. Pozzolanic and cement-based binding agents are typically appropriate for inorganic contaminants. They also raise the pH of the water which may help precipitate and immobilize some heavy metal contaminants; however, they may also cause elevated pH in stormwater runoff from the ISRA Area post-treatment.

2.2.2 Remedial Action Alternatives Screening

Remedial action alternatives described above have been evaluated considering short- and long-term effectiveness, long-term reliability, implementability, environmental impacts/sustainability, and relative cost of each remedial action in achieving the objectives of the CAO (remediating areas of contaminated soil in order to eliminate COCs that have may have contributed in exceedances of NPDES permit limits and benchmarks). An initial screening of the alternatives listed above was performed to eliminate alternatives that would not meet ISRA project requirements regarding schedule, or that could potentially result in degradation of surface water quality without significant mitigation measures.

Table 2-1 presents the result of the initial remedial alternatives screening evaluation of the ISRA project. For each screening criterion, alternatives are compared and ranked from 0 to 5 based on how well the criterion is met. A “0” indicates the criterion is not met at all, and a “5” indicates the criterion is met completely. Costs are scored based on relative magnitude of typical costs for the different alternatives, with a “1” being a relatively high cost and a “5” being a relatively low cost. Based on this evaluation, the three highest ranking alternatives are:

- Excavation and Offsite Disposal
- Installation of a Clay Cap
- Construction of a Diversion / Collection Feature

The geomembrane cap was not selected as it is similar to the clay cap, and may be slightly less feasible and more costly. If new information or a more detailed evaluation changes this relative ranking (if suitable clay material is unavailable, for instance) the geomembrane cap could be reconsidered.

Excavation and offsite disposal is the highest ranking alternative, and is considered the preferred, default approach to source removal; however, the capping and diversion / collection alternatives are retained for consideration at ISRA Areas where circumstances cause excavation to be less feasible or cost-effective. It should be noted that applications of multiple remedial alternatives could be selected and implemented within a single ISRA Area if necessary to meet remedial goals.

2.3 SITE-SPECIFIC SOIL REMEDIATION GOALS (SRG)

Site-specific SRGs have been developed for each ISRA Area identified and recommended for remedial action. The SRGs were used to estimate the extent of the ISRA Areas during the remedial alternatives evaluation, and as a cleanup goal for confirmation sampling. Site-specific SRGs were developed for a particular ISRA Area based on the results of the ISRA Areas evaluation process presented in Section 2.1, along with the detected concentrations of ISRA COCs in samples collected within the ISRA Area.

ISRA Area SRGs are consistent with or near background concentrations for the targeted COCs. As described above, the 2005 soil background data are being re-evaluated by DTSC, and a final background dataset and comparison values are not defined at this time. ISRA SRGs will be adjusted, as necessary, once a final background dataset is approved (anticipated by mid-2010), and ISRA Area recommendations will be re-evaluated as warranted. Also, it should be noted that ISRA SRGs for dioxins proposed in this plan are slightly higher than current background levels since there is more uncertainty in the 2005 dataset for dioxins (16 samples for dioxins versus approximately 40 samples for metals), and since the Outfall 008 and 009 watersheds were extensively burned during the 2005 Topanga Fire, resulting in dioxin-containing ash and burned debris deposited throughout the area. For current planning purposes, it has been assumed that the dioxin SRG is up to approximately 3 times the dioxin background TCDD TEQ comparison level (up to about 3 picograms per gram [pg/g]), since this is within the range of regionally published dioxin background values (1 to 6 pg/g) (United States Environmental Protection Agency [USEPA], 2000; USEPA, 2001). SRGs are presented for each ISRA Area in Sections 3 and 4.

Also, as described in Section 7, ISRA project implementation includes an iterative evaluation of NPDES sampling results to soil COCs to determine effectiveness of the ISRA remedial action. If warranted, and once a soil dioxin background dataset is defined, soil dioxin sampling results and ISRA recommendations for those areas within the Outfall 008 and 009 watersheds will be re-evaluated.

3.0 OUTFALL 008 ISRA AREA IDENTIFICATION AND REMEDIAL PLANNING

Within the Outfall 008 watershed, three ISRA PEAs were identified in the Preliminary ISRA Work Plan based on available soil data (Figure 1-5). Subsurface soil data were also considered in that evaluation; all subsurface soil COC detections above background comparison levels were collocated with surficial COC impacts. As described below, soils in the Outfall 008 watershed ISRA PEAs are generally shallower than 3 feet thick.

As described in the Preliminary ISRA Work Plan, the ISRA PEAs are highly generalized and approximate due to data limitations. Since preparation of the Preliminary ISRA Work Plan, additional soil samples were collected to further delineate areas exceeding background comparison levels for the ISRA COCs and RCRA risk drivers, and assess concentrations of ISRA COCs near and/or down-gradient of former operational areas previously not investigated (see Section 3.1). This section summarizes the sampling activities and results, the ISRA Area identification results, the remedial alternatives evaluation results for each ISRA Area, and the recommended remedial actions within the Outfall 008 watershed. For ease of presentation, descriptions below use the term “COC” to include both ISRA COCs and collocated RCRA risk drivers.

3.1 SOURCE DELINEATION AND DATA GAP SAMPLING

An evaluation of historical sample locations and analytical suites was performed to identify locations for source delineation and data gap sampling. Source delineation sampling is performed to further refine the extent and nature of soil COCs within ISRA PEAs. Data gap sampling is performed near and/or down-gradient, some within surface water drainages, of former operational areas where the absence of a COC has not been verified by previous sampling. The sampling approach, plan, methods, and results of the source delineation and data gap sampling performed within Outfall 008 are described below.

3.1.1 Sampling Approach and Plan

Source delineation and data gap sampling was performed between February and April 2009 to further refine the extent and magnitude of COCs within the Outfall 008 watershed. Source delineation sample locations were performed approximately 50 feet from the sample location(s) with COCs exceeding background concentrations and approximately 50 feet from other source delineation sample locations. A spacing of 50 feet was chosen to allow for a better estimate of the contaminant volume and distribution in a particular area. Step-out source delineation sample locations were also performed. Step-out samples were located approximately 100 feet from the inner source delineation sample location, and between 100 and 200 feet from other step-out source delineation sample locations. Source delineation sample locations were also performed in close vicinity to existing sample locations for which the vertical extent required assessment. Data gap sample locations were performed near and/or down-gradient, some within surface water drainages, of former operational areas where the absence of a COC had not been verified by previous sampling. Source delineation and data gap sample locations are shown on Figure 3-1. As shown on this figure, additional data gap and delineation sampling results are pending in a few areas and will be used to refine excavation extents proposed in this work plan.

In general, two discrete soil samples were proposed for collection at each sample location, including one surface soil sample and one subsurface soil sample. Surface soil samples were collected between 0 and 0.5 feet below ground surface (bgs). Subsurface soil samples were targeted to be collected between 4.5 and 5 feet bgs, but could be collected at more shallow locations (but typically no shallower than 3.0 feet bgs) if bedrock was encountered prior to 5 feet bgs. Analysis of the subsurface soil sample would be performed to assess the vertical extent of ISRA COCs at concentrations exceeding background comparison concentrations, or to provide data to support the data gap evaluation.

3.1.2 Sampling and Analysis Methods

Surface soil samples were collected in 2-inch-diameter stainless steel sleeves. Subsurface soil samples were collected by hand augering to the target sample depth using a nominal 3-inch-diameter hand auger and filling a 2-inch-diameter stainless steel sleeve with cuttings from the hand auger at the target sample depth. Boreholes were backfilled with hand auger cuttings. Following sample collection, the ends of the sample sleeves were capped with teflon sheets and plastic end caps, and labeled with the sample identification, sample date, and time. The samples were placed in Ziploc bags and stored in a cooler containing ice. Soil samples were transported to the analytical laboratories under chain–of-custody. Sampling equipment was decontaminated at the work site by hand washing with a phosphate-free detergent solution, followed by a double bucket rinse with distilled water.

The analytical suite for source delineation samples was chosen based on the concentrations associated with a potential source area, and included both ISRA COCs and RCRA risk drivers. The analytical suite for data gap samples was chosen based on the analytes for which the data gap existed. Within Outfall 008, data gap sampling was performed for dioxins. Data gap sampling was not necessary for metal COCs since adequate assessment within the former operational areas within the Outfall 008 watershed had been performed for the ISRA project. Source delineation and data gap samples were analyzed by one or more of the following analyses:

- Metals (arsenic, cadmium, copper, lead, and/or zinc) by Environmental Protection Agency (EPA) Method 6020; and/ or
- Dioxins by EPA Method 1613B.

The field sampling, laboratory analysis, and quality control samples were collected according to DTSC-approved RFI Field Standard Operating Procedures and Quality Assurance Project Plan (QAPP) requirements.

3.1.3 Sampling Results

A total of 60 soil samples (53 surface samples, 4 subsurface samples, and 3 duplicate samples) were collected from 52 locations during the Outfall 008 ISRA source area and data gap sampling, performed between February and April 2009. Of those, two samples collected were placed on hold pending results of the other samples, and were not analyzed since the ISRA PEA was sufficiently defined for remedial evaluation and planning purposes. The low number of subsurface samples is due to the presence of bedrock at depths less than 3.0 feet bgs at most of the sample locations. Three samples were collected at depths between 1.0 and 3.0 feet bgs (1 surface sample and 2 subsurface samples) to allow for a data gap evaluation of dioxins in subsurface soils in locations where bedrock was encountered at depths less than 3.0 feet bgs. As noted above, some additional sampling results are pending and will be used to refine excavation extents proposed in this work plan.

Soil samples collected from 38 locations were analyzed for one or more metals (39 primary soil samples), and soil samples collected from 28 locations were analyzed for dioxins (33 primary soil samples). Results of chemical testing for metals (arsenic, cadmium, copper, lead, and zinc) and dioxins are presented in Table 3-1. Below is a summary of the results received to date:

Metals. Of the 36 soil samples (all surface samples) analyzed for one or more of the metals listed above, only the sample from boring HZBS0078 contained a metal at a concentration above the background comparison concentration (a deep sample was not collected at this location due to the presence of bedrock at a depth of 2.8 feet bgs). The soil sample contained lead at a concentration of 53.6 milligrams per kilogram (mg/kg), approximately 1.6 times the background comparison concentration for lead (34 mg/kg). No surface samples contained concentrations of arsenic, cadmium, copper, or zinc above the background comparison concentrations.

Dioxins. Of the 30 soil samples (27 surface samples and 3 subsurface samples) analyzed for dioxins, 8 surface soil samples contained TCDD TEQ concentrations exceeding the background comparison concentration of 0.87 pg/g. Three of the exceedances were below three times the background comparison concentration, four of the exceedances were between 3 and 9 times the background comparison concentration, and one of the exceedances was approximately 100 times the background comparison concentration. No subsurface samples contained dioxin concentrations above the background comparison concentration.

Source delineation and data gap sampling was performed within the Outfall 008 watershed to refine the estimated extent and nature of the soil COC areas within each ISRA PEA, and identify new ISRA PEAs if data gap samples collected outside the identified ISRA PEAs exceeded background comparison concentrations. Source delineation sample results refined PEA-CYN-1 and PEA-HVS-1, and subdivided PEA-HVS-2 into three distinct PEAs, including PEA-HVS-2A, PEA-HVS-2B, and PEA-HVS-2C (Figure 3-2). Data gap sampling identified two new PEAs within Outfall 008, including PEA-HVS-3, located in the northwestern portion of the Happy Valley South (HVS) RFI Site, and PEA-DRG-1, located within the drainage that conveys stormwater from the western portion of the Outfall 008 watershed (Figure 3-2). Both of the new PEAs were identified due to a dioxin sample result that exceeded the background comparison concentration by more than a factor of 3. Subsurface soil concentrations above background comparison values for ISRA COCs within the Outfall 008 watershed are collocated with the shallow exceedance locations shown on Figure 3-2 (MWH, 2009). Subsurface exceedances have been considered during PEA refinement evaluations. A summary of the chemical and physical characteristics of the five refined ISRA PEAs and the two new ISRA PEAs are presented in Table 3-2.

3.2 ISRA AREA IDENTIFICATION

Following completion of the delineation and data gap sampling and refinement of existing PEAs and identification of new PEAs, an evaluation was performed on each PEA to further assess the potential for each site to contribute COCs to surface water using the methods presented in Section 2.1. The methods included evaluating each PEA using criteria developed with the goal of highlighting the areas with the greatest chance of contributing contaminants to the drainages, and the use of the RUSLE2 to estimate COC loss within each PEA. The evaluation and results for each of these methods is described below, along with a summary of the ISRA Areas identified.

3.2.1 ISRA Criteria Evaluation

The chemical and physical characteristics of each ISRA PEA that are used for the contaminant migration criteria evaluation for Outfall 008 are presented in Table 3-2. The physical and geochemical parameter evaluation totals for the Outfall 008 PEAs are presented in Table 3-3, along with Total Rank of each of the ISRA PEAs. The results of the contaminant migration criteria evaluation for Outfall 008 are presented in Table 3-4.

The ranking of the ISRA PEAs from most to least likely to contribute COCs in soil to surface water based on results of the criteria evaluation are:

Site Name	Total Rank
1. PEA-HVS-2B	27.7
2. PEA-HVS-1	27.1
3. PEA-HVS-3	25.0
4. PEA-HVS-2C	22.5
5. PEA-HVS-2A	22.3
6. PEA-DRG-1	22.2
7. PEA-CYN-1	17.2

The two highest ranked PEAs, PEA-HVS-2B and PEA-HVS-1, are approximately 2 points higher than the second ranked PEA, with the distinguishing factors including COC concentrations above background, presence of RCRA risk drivers, and proximity to drainage compared to the other PEAs. The third through the sixth ranked PEA are ranked similarly, and are within about 3 points of each other. The least ranked PEA, PEA-CYN-1, is about 5 points less than the sixth ranked PEA.

3.2.2 RUSLE Results

As described in Section 2.1 above, the RUSLE results were also considered to prioritize recommendations for ISRA Areas within the Outfall 008 watershed based on the average annual ISRA COC yield from each of the ISRA PEAs compared to the average annual ISRA COC yield for the entire watershed. The Geosyntec memo (Appendix B) presents the results of the average annual sediment yield from the PEAs, the average annual ISRA COC yield from the PEAs, and a comparison of the average annual ISRA COC yield of each PEA to that of the entire watershed (Geosyntec, 2009). To be conservative, the sediments within each PEA were assumed to have concentrations of ISRA COCs equal to the greatest concentration detected within that particular PEA. The analysis also assumed background concentrations for sediments within the watershed.

Based on the analysis, all but one of the seven ISRA PEAs are believed to contribute less than 3 percent of the annual pollutant yield within the watershed for the ISRA COCs (Geosyntec, 2009). The model indicates PEA-HVS-3, HVS-2B, HVS-2A contribute the most to the annual COC yield of the watershed, including 20 percent for dioxins (PEA-HVS-3), 2.4 percent for copper (PEA-HVS-2B), and 1.6 percent for lead (PEA-HVS-2A) (Appendix B). These results are conservative and likely biased high because, as mentioned above, the sediments within each PEA were assumed to have concentrations of ISRA COCs equal to the greatest concentration detected within that particular PEA.

3.2.3 ISRA Area Identification Summary

The contaminant migration criteria evaluation resulted in six of seven of the PEAs with a Total Rank above a value of 20, and all PEAs with a Total Rank above a value of 15. Based on the contaminant migration ranking and RUSLE model results, the highest priority areas for ISRA implementation are HVS-2A, HVS-2B, HVS-3, and HVS-1. To conservatively remove all potential COC sources, all seven of the Outfall 008 refined and new PEAs are considered ISRA Areas.

3.3 REMEDIAL ALTERNATIVES EVALUATION AND PLAN

Potential source removal alternatives for the Outfall 008 ISRA Areas were screened in Section 2.2.2 and include excavation with offsite disposal, capping with a clay cap, and construction of diversion and collection structures. Excavation was ranked the highest in meeting the CAO objectives and is considered the default approach to source removal unless circumstances at specific ISRA Areas render another alternative more feasible or cost-effective. The Outfall 008 ISRA Areas are similar in physical, chemical, and geochemical characteristics. There are relatively small volumes of material to be removed from each area, and there are no known site constraints that render excavation less feasible. Therefore, excavation and offsite disposal is the recommended remedial alternative for each of the identified Outfall 008 ISRA Areas.

A summary of the Outfall 008 ISRA Area remedial plans, including COCs and SRGs for each area, is presented in Table 3-5. Excavation implementation and field methods are described in Section 5. Drawings of the implementation of excavation at each Outfall 008 ISRA Area are included in Appendix C.

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4.0 OUTFALL 009 ISRA AREA IDENTIFICATION AND REMEDIAL PLANNING

Within the Outfall 009 watershed, 11 ISRA PEAs were identified based on available soil data. (Figures 1-6 and 1-7). Subsurface soil data were also considered in that evaluation; all subsurface soil COC detections above background comparison levels were collocated with surficial COC impacts. As described in the Preliminary ISRA Work Plan, the ISRA PEAs are highly generalized and approximate due to data limitation. Since preparation of the Preliminary ISRA Work Plan, additional soil samples were collected at and near the Expendable Launch Vehicle (ELV) ISRA PEA (PEA-ELV-1) to further delineate areas exceeding background comparison levels for the ISRA COCs, and assess concentrations of ISRA COCs near and/or down-gradient of former operational areas previously not investigated (see Section 4.1). The ELV was considered a priority area based on the expected degree and extent of contamination present, and the amount of available 2009 federal funding for ISRA implementation on NASA property. This section summarizes the sampling activities and results, the ISRA Area identification results, the remedial alternatives evaluation results for each ISRA Area, and the recommended remedial actions at the ELV ISRA PEA within the western Outfall 009 watershed. Similar to Section 3 above, descriptions below use the term "COC" to include both ISRA COCs and collocated RCRA risk drivers.

Source delineation and data gap sampling are ongoing in the other ISRA PEAs in the western portion of Outfall 009, and planned for the eastern portion of Outfall 009, as presented in Section 7. ISRA work in the Outfall 009 watershed is being phased due to the ongoing Northern Drainage cleanup under the oversight of DTSC, completion of stormwater maintenance activities, and federal funding constraints on federal property. A brief description of the ongoing work in the Outfall 009 watershed as part of the Northern Drainage and storm water maintenance programs, including work performed, in progress, and planned as part of the ISRA project, is provided below.

Northern Drainage Cleanup. As described in the Preliminary ISRA Work Plan (MWH, 2009), there are ongoing cleanup activities being performed under DTSC direction. The Northern Drainage cleanup is being performed per an Imminent and Substantial Endangerment

Determination and Order and Remedial Action Order (DTSC, 2007) and a CAO (RWQCB, 2007). Both orders applied to property encompassed within the "Northern Drainage," including the former Liquid Oxygen (LOX) Plant debris area and the former Rocketdyne-Atomics International Rifle and Pistol Club (Shooting Range), located on Mountains Recreation Conservancy Authority (MRCA) property. Cleanup activities that addressed debris in the Northern Drainage near the former LOX Plant were completed in 2007 (MWH, 2008). Cleanup activities to address clay pigeon debris near the former Shooting Range and within the Northern Drainage began in 2008 and are planned for the 2009 dry season, and also include removal of residual lead shot present in the area. Additional assessment sampling and delineation will be performed in upland areas adjacent to the former shooting range, and along the banks and in the stream bed from the former LOX Plant into the American Jewish University / Brandeis-Bardin Campus (BBC) property to the north, the results of which will be used to target any additional removal areas and select the appropriate methods for removing the remaining clay targets. A separate lead shot removal work plan will be submitted to DTSC for review and approval.

Stormwater Maintenance Activities. Maintenance activities have been performed at stormwater culverts in the eastern portion of the Outfall 009 watershed on Boeing and Sage Ranch property. As part of this program, the culverts have been cleared of materials obstructing flow (e.g., sediment build-up, vegetation or other debris), and upgraded by replacing old piping and installing weirs and filtration media to help promote sediment settling and removal of potential pollutants. This work has been completed in portions of three ISRA PEAs on Boeing property (PEA-A1LF-1, PEA-A1LF-2, and PEA-LOX-2), with additional sampling in progress to characterize ISRA COCs in each of these areas.

As warranted, addenda to this Final ISRA Work Plan will be prepared to document the evaluations of the ISRA PEAs affected by the Northern Drainage and stormwater maintenance activities once these activities have been completed.

4.1 SOURCE DELINEATION AND DATA GAP SAMPLING

An evaluation of historical sample locations and analytical suites was performed to identify locations for source delineation and data gap sampling. Source delineation sampling is performed to further refine the extent and nature of soil COCs within ISRA PEAs. Data gap sampling is performed near and/or down-gradient, some within surface water drainages, of former operational areas where the absence of a COC has not been verified by previous sampling. The sampling approach, plan, methods, and results of the source delineation and data gap sampling performed near the ELV ISRA PEA (PEA-ELV-1) within western portion of Outfall 009 are described below.

4.1.1 Sampling Approach and Plan

Source delineation and data gap sampling was performed between March and April 2009 to further refine the extent and magnitude of COCs within the Outfall 009 watershed. Source delineation sample locations were performed approximately 50 feet from the sample location(s) with COCs exceeding background concentrations and approximately 50 feet from other source delineation sample locations. A spacing of 50 feet was chosen to allow for a better estimate of the contaminant volume and distribution in a particular area. Step-out source delineation sample locations were also performed in some areas. Step-out samples were located approximately 100 feet from the inner source delineation sample location, and between 100 and 200 feet from other step-out source delineation sample locations. Source delineation sample locations were also performed in close vicinity to existing sample locations for which the vertical extent required assessment. Data gap sample locations were performed near and/or down-gradient, some within surface water drainages, of former operational areas where the absence of a COC had not been verified by previous sampling. Source delineation and data gap sample locations are shown on Figure 4-1. The initial sampling effort has been completed for the NASA responsible areas in the Outfall 009 watershed, but further data gap and delineation samples may be warranted pending the results of the samples.

In general, two discrete soil samples were proposed for collection at each sample location, including one surface soil sample and one subsurface soil sample. Surface soil samples were collected at from 0 to 0.5 feet bgs. Subsurface soil samples were targeted to be collected between 4.5 and 5 feet bgs, but could be collected at more shallow locations (but typically no shallower than 3.0 feet bgs) if bedrock was encountered prior to 5 feet bgs. Analysis of the subsurface soil sample would be performed to assess the vertical extent of ISRA COCs at concentrations exceeding background comparison concentrations, or to provide data to support the data gap evaluation.

4.1.2 Sampling and Analysis Methods

Surface and subsurface soil samples were collected by hand augering to the target sample depth using a decontaminated stainless steel nominal 3-inch-diameter hand auger and filling pre-labeled glass sampling containers provided by the laboratories with cuttings from the hand auger at the target sample depth. Boreholes were backfilled with hand auger cuttings. The sampling containers were placed in Ziploc bags and stored in a cooler containing ice. Soil samples were transported to the analytical laboratories under chain–of-custody. Sampling equipment was decontaminated at the work site by hand washing with a phosphate-free detergent solution, followed by a double bucket rinse with distilled water.

The analytical suite for source delineation samples was chosen based on the concentrations associated with a potential source area, and included ISRA COCs. The RCRA contaminants were not a driver in the areas where additional sampling was required for delineation. The analytical suite for data gap samples was chosen based on the analytes for which the data gap existed. Source delineation and data gap samples were analyzed by one or more of the following analyses:

- Metals (cadmium, copper, and/or lead) by Environmental Protection Agency (EPA) Method 6020
- Mercury by EPA Method 7471A; and/ or
- Dioxins by EPA Method 1613B.

The field sampling, laboratory analysis, and quality control samples were collected according to DTSC-approved RFI Field Standard Operating Procedures and Quality Assurance Project Plan (QAPP) requirements. As described above, the highest priority ISRA PEA in the eastern portion of Outfall 009 is the ELV area (PEA-ELV-1). Since implementation of remediation at the ELV

ISRA was anticipated and scheduled for completion in 2009, an expedited turnaround was obtained for these results.

4.1.3 Sampling Results

This subsection describes the sample results for PEA-ELV-1 only. The sample results for the other ISRA PEAs will be discussed in subsequent addenda to this work plan (see Section 7) because the supplemental sampling effort is ongoing.

A total of 11 soil samples (8 surface samples, 2 subsurface samples, and 1 duplicate sample) were collected during the PEA-ELV-1 source area delineation sampling, performed on March 24, 2009. The low number of subsurface samples is due to the presence of bedrock at depths less than 3.0 feet bgs at most of the sample locations. An additional 12 step out samples were collected in April 2009 to fully characterize PEA-ELV-1, and the data will be utilized to refine the excavation extents proposed in this work plan.

Soil samples collected from four locations were analyzed for one or more metals (6 soil samples), and soil samples collected from four locations were analyzed for dioxins (5 soil samples). Results of chemical testing for metals (cadmium, copper, lead, and mercury) and dioxins are presented in Table 4-1. Below is a summary of the results:

> **Metals.** Of the five soil samples (4 surface samples and 1 subsurface sample) analyzed for one or more of the metals listed above, none contained a metal at a concentration above the background comparison concentration in PEA-ELV-1.
>
> **Dioxins.** Of the five soil samples (4 surface samples and 1 subsurface sample) analyzed for dioxins, two surface soil samples contained TCDD TEQ concentrations exceeding the background comparison concentration. The TCDD TEQ of the surface soil sample collected from EVBS1141 was 8.17 pg/g, which was over 9 times the background comparison concentration of 0.87 pg/g, while the subsurface soil sample collected from this location was below background. The surface soil sample collected at EVBS1142 had a TCDD TEQ of 2.27 pg/g, which was over two times the background concentration.

Source delineation and data gap sampling was performed within the western portion of the Outfall 009 watershed to refine the estimated extent and nature of the soil COC areas within each ISRA PEA, and identify new ISRA PEAs if data gap samples collected outside the identified ISRA PEAs exceeded background comparison concentrations. Samples were collected at each of the NASA responsible ISRA PEAs in the western portion of Outfall 009, but results are only available for inclusion in the current document for the PEA-ELV-1. Source delineation sample results subdivided PEA-ELV-1 into four distinct PEAs, including PEA-ELV-1A, PEA-ELV-1B, PEA-ELV-1C, and PEA-ELV-1D (Figure 4-2). Subsurface soil concentrations above background comparison values for ISRA COCs within the Outfall 008 watershed are collocated with the shallow exceedance locations shown on Figure 4-2 (MWH, 2009). Subsurface exceedances have been considered during PEA refinement evaluations. A summary of the chemical and physical characteristics of the four refined ISRA PEAs are presented in Table 4-2.

4.2 ISRA AREA IDENTIFICATION

Following completion of the delineation and data gap sampling and refinement of the ELV ISRA PEA, an evaluation was performed on each PEA to further assess the potential for each site to contribute COCs to surface water using the methods presented in Section 2.1. The methods included evaluating each PEA using criteria developed with the goal of highlighting the areas with the greatest chance of contributing contaminants to the drainages, and the use of the RUSLE to estimate COC loss from each PEA. The evaluation and results for each of these methods is described below, along with a summary of the ISRA Areas.

4.2.1 ISRA Criteria Evaluation

As mentioned previously, data were only available for the PEA-ELV-1 to complete the ISRA criteria evaluation. The chemical and physical characteristics of each refined ISRA PEA that are used for the contaminant migration criteria evaluation for Outfall 009 are presented in Table 4-2. The physical and geochemical parameter evaluation totals for the Outfall 009 PEAs are presented in Table 4-3, along with Total Rank of each of the ISRA PEAs. The results of the contaminant migration criteria evaluation for Outfall 009 are presented in Table 4-4.

The ranking of the ISRA PEAs from most to least likely to contribute COCs in soil to surface water based on results of the criteria evaluation are:

Site Name	Total Rank
1. PEA-ELV-1D	29.9
2. PEA-ELV-1C	23.8
3. PEA-ELV-1B	14.9
4. PEA-ELV-1A	12.6

The greatest ranked PEA, PEA-ELV-1D is 6.1 points greater than PEA-ELV-1C, while the third ranked PEA (PEA-ELV-1B) is 8.9 points less than the second ranked PEA. The distinguishing factors of the two highest ranked PEAs included COC concentrations above ten times background, the lack of impervious surface cover, and the presence of RCRA risk drivers including trichloroethene (TCE) detected in the subsurface soil at PEA-ELV-1D at a concentration of 66 mg/kg, which was 30,000 times the residential human health risk-based screening level (RBSL) of 0.0022 mg/kg.

4.2.2 RUSLE Results

As described in Section 2.1, the RUSLE results were also considered to prioritize recommendations for ISRA Areas within the Outfall 009 watershed based on the average annual ISRA COC yield from the two highest ranked refined ISRA PEAs (ELV-1C and ELV-1D) compared to the average annual ISRA COC yield for the entire watershed. The Geosyntec memorandum (Appendix B) presents the results of the average annual sediment yield from these refined PEAs, the average annual ISRA COC yield from these refined PEAs, and a comparison of the average annual ISRA COC yield of PEA-ELV-1C and PEA-ELV-1D to that of the entire watershed (Geosyntec, 2009). To be conservative, the sediments within each PEA were assumed to have concentrations of ISRA COCs equal to the greatest concentration detected within that particular PEA. The analysis also assumed background concentrations for sediments within the watershed.

Based on the analysis, PEA-ELV-1C contributes less than 6 percent and PEA-ELV-1D contributes less the 0.5 percent of the annual pollutant yield within the watershed for the ISRA COCs (Geosyntec, 2009). The model indicates PEA-ELV-1C contributes the most to the annual COC yield of the watershed for dioxins with an estimated 5.1 percent contribution. The other ISRA COCs combined (lead, copper, cadmium, and mercury) are less than 0.2 percent contribution from PEA-ELV-1D (Appendix B). These results are conservative and likely biased high because, as mentioned above, the sediments within each PEA were assumed to have concentrations of ISRA COCs equal to the greatest concentration detected within that particular PEA.

4.2.3 ISRA Area Identification Summary

The contaminant migration criteria evaluation resulted in two of the four refined ELV-1 PEAs with a Total Rank above a value of 15. Based on the contaminant migration ranking and RUSLE model results, the highest priority areas for ISRA implementation are ELV-1C and ELV-1D. No action is proposed at refined ISRA PEAs ELV-1A and ELV-1B because the target areas with COC exceedances are beneath asphalt (Table 4-5). To remove the potential COCs sources that may be affecting the water quality at the Outfall 009 NPDES monitoring point, only the refined ELV-1C and ELV-1D are considered ISRA Areas. The ELV-1C and ELV-1D are further refined by taking into consideration the slope, topography, and natural drainage boundaries. Figure 4-3 shows the two ISRA Areas that will be carried forward for remedial alternatives evaluation.

4.3 REMEDIAL ALTERNATIVES EVALUATION AND PLAN

Potential source removal alternatives for the ELV ISRA Areas (ISRA-ELV-1C and ISRA-ELV-1D) were screened in Section 2.2.2 and include excavation with offsite disposal, capping with a clay cap, and construction of diversion and collection structures. Excavation was ranked the highest in meeting the CAO objectives and is considered the default approach to source removal unless circumstances at specific ISRA Areas render another alternative more feasible or cost-effective. ISRA-ELV-1C and ISRA-ELV-1D are similar in physical, chemical, and geochemical characteristics. There are relatively small volumes of material to be removed from each area, and there are no known site constraints that render excavation less feasible. Therefore, excavation and offsite disposal is the recommended remedial alternative for the two ELV ISRA Areas.

A summary of the Outfall 009 ISRA Area remedial plans, including COCs and SRGs, is presented in Table 4-5. Excavation implementation and field methods are described in Section 5. Drawings of the implementation of excavation at the Outfall 009 ELV ISRA Areas are included in Appendix D.

5.0 REMEDIAL ACTION IMPLEMENTATION

As discussed in previous sections, a remedial alternatives analysis has been performed for each ISRA Area to identify the most appropriate remedial action. The analysis identified excavation, capping, and diversion/collection surface controls as the most likely remedial actions for the ISRA project (Section 2.2.2). The remedial alternatives analysis for the Outfall 008 ISRA Areas (Section 3) identified excavation as the most appropriate remedial action. The remedial alternatives analysis for the Outfall 009 ISRA Areas (Section 4) that were evaluated identified excavation as the most appropriate remedial action. However, because the ISRA Area identification process has not been completed for the Outfall 009 watershed, the implementation of excavation, capping, and surface controls are still potential remedial actions for the remaining ISRA PEAs. A general description of the implementation process for these three remedial actions is described below, followed by a general description of site preparation, confirmation sampling, performance sampling, and site restoration that will be performed for these alternatives. There may be instances where the selected remedial option for an ISRA Area is a combination of remedial alternatives (e.g., excavation and capping). If this is the case, the implementation process will follow the procedures described below for the appropriate portions of the ISRA Area.

Please note that prior to performing the remedial actions described below, several planning documents (a site-specific Health and Safety Plan [H&S Plan], Erosion Control Plans (including a Stormwater Pollution Prevention Plan [SWPPP]), a Soil Management Plan (SMP), and a Transportation Plan), and site surveys and permitting packages will be prepared and, as necessary, will be submitted to appropriate agencies for review and/or approval. These documents are described in further detail in Section 6.

5.1 EXCAVATION

If selected, excavation would involve the complete removal of potential ISRA source areas, and disposal of the removed soils at a permitted disposal facility. The potential source areas would be removed to a point where remaining contaminant concentrations are consistent with SRGs for those areas. Soil would be excavated to the depth identified in excavation plans. If access allows, soil removal would be performed using an excavator or backhoe, and in some circumstances a vacuum truck. Characterization, management, and offsite disposal of excavated soil would be performed following the procedures established in the SMP (Section 6.3). Excavation confirmation samples would be collected following the procedures in Section 5.5, with results providing a basis for completion of the removal action. The lateral extent and depth of the excavated area would be recorded with a final survey. Site preparation, restoration, and performance sampling would be performed following the methods described in Sections 5.4, 5.6, and 5.7. For excavation work performed within Outfall 008 near the Happy Valley RFI Site, an unexploded ordinance (UXO) trained person will be present as required by facility land use notifications.

5.2 CAPPING

If selected, capping would involve completely covering the potential ISRA Areas with a low-hydraulic-conductivity layer. The goal for installation of the cap is to minimize the infiltration of water into the potential source area and to provide erosion control thereby minimizing the mobilization of COCs. The two potential capping techniques for ISRA Areas include installation of a clay cap and a geomembrane cap. The general field methods to install these caps are described below. Both clay and geomembrane caps would require routine inspection, maintenance, and land use restrictions (such as fencing or deed notifications) to prevent damage to the cap or future use in an area. If capping is recommended for an ISRA landfill area, then a separate ISRA Work Plan Addenda would be prepared that describes the selection of cap type and design details for RWQCB approval.

5.2.1 Clay Cap

If selected, the clay cap would consist of a layer of compacted clean, cohesive soil. Compaction tests would be performed during installation of the soil cap to confirm density requirements are being achieved. Areas adjacent to the ISRA would be evaluated for suitability for use as soil for constructing the cap or agency-approved clean import fill may be used. The soil cap would be installed over the existing site grade, with the final soil cap grade designed to drain stormwater without ponding and minimize erosion of the surrounding areas. Surrounding areas may need to be recontoured to minimize erosion. Although the soil cap would not be impermeable, it would effectively isolate the COCs in soil from contact with stormwater and serve to prevent the transport of constituents by rain water. Site preparation, restoration, and performance sampling would be performed following the methods described in Sections 5.4, 5.6, and 5.7.

5.2.2 Geomembrane Cap

If selected, the geomembrane cap would consist of a low linear density polyethylene geomembrane placed on a suitable prepared subgrade (smooth [free of all foreign and organic material, sharp objects, or debris of any kind] and graded to provide a firm, unyielding foundation with no sharp changes or abrupt breaks in grade) designed to drain stormwater without ponding. The geomembrane would be seamed by extrusion and/or fusion welding. The geomembrane would be anchored along the perimeter of the ISRA Area with an anchor trench excavated approximately 2-feet by 2-feet, prior to liner system placement. Slightly rounded corners shall be provided in the trench to avoid sharp bends in the geomembrane.

The geomembrane would be protected with a layer of clean soil or gravel placed over the geomembrane recontoured to drain stormwater without ponding and to minimize erosion of the surrounding areas. Surrounding areas may need to be recontoured to minimize erosion. The anchor trenches would be backfilled with similar material. Site preparation, restoration, and performance sampling would be performed following the methods described in Sections 5.4, 5.6, and 5.7.

5.3 DIVERSION / COLLECTION SURFACE CONTROLS

If selected, a temporary diversion drainage channel would be constructed to direct stormwater around the ISRA Area to reduce the volume of water in contact with and potentially mobilizing COCs. A temporary sedimentation or detention basin would be constructed downstream of the ISRA Area to collect stormwater flowing off the site and allow the suspended solids to settle. The basin operates as a detention reservoir while sediment is deposited by flow moving slowly through it. The sedimentation basin would discharge via an overflow weir or pipe and reconnect with the natural drainage downstream. The basin would require cleaning out frequently, likely after each storm, to control re-suspension of trapped sediments.

The ISRA Area would be evaluated and a detailed design of the diversion channel and sedimentation basin would be prepared. The design of the diversion channel and basin size requires information about the drainage area that includes erosion characteristics, surface cover and condition, and length and steepness of slopes. The design may include recontouring of surrounding areas to minimize erosion. Site preparation, restoration, and performance sampling would be performed following the methods described in Sections 5.4, 5.6, and 5.7.

5.4 SITE PREPARATION

ISRA Areas planned for remedial actions will be surveyed and the lateral limits of the area identified with stakes. A utility survey will be performed within and adjacent to each excavation site to locate pipelines, conduits, and utilities. Erosion controls will be implemented prior to and during excavation, as necessary, to reduce the transport of sediment from disturbed soil areas consistent with the approved SWPPP (Section 6.2). If necessary, vegetation within the ISRA Area will be cleared and disposed offsite at an appropriate disposal facility.

5.5 CONFIRMATION SOIL SAMPLING

Following removal of ISRA Area soils, soil samples will be collected to confirm that the SRGs for ISRA COCs have been achieved throughout the removal areas. Excavation sidewall and floor confirmation samples will be collected. Sidewall confirmation samples will be collected at a frequency of 1 sample for every 200 square feet, and be evenly distributed horizontally, but at varying depths. Floor confirmation sample will be collected at a frequency of 1 sample for every 400 square feet, and be evenly distributed horizontally. Floor and sidewall confirmation samples will not be collected if bedrock represents the excavation extent. Confirmation samples will be analyzed for the particular ISRA COCs and RCRA risk drivers associated with the ISRA Area specified in Tables 3-5 and 4-5.

Excavation activities will be complete when the results of confirmation soil samples collected from the floor and sidewalls of the excavation are consistent with SRGs for each ISRA Area (Tables 3-5 and 4-5), which consist of 2005 metal background concentrations, or within about three times the dioxin TEQ background level (approximately 3 pg/g). If confirmation sample results exceed the SRGs, additional soil will be excavated from the area surrounding the sample and additional confirmation samples will be collected.

Soil samples will be collected and analyzed following DTSC-approved field sampling and analytical methods as specified in the QAPP or recently DTSC-approved work plans for the RFI. Analytical reporting limits for confirmation samples in the ISRA Areas proposed in this work plan are provided in Table 5-1. Briefly, confirmation samples will be collected in 2-inch-diameter stainless steel sleeves using a drive sampler or using a trowel from the excavation sidewalls or bottom. As necessary, boreholes will be backfilled with hand auger cuttings. Following sample collection, the ends of the sample sleeves will be capped with teflon sheets and plastic end caps and labeled with the sample identification, sample date, and time. The samples will be placed in Ziploc bags and stored in a cooler containing ice. Soil samples will be transported to the California-certified analytical laboratories under chain–of-custody. Sampling equipment will be decontaminated at the work site by hand washing with a phosphate-free detergent solution, followed by a double bucket rinse with distilled water.

5.6 SITE RESTORATION

After completion of one of the remedial actions described above, restoration activities will be performed to minimize erosion and sediment transport from the site, and promote establishment of vegetation. Disturbed areas will either be restored to approximately existing grades using imported clean fill, or the areas will be recontoured without the addition of imported soil, to achieve grades that will prevent ponding of stormwater in excavated areas, reduce the potential for erosion, and provide topsoil sufficient to allow revegetation. If surrounding soils are used for fill during recontouring, they will be sampled for ISRA COCs or potentially collocated RCRA risk drivers prior to use. Areas disturbed during construction activities will be recontoured so that the overall drainage pattern at and near the ISRA Area is similar to pre-ISRA conditions. Restoration methods may be refined upon consultation with the Surface Water Expert Panel. Erosion control Best Management Practices (BMPs) consistent with the approved SWPPP (Section 6.2) will be implemented and maintained, as necessary, until the site has been reestablished to pre-existing erosion sediment loss conditions. Once site restoration activities are complete, a survey will be performed to confirm actual grading matches design.

5.7 PERFORMANCE SAMPLING PROCEDURES AND FREQUENCY

Performance sampling will be implemented at each ISRA Area following completion of remedial actions, and will involve the collection of surface water runoff samples downgradient of the ISRA Area. Surface water grab samples will be collected from the first point flow is observed, even if it is below multiple ISRA Areas. If surface water flow is observed upgradient of the ISRA Area, an upgradient surface water sample will also be collected for comparison purposes. Performance sampling will be performed at least monthly, as feasible, and samples will be analyzed for the ISRA COCs. Analytical reporting limits for the performance surface water samples for the ISRA Areas proposed in this work plan are based on NPDES benchmark specifications for ISRA COCs and provided in Table 5-2.

ISRA performance will also include evaluation of NDPES sampling results at Outfalls 008 and 009. If NPDES permit limits and/or benchmarks are not achieved at these outfalls following ISRA implementation, additional activities will be considered and proposed to the RWQCB in addenda to this work plan.

6.0 ADDITIONAL REMEDIAL ACTION PLANNING ACTIVITIES

To support the proposed ISRA activities, several planning activities will be performed prior to implementation. This includes the preparation of several planning documents, including a site-specific H&S Plan, Erosion Control Plans, a SMP, and a Transportation Plan. In addition, site surveys and permitting packages will be prepared and submitted to appropriate agencies. The completion of the above listed items is discussed in further detail below.

6.1 HEALTH & SAFETY PLAN

The contractor selected to perform the ISRA work shall prepare a H&S Plan in accordance with all applicable federal, state, local, and facility rules and regulations before commencing work at the site. The purpose of the H&S Plan is to orient the site workers to the health and safety hazards and control measures associated with the field activities. By raising the awareness to potential site hazards, it is possible to minimize personal injuries and illnesses and physical damage to equipment, supplies and property. Thus, the plan will emphasizes management responsibilities, preplanning, as well as safety management systems that include training, medical surveillance, selection of personal protective equipment (PPE), exposure assessments, and emergency response. The H&S Plan will be reviewed and approved by RWQCB, and will be maintained by the contractor during the implementation of ISRA activities.

During implementation of the ISRA activities, contractors will be required to ensure that all field activities are conducted safely and in accordance with applicable specifications of the H&S Plan. It should be recognized that the evaluation of hazards, levels of protection, and procedures specified in the H&S Plan will be based on the best information available during the writing of the plan, and therefore every feasible safety or health hazard faced on site may not be contained in the original H&S Plan document and that site conditions change. Therefore, it is always part of every employee’s job to continuously assess site conditions in relation to his/her own knowledge of how to do a task safely. If changes to the H&S Plan are identified during implementation of the ISRA activities, a record of H&S changes will be prepared and maintained with the H&S Plan.

6.2 EROSION CONTROL PLANS

During construction activities, erosion and sediment control measures are required per federal, state, and local laws and regulations. A site-specific SWPPP will be prepared (or a current SWPPP modified) to outline the appropriate sediment and erosion control practices that will be implemented to prevent contaminants (ISRA COCs and RCRA risk drivers/contributors) in any soil excavated or otherwise disturbed from being mobilized during wind or rain events. The SWPPP will also outline the implementation of the stormwater pollution prevention program and the pollution control practices and monitoring to be conducted at the site. The SWPPP will meet the requirements in the California General Construction Stormwater Permit. During project implementation, the SWPPP will be modified and amended to reflect any changes in construction or operations that may affect the discharge of pollutants from the construction site to surface waters or groundwater. The SWPPP will also be amended if it has not achieved the general objective of reducing pollutants in stormwater discharges.

The SWPPP will provide recommendations on suitable and appropriate BMPs for the construction site. Erosion control BMPs, also referred to as soil stabilization, is a control measure that is designed to prevent soil particles from becoming suspended in stormwater runoff. Soil stabilization is accomplished by physical stabilization, vegetative stabilization, and good construction practices. Physical stabilization controls are usually employed during construction when the site has been disturbed and is exposed, and vegetative stabilization is usually employed before and after construction. The potential for erosion is reduced in the following ways:

- Shielding the surface from direct impact of rain drops and irrigation;
- Preserving existing vegetation;
- Improving the water-holding capacity of the soil;
- Slowing runoff sufficiently to allow for sedimentation to occur;
- Physically binding the soil through root structures; and
- Limiting the size and duration of the area of disturbed soil.

6.3 SOIL MANAGEMENT

A SMP will be prepared to support ISRA construction activities. The SMP will provide procedures for characterization, handling, storage, disposal, and documentation of soil generated during construction activities. As will be specified in the SMP, waste characterization samples may be comprised of *in situ* characterization samples collected prior to excavation, *ex situ* stockpile characterization samples collected following excavation, or a combination of these samples, contingent on waste characterization requirements. Excavated soil will be placed into stockpiles, or directly into 20 cubic-yard transport bins or dump trucks for offsite disposal. Stockpile placement and waste characterization sampling are described briefly below, and will be detailed in the SMP.

6.3.1 Stockpile Management

Soil excavated during construction activities for each ISRA Area will be segregated and stockpiled separately based on previous sampling results compared to hazardous waste criteria. Stockpiles will be labeled as "Potential Nonhazardous Soil" or "Potential Hazardous Soil". Stockpiles of soil will be located in the pre-designated locations to be specified in the SMP based on final ISRA Area approval. All stockpiles will be managed according to the SWPPP, including standard construction BMPs. At a minimum, the following types of BMPs will be used to properly manage stockpiles:

- Stockpiles will be located a minimum of 50 feet away from concentrated flows of stormwater, drainage courses, and inlets.
- Stockpiles will be protected from stormwater run-on using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbag, gravel bags, or straw bale barriers.
- Wind erosion control practices will be implemented for all stockpiled material.
- Stockpiles will be protected with a temporary linear sediment barrier and covered with plastic sheeting prior to the onset of precipitation.
- Stockpiles will be placed on a liner when located on top of bare earth or gravels.

When soils are initially excavated and stockpiled, reactive organic compounds (ROC) emissions will be measured using a photo ionization detector (PID) to determine if mitigation measures are required according to Rule 74.29 of the Ventura County Air Pollution Control District (VCAPCD). Mitigation actions to minimize emissions of ROC to the atmosphere include keeping soil surfaces visibly moist by water spray, treating soil surfaces with a vapor suppressant, or covering soil surfaces with a continuous heavy duty plastic sheeting (4 mil or greater) or other similar covering.

Records summarizing soil stockpile dates, ROC emission measurements, descriptions of monitoring equipment and techniques, descriptions of mitigation measures employed for dust, odor, and ROC emissions, and stockpile disposal details will be provided in the ISRA Remedial Action Summary Report.

6.3.2 Waste Characterization Sampling

Characterization of excavated soils for offsite disposal may occur *in situ* and/or *ex situ*. If characterization sampling is performed *ex situ*, sampling will occur following the segregation of soils into stockpiles as described above. Stockpile characterization samples will include previously collected *in situ* soil samples and/or additional soil stockpile samples. Minimum stockpile sample frequency is based on DTSC recommendations for imported fill stockpile confirmation sampling (DTSC, 2001), and are as follows:

1. For stockpiles up to 1,000 cubic yards (cy), 1 sample will be collected per 250 cy.
2. For stockpiles from 1,000 to 5,000 cy, 4 samples will be collected for the first 1,000 cy and 1 sample per each additional 500 cy.
3. For stockpiles with greater than 5,000 cy, 12 samples will be collected for the first 5,000 cy, and 1 sample for each additional 1,000 cy.

Characterization samples will be analyzed for the required constituents for offsite disposal, including radiological screening. The procedures to perform radiological screening will be similar procedures to those established for ongoing cleanup activities in the Northern Drainage.

6.4 TRANSPORTATION PLAN

A Transportation Plan will be prepared which defines procedures for transporting personnel, equipment, and materials between designated entrance/exit points and the ISRA Areas. The plan will present the transportation route to and from the offsite disposal location(s). Traffic controls described in the Transportation Plan will be implemented to facilitate safe and efficient traffic flow within facility and on public roadways. This traffic plan will be revised and updated as appropriate to address additional work or changes in scope of work associated with ISRA source removal actions.

6.5 SITE SURVEYS AND PERMITTING PACKAGES

Biological and archaeological surveys within the Outfall 008 and 009 ISRA project work areas will be performed prior to implementation of remedial actions. A biological survey will be performed during the planning phase, immediately prior to ISRA remedial action implementation, and at times during ISRA implementation. The biological survey will be performed to identify the presence of sensitive species and to help prepare potential relocation and/or mitigation options. An archaeological survey will be performed during the planning phase of the ISRA to identify the potential presence of human artifacts. Survey reports will be provided to appropriate regulatory agencies as part of the environmental permitting process, or to overseeing state departments as appropriate.

Based on the planned and anticipated ISRA cleanup, it is expected that regulatory permits will be required to implement the proposed work scope. Activities performed in ephemeral streambeds in California may fall within the jurisdiction of the California Department of Fish and Game (CDFG), the United States Army Corp of Engineers (USACE), and/or the RWQCB. Based on the proposed scope of work, a CDFG Notification of Lake or Streambed Alteration (Streambed Alteration Agreement [SAA]) may be required. Currently, Boeing has an active SAA for the Happy Valley Drainage (Outfall 008 watershed) and the Northern Drainage (Outfall 009 watershed) (SAA 1600-2003-5052-R5 and amendment). This SAA and its amendment will be reviewed and CDFG contacted to confirm its applicability for the ISRA activities. It is anticipated no further permitting will be required by CDFG.

Currently, Boeing does not have an active Clean Water Act (CWA) Section 404 permit or a 401 certification for either the Outfall 008 or 009 drainages (nor does NASA). Applications for Section 404 permits (e.g., Nationwide Permit 38 [NWP38]) from USACE, and any required Section 401 water quality certifications from the RWQCB, may need to be prepared for the Outfall 008 and 009 drainages, should there be dredge and fill activities subject to such permitting requirements that are performed as part of the ISRA remedial actions.

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7.0 ISRA SCHEDULE AND REPORTING

The following sections present the ISRA implementation schedule and reporting requirements, and provide information regarding the location of document submittals to the RWQCB.

7.1 ISRA SCHEDULE

An implementation schedule for the remaining work to be performed to complete the ISRA effort is presented below. Included in this schedule are data gap sampling, permitting submittal requirements, and other supporting plans for implementation, as well as performance monitoring requirements following plan implementation. The ISRA schedule is contingent on several factors including agency work plan or work plan addenda approval, obtaining several permit authorizations, and data gap and delineation sampling results. However, as shown below and presented in more detail in Figure 7-1, the target ISRA project completion date is prior to the Fall 2012 rainy season.

As described in the Preliminary Work Plan and in Sections 1 and 4, the proposed ISRA schedule accounts for phasing of implementation to allow completion of ongoing work within the Northern Drainage and to accommodate federal funding constraints for work to be performed on NASA property. It is assumed below that implementation of source removal actions will occur in 2009 for the Outfall 008 area and a portion of the Outfall 009 watershed.

<u>Phase I Implementation:</u>

February - May 2009	Delineation and Data Gap Sampling for Outfall 008 and a portion of Outfall 009
May 2009	Submit Final ISRA Work Plan to RWQCB
June - December 2009	Complete required archeological and/or biological surveys for proposed work areas
	Submit permitting packages or permitting amendments for potential implementation areas within drainages
	Prepare supporting plans for ISRA implementation, including Erosion Control Plan, SMP, Traffic Management Plan, and H&S Plan

Summer/Fall 2009	Implement ISRA Work Plan field work and restoration activities following approval by RWQCB, issuance of necessary permits, and completion of required studies/surveys

Phase II Implementation:

June - December 2009	Additional Delineation and Data Gap Sampling (if necessary)
April 2010	Submit Final ISRA Work Plan Addenda to RWQCB (if required based on any additional delineation or data gap sampling) Confirm permitting status and adequacy of other planning documents for 2010 planned efforts and submit modifications if necessary
Summer/Fall 2010	Implement ISRA Work Plan field work and restoration activities following approval by RWQCB, issuance of necessary permits, or completion of required studies/surveys
Summer/Fall 2011	Implement ISRA Work Plan field work and restoration activities following approval by RWQCB, issuance of necessary permits, or completion of required studies/surveys
TBD	Submit ISRA Summary Report (the tentative Cease and Desist Order , pending approval on May 7 or 8, 2009, specifies submittal of a summary report on the ISRA activities by August 31, 2012)

As described in Section 5.7, following ISRA implementation, effectiveness of the soil source removal will be evaluated by the results of surface water samples collected at Outfalls 008 and Outfall 009. These sampling results will be used to determine whether additional ISRA evaluation and potential cleanup actions may be warranted. Effectiveness of the implemented ISRA cleanup activities will be discussed with the RWQCB, and if required, an ISRA Work Plan Addendum will be prepared for RWQCB review and approval.

7.2 ISRA REPORTING

The submittal dates of the ISRA Phase I and Phase II Implementation Reports are uncertain at this time since the CAO indicates that these dates will be determined by the RWQCB following review and approval of this work plan. Because of the phasing of the ISRA work to be performed, Boeing and NASA propose to provide the RWQCB quarterly progress reports until construction field work is complete (targeted Fall/Winter 2011). Boeing will post all project deliverables, including Preliminary and Final Work Plans, supporting plans (H&S Plan, Erosion Control Plans [SWPPP], SMP, Transportation Plan, and permits), Quarterly Progress Reports, and Phase I and Phase II Implementation Reports on their NPDES web site at: ***http://www.boeing.com/aboutus/environment/santa_susana/isra.html***.

Each quarterly progress report will describe:

- Progress made, including type(s) of activity and work performed;
- Summary of confirmation and/or performance sampling results;
- Problems identified / corrective actions recommended; and,
- Activities and work planned for next quarter.

Quarterly ISRA Reports will be submitted on March 31, June 30, September 30, and December 31 each year, and will begin with the first submittal on June 30, 2009.

ISRA Implementation Reports will describe the work performed during each phase, and provide details regarding:

- Field activities, including excavation extent, backfill placement and source, and confirmation sampling results;
- Waste characterization and disposal locations;
- Final site conditions including topographic surveys and restoration activities;
- Performance monitoring results; and,
- Ongoing actions and recommendations as warranted.

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TABLES

Table 1-1
Summary of NPDES Permit Limit Exceedances - Outfalls 008 and 009
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Analyte	Sample Date	Result	Units	2007 Permit Limit	Units	Data Type
Outfall 008, Happy Valley Drainage						
Copper	18-Feb-05	15	μg/L	14	μg/L	Monitoring-only
Lead	20-Oct-04	9.8	μg/L	5.2	μg/L	Monitoring-only
Lead	27-Oct-04	9.0	μg/L	5.2	μg/L	Monitoring-only
Lead	28-Dec-04	6.4	μg/L	5.2	μg/L	Monitoring-only
Lead	18-Feb-05	13	μg/L	5.2	μg/L	Monitoring-only
Lead	18-Oct-05	120	μg/L	5.2	μg/L	Monitoring-only
Lead	1-Jan-06	20	μg/L	5.2	μg/L	Monitoring-only
Lead	15-Apr-06	18	μg/L	5.2	μg/L	Compliance
Lead	25-Jan-08	6.3	μg/L	5.2	μg/L	Compliance
Dioxins / TCDD TEQ	18-Feb-05	4.46E-08	μg/L	2.80E-08	μg/L	Monitoring-only
Dioxins / TCDD TEQ	28-Feb-06	3.19E-07	μg/L	2.80E-08	μg/L	Monitoring-only
Outfall 009, WS-13 Drainage						
Cadmium	17-Oct-05	9.2	μg/L	4.0	μg/L	Monitoring-only
Copper	17-Oct-05	39	μg/L	14	μg/L	Monitoring-only
Copper	18-Feb-06	22	μg/L	14	μg/L	Monitoring-only
Copper	4-Apr-06	26	μg/L	14	μg/L	Compliance
Lead	28-Dec-04	11	μg/L	5.2	μg/L	Monitoring-only
Lead	18-Feb-05	10	μg/L	5.2	μg/L	Monitoring-only
Lead	17-Oct-05	260	μg/L	5.2	μg/L	Monitoring-only
Lead	18-Feb-06	33	μg/L	5.2	μg/L	Monitoring-only
Lead	4-Apr-06	64	μg/L	5.2	μg/L	Compliance
Lead	22-Sep-07	8.6	μg/L	5.2	μg/L	Compliance
Lead	3-Feb-08	6.0	μg/L	5.2	μg/L	Compliance
Lead	15-Dec-08	19	μg/L	5.2	μg/L	Compliance
Mercury	4-Jan-05	0.2	μg/L	0.13	μg/L	Monitoring-only
Mercury	17-Oct-05	0.21	μg/L	0.13	μg/L	Monitoring-only
Oil & Grease	11-Jan-05	16	mg/L	15	mg/L	Compliance
pH	17-Oct-05	8.80	pH units	6.5 - 8.5	pH units	Compliance
Dioxins / TCDD TEQ	4-Jan-05	1.72E-06	μg/L	2.80E-08	μg/L	Monitoring-only
Dioxins / TCDD TEQ	18-Feb-05	5.20E-08	μg/L	2.80E-08	μg/L	Monitoring-only
Dioxins / TCDD TEQ	17-Oct-05	9.10E-04	μg/L	2.80E-08	μg/L	Monitoring-only
Dioxins / TCDD TEQ	9-Nov-05	6.14E-07	μg/L	2.80E-08	μg/L	Monitoring-only
Dioxins / TCDD TEQ	18-Feb-06	1.56E-05	μg/L	2.80E-08	μg/L	Monitoring-only
Dioxins / TCDD TEQ	4-Apr-06	1.77E-05	μg/L	2.80E-08	μg/L	Compliance
Dioxins / TCDD TEQ	19-Feb-07	7.64E-07	μg/L	2.80E-08	μg/L	Compliance
Dioxins / TCDD TEQ	22-Sep-07	3.13E-06	μg/L	2.80E-08	μg/L	Compliance
Dioxins / TCDD TEQ	3-Feb-08	3.58E-07	μg/L	2.80E-08	μg/L	Compliance
Dioxins / TCDD TEQ	26-Nov-08	3.99E-07	μg/L	2.80E-08	μg/L	Compliance
Dioxins / TCDD TEQ	15-Dec-08	1.83E-06	μg/L	2.80E-08	μg/L	Compliance

Notes:

NPDES Permit exceedances are sample results that are greater than the NPDES limit and were collected after the discharge limit was established for that outfall (compliance data above).

Dioxins / TCDD TEQ - A sum of 17 dioxin / furan congener results adjusted for toxicity. The TEQ is calculated by multiplying the result of each congener by its respective World Health Organization's (WHO's) toxic equivalency factor (TEF), which is based on the relative potency of the congener to cause a toxic response relative to 2,3,7,8-TCDD. TCDD TEQ values do not include laboratory data not quantified (DNQ) as specified in the NPDES permit.

TCDD TEQ - tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)

Table 2-1
Remedial Alternatives Screening Evaluation Matrix
(Page 1 of 1)

Source Removal Alternative	Must meet CAO Requirments	Short-Term Effectiveness	Long-Term Effectiveness	Implementability	Environmental Impact / Sustainability	Cost	Overall Ranking
1. No Action	0 Does not meet CAO requirments as source is not removed.	0 Not effective	0 Not effective	5 Easily implemeted	5 No environmenta impact because no action	5 No cost	NA - does not meet CAO requirments
2. Excavation and Offsite Disposal	5 Meets CAO requirement by complete removal of sources	5 Can be implemented quickly and effective immediately upon completion	5 Source completely removed	4 Uses standard , readily available equipment and procedures	3 Short term impacts to stream beds and potential for temporary mobilization of sediments. Relocates COCs without treatment.	3	25
3. Clay Cap	4 Meets CAO requirment by removing source from contact with stormwater, but source remains	4 Implementation will take longer than excavation	3 Clay cap will require routine maintenance to maintain effectiveness. May be subject to erosion, cracking.	2 A suitable source of clean soil may not be available. Not implementable in stream beds or drainages.	4 May change drainage patterns	4	21
4. Geomembrane Cap	4 Meets CAO requirment by removing source from contact with stormwater, but source remains	4 Implementation will take longer than excavation	3 Geomembrane cap will require routine maintenance	2 More difficult to implement that clay cap. Not implementable in stream beds or drainages.	4 May change drainage patterns.	3	20
5. Asphalt Cap	4 Meets CAO requirment by removing source from contact with stormwater, but source remains	2 Implementation will take longer than excavation. Will increase velocity of stormwater runoff and may contribute to increase in downstream erosion.	3 Asphalt cap will require routine maintenance and will deteriorate over time.	2 More difficult to implement that clay cap. Not implementable in stream beds or drainages.	2 Creates an impervious surface which increases run off rate, changes the nearby stream hydrograph and contributes to downstream erosion	3	16
6. Diversion/Collection	2 Does not meet CAO requirement because source is not removed and stormwater is in contact with source, however migration of COCs is restricted.	4 Likely to be effective in the short term but not as effective at removing COCs as excavation.	3 Diversion and collection systems will need routine maintenance and may need periodic repairs and replacement. Can be damaged or ineffective in unexpected large storm events.	4 Readily implemented using standard equipment and methods, however, the availability of appropriate locations to construct diversion and collection structures is unclear.	4 Envronmental impact relatively low, but the change in runoff patterns may change the stream hydrograph and result in habitat alternation	3	20
7. Chemical Addition	3 Does not remove source, but prevents mobilization of COCs	3 Likely to be effective in the short term and can be implemented quickly; however applicability to reduction of mobility of metals is not clear. May increase velocity of stormwater runoff and may contribute to increase in downstream erosion depending on restoration method.	3 Long term effectiveness is unknown. Likely to degrade over time and require re-application.	4 Easily implemented; however, availability and delivery of chemical additives to the site are uncertain	3 Effect of adding polymer to the environment is unknown, especially as chemical degrades over time.	2 Cost likely less than S/S due to less mixing required.	18
8. Solidification/Stabilization	3 Does not remove source but prevents mobilization of COCs; however, likely to increase pH in stormwater	2 Will take longer than excavation to implement and may increase pH of stormwater	4 Effective in the long-term although surface degradation may occur	3 Requires hauling, storing, and mixing Portand cement mixtures. Dust controls will be required. Thorough mixing may be difficult at the ISRA sites.	2 Potential impact from increased pH on stormwater runoff. Portland Cement dust may be released.	1	15

General Notes:

The RWQCB ISRA CAO requires the following:

- Address the sources that are discharging the constituents that exceeded NPDES Permit limits within the Outfall 008 and 009 watersheds;
- Use methods to minimize impacts to the streambed adjacent to habitat during cleanup activities;
- Protect the water quality during and after cleanup activities; and
- Restore the streambed and surrounding habitat following cleanup activities.

Order of magnitude costs for the purposes of relative ranking of alternatives were developed from information provided by the Federal Remediation Technology Round Table website, the Naval Facilities Engineer Command web pages, and professional judgement.

- Subtitle D (clay) cap - $175k/acre, Subtitle C (geomembrane) cap - $225/acre, - Solidification/Stabilization - $165/cubic yard, Asphalt cap - $225/acre, and Excavation - between $20 and $60/ton depending on haul distance and assuming non-hazardous disposal.

Table 3-1
Outfall 008 Data Gap and Source Delineation Sample Results
(Page 1 of 2)

Sample ID	Sample Date	Sample Depth	Results in mg/kg Arsenic	Cadmium	Copper	Lead	Zinc	Dioxins / TCDD TEQ (pg/g)
CNBS0128S001	25-Feb-09	0 - 0.5	--	0.21 J	9.3	16.8	52.6	0.68
CNBS0129S001	25-Feb-09	0 - 0.5	--	0.18 J	8.3	10.8	49.7	--
CNBS0130S001	25-Feb-09	0 - 0.5	--	0.17 J	7.9	12.4	48.2	--
CNBS0131S001	20-Apr-09	0 - 0.5	--	--	X	X	--	X
CNBS0132S001	25-Feb-09	0 - 0.2	--	--	--	2.1	--	--
CNBS0133S001	25-Feb-09	0 - 0.2	--	--	--	5.2	--	--
CNBS0134S001	25-Feb-09	0 - 0.2	--	--	--	6.4	--	0.10
HZBS0062S001	24-Feb-09	0 - 0.5	--	--	12.3 P	13.3	--	**4.33 P**
HZBS0063S001	24-Feb-09	0 - 0.5	--	--	--	25.7	--	--
HZBS0064S001	24-Feb-09	0 - 0.5	--	--	--	11.7	--	--
HZBS0065S001	24-Feb-09	0 - 0.5	--	--	--	13.1	--	--
HZBS0066S001	--	--			*Sample Not Collected (Bedrock)*			
HZBS0067D001	24-Feb-09	0 - 0.5	--	--	--	--	--	0.16
HZBS0067S001	24-Feb-09	0 - 0.5	--	--	--	--	--	0.10
HZBS0068S001	25-Feb-09	0 - 0.5	--	0.4	--	11.7	67.9	--
HZBS0069S001	25-Feb-09	0 - 0.2	--	0.13 J	6.32 P	6.7	47.9	0.323 P
HZBS0070S001	24-Feb-09	0 - 0.5	--	0.22 J	--	13.2	51.3	**1.9**
HZBS0071S001	25-Feb-09	0 - 0.5	--	0.4	--	9.4	45.6	--
HZBS0072S001	25-Feb-09	0 - 0.5	--	0.096 J	--	7.2	54.1	--
HZBS0073S001	24-Feb-09	0 - 0.5	--	--	--	8.3	--	0.17
HZBS0073AS002	20-Mar-09	1.9 - 2.4	--	--	--	--	--	0.19
HZBS0074S001	25-Feb-09	0 - 0.5	--	--	--	8.9	--	--
HZBS0075S001	24-Feb-09	0 - 0.5			*Sample Not Analyzed*			
HZBS0076S001	25-Feb-09	0 - 0.5	--	--	--	11.1	--	--
HZBS0077S001	25-Feb-09	0 - 0.5	--	--	--	13.9	--	0.34
HZBS0078S001	25-Feb-09	0 - 0.5	--	--	--	**53.6**	--	--
HZBS0079S001	24-Feb-09	0 - 0.5	--	--	--	16.2	--	0.23
HZBS0079AS002	20-Mar-09	1.5 - 2.0	--	--	--	--	--	0.012
HZBS0080S001	25-Feb-09	0 - 0.5	--	--	0.404 P	23.2	--	0.259 P
HZBS0081S001	25-Feb-09	0 - 0.5	--	--	X	X	--	X
HZBS0082S001	25-Feb-09	0 - 0.5	--	--	0.328 P	25.5	--	0.399 P
HZBS0082S002	25-Feb-09	3.2 - 3.7	--	--	X	X	--	X
HZBS0083S001	25-Feb-09	0 - 0.5	--	--	--	--	--	0.84
HZBS0084S001	25-Feb-09	0 - 0.5	--	--	1.32 P	15	--	0.275 P
HZBS0085S001	25-Feb-09	0 - 0.5	4	0.37	26.2	28.9	--	--
HZBS0086S001	24-Feb-09	0 - 0.5	4.5	0.4	15.9 J	9.8	--	--
HZBS0087S001	24-Feb-09	0 - 0.5	4.8	0.39	16.9 J	9.6	--	--
HZBS0088D001	24-Feb-09	0 - 0.5	5.4	0.41	15.3 J	12.7	77.5	--
HZBS0088S001	24-Feb-09	0 - 0.5	4.2	0.36	13.9 J	11.1	71.7	--
HZBS0089S001	24-Feb-09	0 - 0.5	--	--	--	14.9	--	**1.4**
HZBS0090S001	24-Feb-09	0 - 0.5	--	--	--	7.6	57.9	0.060
HZBS0091S001	24-Feb-09	0 - 0.3	--	--	--	8	--	--
HZBS0092S001	25-Feb-09	0 - 0.5	2.1	0.21 J	6.1	21	--	--
HZBS0093S001	24-Feb-09	0 - 0.5	4.4	0.38	15.3 J	9.8	--	--
HZBS0094S001	24-Feb-09	0 - 0.5	4.7	0.32	14.8 J	9.5	--	0.52
HZBS0095S001	24-Feb-09	0 - 0.5	4.3	0.39	14.8 J	9.8	--	--
HZBS0096S001	24-Feb-09	0 - 0.5			*Sample Not Analyzed*			
HZBS0097S001	25-Feb-09	0 - 0.5	--	--	--	13.9	--	--

Table 3-1
Outfall 008 Data Gap and Source Delineation Sample Results
(Page 2 of 2)

Sample ID	Sample Date	Sample Depth	Results in mg/kg Arsenic	Cadmium	Copper	Lead	Zinc	Dioxins / TCDD TEQ (pg/g)
HZBS0098S001	20-Mar-09	0 - 0.5	--	--	--	--	--	**1.97**
HZBS0098S002	20-Mar-09	1.0 - 1.5	--	--	--	--	--	0.054
HZBS0099S001	20-Mar-09	0 - 0.5	--	--	--	--	--	**97.5**
HZBS0100S001	20-Mar-09	0 - 0.5	--	--	--	--	--	0.18
HZBS0101S001	20-Mar-09	0 - 0.5	--	--	--	--	--	0.35
HZBS0102S001	20-Mar-09	0 - 0.3	--	--	--	--	--	0.075
HZBS0103S001	20-Mar-09	0 - 0.5	--	--	--	--	--	0.26
HZBS0104S001	20-Mar-09	0 - 0.5	--	--	--	--	--	**3.3**
HZBS0105S001	16-Apr-09	0 - 0.5	--	--	--	--	--	**5.33 P**
HZBS0106S001	16-Apr-09	0 - 0.5	--	--	--	--	--	0.0358 P
HZBS0106S002	16-Apr-09	3.5 - 4.0	--	--	--	--	--	0.00648 P
HZBS0107D001	16-Apr-09	0 - 0.5	--	--	--	--	--	**6.85 P**
HZBS0107S001	16-Apr-09	0 - 0.5	--	--	--	--	--	**7.34 P**
2005 Background Comparison Concentration			***15***	***1***	***29***	***34***	***110***	***0.87***

Notes:

☐ Sample Exceeds the 2005 Background Comparison Concentration (MWH, 2005)

J - Result is estimated
mg/kg - milligrams per kilogram
P - Preliminary data, data has not been validated
pg/g - picograms per gram
TCDD TEQ - tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)
X - result pending
"--" - not analyzed

Dioxins / TCDD TEQ - A sum of 17 dioxin / furan congener results adjusted for toxicity. The TEQ is calculated by multiplying the result of each congener by its respective World Health Organization's (WHO's) toxic equivalency factor (TEF), which is based on the relative potency of the congener to cause a toxic response relative to 2,3,7,8-TCDD. TCDD TEQ values do not include laboratory data not quantified (DNQ) as specified in the NPDES permit.

Table 3-2
Outfall 008 ISRA PEA Chemical and Physical Characteristics
(Page 1 of 1)

Site Name	ISRA COCs Exceeding Background Comparison Concentrations[1]	RCRA Risk Drivers Exceeding Background Comparison Concentrations[1]	Surface Area, Range of Exceedance Depth, Average Exceedance Depth[2], and Volume Estimate	Surface Conditions	Other Physical Parameters of ISRA Area	
PEA-CYN-1	Lead: 2.6x BG	- -	SA = 160 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 110 cy	% with Vegitated Cover = 50% Type of Vegetation = Shrubs % with Impermeable Cover = 0% Surface Roughness = Intermitent	Soil Texture = Coarse Slope Length = 40 feet Elevation Change = 0 feet % Slope = 0%	Distance From Drainage = 340 feet Depth to Groundwater = >10 feet
PEA-DRG-1	Dioxins: 3.8x BG	- -	SA = 190 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 130 cy	% with Vegitated Cover = 75% Type of Vegetation = Grasses, Shrubs % with Impermeable Cover = 15% Surface Roughness = Intermitent	Soil Texture = Medium Slope Length = 55 feet Elevation Change = 20 feet % Slope = 36%	Distance From Drainage = 0 feet Depth to Groundwater = >10 feet
PEA-HVS-1	Dioxins: 5.0x BG Dioxins: 1.6x BG Lead: 1.2x BG	Cadmium: 3.6x BG Zinc: 1.6x BG	SA = 390 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 260 cy	% with Vegitated Cover = 85% Type of Vegetation = Grasses, Shrubs % with Impermeable Cover = 0% Surface Roughness = Intermitent	Soil Texture = Medium Slope Length = 40 feet Elevation Change = 10 feet % Slope = 25%	Distance From Drainage = 40 feet Depth to Groundwater = >10 feet
PEA-HVS-2A	Lead: 2.1x BG Lead: 1.6x BG Lead: 1.3x BG Lead: 1.2x BG	- -	SA = 3,200 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 2,100 cy	% with Vegitated Cover = 80% Type of Vegetation = Grasses, Shrubs % with Impermeable Cover = 40% Surface Roughness = Intermitent	Soil Texture = Medium Slope Length = 220 feet Elevation Change = 40 feet % Slope = 18%	Distance From Drainage = 170 feet Depth to Groundwater = >10 feet
PEA-HVS-2B	Copper: 14.3x BG Copper: 2.6x BG Copper: 2.4x BG Copper: 1.7x BG Copper: 1.3x BG Lead: 1.2x BG	Arsenic: 1.6x BG Cadmium: 1.2x BG Cadmium: 1.1x BG	SA = 1,000 yd^2 Depth Range = 0 - 3.5 feet Depth Average = 2 feet (0.67 yards) Volume = 700 cy	% with Vegitated Cover = 40% Type of Vegetation = Grasses, Shrubs % with Impermeable Cover = 5% Surface Roughness = Intermitent *Note: BMP in place in southern portion (gravel rock crib)*	Soil Texture = Medium Slope Length = 140 feet Elevation Change = 30 feet % Slope = 21%	Distance From Drainage = 30 feet Depth to Groundwater = >10 feet
PEA-HVS-2C	Lead: 1.0x BG	Cadmium: 4.8x BG Cadmium: 2.8x BG Zinc: 1.2x BG Zinc: 1.4x BG	SA = 580 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 390 cy	% with Vegitated Cover = 80% Type of Vegetation = Grasses, Shrubs % with Impermeable Cover = 15% Surface Roughness = Intermitent	Soil Texture = Medium / Fine Slope Length = 45 feet Elevation Change = 20 feet % Slope = 44%	Distance From Drainage = 130 feet Depth to Groundwater = >10 feet
PEA-HVS-3	Dioxins: 111x BG Dioxins: 8.4x BG Dioxins: 6.1x BG	- -	SA = 740 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 500 cy	% with Vegitated Cover = 65% Type of Vegetation = Shrubs, Bushes % with Impermeable Cover = 0% Surface Roughness = Intermitent	Soil Texture = Fine Slope Length = 40 feet Elevation Change = 10 feet % Slope = 25%	Distance From Drainage = 100 feet Depth to Groundwater = >10 feet

General Notes:

1 - Background comparison concentration (MWH, 2005):
- Arsenic: 15 mg/kg
- Cadmium: 1 mg/kg
- Copper: 29 mg/kg
- Dioxin / TCDD TEQ: 0.87 pg/g
- Lead: 34 mg/kg
- Zinc: 110 mg/kg

1.6x BG - Analyte detected in a soil sample at a concentration approximately 1.6 times the background comparison concentration (MWH, 2005).
BMP - Best Management Practice
COCs - constituents of concern
cy - cubic yards
mg/kg - milligrams per kilogram
pg/g - picograms per gram
SA - Surface Area
TCDD TEQ - tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)

Table 3-3
Outfall 008 ISRA PEA Criteria Evaluation Matrix
(Page 1 of 1)

Site Name	ISRA Area Identification Evaluation Criteria (Rate 0 to 5)							Total	Rank
	Concentration of ISRA COCs Compared to Background[1] 0 - <1.2x BG 1 - ≥1.2x BG and <2x BG 3 - ≥2x BG and <10x BG 5 - ≥10x BG	Concentration of non-ISRA Compounds Compared to Background[1] 0 - <1.2x BG 1 - ≥1.2x BG and <2x BG 3 - ≥2x BG and <10x BG 5 - ≥10x BG	Volume of Contamination Present 1 - <200 cy 3 - ≥ 200 cy and <1,000 cy 5 - ≥ 1,000 cy	Minimum Depth of Exceedance 1 - ≥ 5 feet bgs 3 - ≥ 2 feet bgs and <5 feet bgs 5 - <2 feet bgs	Physical and Geochemical Parameters Contributing to Contaminatnt Transport (See Table 3-4) (Rate 0 to 7)	Proximity to Drainage 1 - ≥ 200 feet 3 - ≥ 50 feet and <200 feet 5 - <50 feet	% of Impervious Surface 0 - 100% Covered 1 - ≥75% and <100 % Covered 3 - ≥25% and <75 % Covered 5 - <25% Covered		
PEA-CYN-1	3	0	1	5	2.2	1	5	17.2	7
PEA-DRG-1	3	0	1	5	3.2	5	5	22.2	6
PEA-HVS-1	3	3	3	5	3.1	5	5	27.1	2
PEA-HVS-2A	3	0	5	5	3.3	3	3	22.3	5
PEA-HVS-2B	5	1	3	5	3.7	5	5	27.7	1
PEA-HVS-2C	0	3	3	5	3.5	3	5	22.5	4
PEA-HVS-3	5	0	3	5	4	3	5	25	3

General Notes:

1 - Background comparison concentration (MWH, 2005):
- Arsenic: 15 mg/kg
- Cadmium: 1 mg/kg
- Copper: 29 mg/kg
- Dioxin / TCDD TEQ: 0.87 pg/g
- Lead: 34 mg/kg
- Zinc: 110 mg/kg

Sites are rated for each criterion based on the potential for contaminant contribution to surface water (Table 3-2 summarizes the conditions present within each PEA)

Rating Scale is from 0 to 5 or 0 to 7, with 0 representing the lowest potential for contaminant contributor to surface water and either 5 or 7 representing the highest potential

1.6x BG - Analyte detected in a soil sample at a concentration approximately 1.6 times the background comparison concentration (MWH, 2005).
COCs - constituents of concern
cy - cubic yards
feet bgs - feet below ground surface
mg/kg - milligrams per kilogram
pg/g - picograms per gram
TCDD TEQ - tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)

Table 3-4
Outfall 008 ISRA PEA Criteria Evaluation - Physical and Geochemical Parameters
(Page 1 of 1)

Site Name	ISRA Area Identification Evaluation Criteria - Physical and Geochemical Parameters Contributing to Contaminant Transport (Rate 0 to 1)							Total (Input for Table 3-3)
	Soil Texture 0.2 - Coarse (sand, loamy sand, sandy loam, etc.) 0.6 - Medium (loam, fine sandy loam, clay loam, etc.) 1.0 - Fine (silt, silty loam, silty clay loam, etc.)	Average % Slope 0 - <2% 0.2 - ≥2% and <5% 0.4 - ≥5% and <10% 0.6 - ≥10% and <20% 0.8 - ≥20% and <30% 1.0 - ≥30%	Average Legth of Slope 0.2 - <75 feet 0.4 - ≥75 feet and <150 feet 0.6 - ≥150 feet and <500 feet 0.8 - ≥500 feet and <1,000 feet 1.0 - ≥1,000 feet	Type of Vegetation 0.2 - Grasses 0.6 - Shrubs, Bushes 1.0 - Bare	% of Vegetative Cover 0 - 100% Covered 0.2 - ≥75% and <100% Covered 0.4 - ≥50% and <75% Covered 0.6 - ≥25% and <50% Covered 0.8 - ≥10% and <25% Covered 1 - <10% Covered	Surface Roughness 0.2 - Continuous (berms, furrows, depressions, etc.) 0.6 - Intermittent (both smooth areas and berms, depressions, etc.) 1.0 - Smooth (no berms, depressions, etc.)	Depth to Groundwater 0.2 - ≥10 feet 0.4 - ≥6 feet and <10 feet 0.6 - ≥3 feet and <6 feet 0.8 - ≥1 foot and <3 feet 1.0 - <1 foot	
PEA-CYN-1	0.2	0	0.2	0.6	0.4	0.6	0.2	2.2
PEA-DRG-1	0.6	1.0	0.2	0.4	0.2	0.6	0.2	3.2
PEA-HVS-1	0.6	0.8	0.2	0.5	0.2	0.6	0.2	3.1
PEA-HVS-2A	0.6	0.6	0.6	0.5	0.2	0.6	0.2	3.3
PEA-HVS-2B	0.6	0.8	0.4	0.5	0.6	0.6	0.2	3.7
PEA-HVS-2C	0.8	1.0	0.2	0.5	0.2	0.6	0.2	3.5
PEA-HVS-3	1.0	0.8	0.2	0.6	0.4	0.8	0.2	4.0

General Notes:

Sites are rated for each criteria based on the potential for contaminant contribution to surface water (Table 3-2 summarizes the conditions present within each PEA)

Rating Scale is from 0 to 1 with 0 representing the lowest potential for contaminant contributor to surface water and 1 representing the highest potential

Total is input in Table 3-3.

Table 3-5
Outfall 008 ISRA Area Remedial Action Summary
(Page 1 of 1)

Site Name	ISRA COCs Exceeding Background Comparison Concentrations[1]	RCRA Risk Drivers Exceeding Background Comparison Concentrations[1]	Surface Area, Range of Exceedance Depth, Average Exceedance Depth[2], and *Ex Situ* Volume Estimate[3]	Remedial Action	Soil Remediation Goals[4]
CYN-1	Lead	- -	SA = 160 yd^2 Depth Range = 0 -2 feet Depth Average = 2 feet (0.67 yards) Volume = 140 cy	Excavation	Lead = 34 mg/kg
DRG-1	Dioxins	- -	SA = 190 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 170 cy	Excavation	Dioxins = 3 pg/g
HVS-1	Dioxins Lead	Cadmium Zinc	SA = 390 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 340 cy	Excavation	Dioxins = 3 pg/g Lead = 34 mg/kg
HVS-2A	Lead	- -	SA = 3,200 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 2,800 cy	Excavation	Lead = 34 mg/kg
HVS-2B	Copper Lead	Arsenic Cadmium	SA = 1,000 yd^2 Depth Range = 0 - 3.5 feet Depth Average = 2 feet (0.67 yards) Volume = 900 cy	Excavation	Copper = 29 mg/kg Lead = 34 mg/kg
HVS-2C	Lead	Cadmium Zinc	SA = 580 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 510 cy	Excavation	Lead = 34 mg/kg
HVS-3	Dioxins	- -	SA = 740 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 640 cy	Excavation	Dioxins = 3 pg/g

General Notes:

1 - Background comparison concentration (MWH, 2005):
- Arsenic: 15 mg/kg
- Cadmium: 1 mg/kg
- Copper: 29 mg/kg
- Dioxin / TCDD TEQ: 0.87 pg/g
- Lead: 34 mg/kg
- Zinc: 110 mg/kg

2 - Average exceedance depth used to estimate volume

3 - Assumes 30% fluff of *ex situ* soils

4 - Soil Remediation Goals are established only for ISRA COCs and, as noted in Section 2.3, are consistent with or near 2005 background comparison concentrations for metals and within approximately 3 times 2005 background comparison concentrations for dioxins (MWH, 2005). The values listed above are based on the 2005 background comparison concentrations of ISRA COCs, and are provided for remedial planning purposes. Also, the 2005 soil background data are being re-evaluated by DTSC and, as necessary, the Soil Remediation Goals may be revised.

"--" - not applicable
cy - cubic yards
mg/kg - milligrams per kilogram
pg/g - picograms per gram
SA - Surface Area
TCDD TEQ - tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)
yds - yards
yd^2 - square yards

Table 4-1
Outfall 009 Data Gap and Source Delineation Sample Results
(Page 1 of 1)

Sample ID	Sample Date	Sample Depth	Results in mg/kg Cadmium	Copper	Lead	Mercury	Dioxins / TCDD TEQ (pg/g)
EVBS1138	--	--	*Sample Not Collected (Concrete Cover)*				
EVBS1139S001	24-Mar-09	0 - 0.5	--	19.8	--	--	--
EVBS1139D001	24-Mar-09	0 - 0.5	--	20	--	--	--
EVBS1140S001	24-Mar-09	0 - 0.5	--	--	--	--	0.25
EVBS1141S001	24-Mar-09	0 - 0.5	--	--	--	--	8.17
EVBS1141S002	24-Mar-09	3.75 - 4.25	--	--	--	--	0.37
EVBS1142S001	24-Mar-09	0 - 0.5	--	--	--	--	2.27
EVBS1143S001	24-Mar-09	0 - 0.5	--	--	--	--	0.63
EVBS1144S001	24-Mar-09	0 - 0.5	0.174 J	--	10.30	0.017	--
EVBS1144S002	24-Mar-09	4.0 - 4.5	0.119 J	--	5.45	0.00387 J	--
EVBS1145S001	24-Mar-09	0 - 0.5	0.0948 J	--	6.60	0.0134	--
EVBS1146S001	24-Mar-09	0 - 0.5	0.0955 J	--	7.19	0.00899	--
2005 Background Comparison Concentration			***1***	***29***	***34***	***0.09***	***0.87***

Notes:
☐ Sample Exceeds the 2005 Background Comparison Concentration (MWH, 2005)

J - Result is estimated
mg/kg - milligrams per kilogram
pg/g - picograms per gram
TCDD TEQ - tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)
"--" - not analyzed

Dioxins / TCDD TEQ - A sum of 17 dioxin / furan congener results adjusted for toxicity. The TEQ is calculated by multiplying the result of each congener by its respective World Health Organization's (WHO's) toxic equivalency factor (TEF), which is based on the relative potency of the congener to cause a toxic response relative to 2,3,7,8-TCDD. TCDD TEQ values do not include laboratory data not quantified (DNQ) as specified in the NPDES permit.

Table 4-2
Outfall 009 ISRA PEA Chemical and Physical Characteristics
(Page 1 of 1)

Site Name	ISRA COCs Exceeding Background Comparison Concentrations[1]	RCRA Risk Drivers Exceeding Background Comparison Concentrations[1]	Surface Area, Range of Exceedance Depth, Average Exceedance Depth[2], and Volume Estimate	Surface Conditions	Other Physical Parameters of ISRA Area	
PEA-ELV-1A	Copper: 1.2x BG	- -	SA = 568 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 379 cy	% with Vegitated Cover = 0 % Type of Vegetation = None % with Impermeable Cover = 100 % Surface Roughness = Smooth	Soil Texture = Medium Slope Length = 83 feet Elevation Change = 0 feet % Slope = 0	Distance From Drainage = 363 feet Depth to Groundwater >10 feet
PEA-ELV-1B	Cadmium: 3.7x BG Lead: 1.7 x BG Mercury: 2.3x BG	- -	SA = 893 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 600 cy	% with Vegitated Cover = 53 % Type of Vegetation = Grasses, Shrubs % with Impermeable Cover = 47 % Surface Roughness = Intermitent	Soil Texture = Medium Slope Length = 86 feet Elevation Change = 26 feet % Slope = 30	Distance From Drainage = 322 feet Depth to Groundwater >10 feet
PEA-ELV-1C	Dioxins: 965x BG	- -	SA = 1,156 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 770 cy	% with Vegitated Cover = 78 % Type of Vegetation = Grasses, Shrubs % with Impermeable Cover = 22 % Surface Roughness = Intermitent	Soil Texture = Medium Slope Length = 39 feet Elevation Change = 8 feet % Slope = 21	Distance From Drainage = 349 feet Depth to Groundwater >10 feet
PEA-ELV-1D	Cadmium: 7.3x BG Copper: 2.2x BG Dioxins: 11.9x BG Lead: 3.5x BG Mercury: 2x BG	TCE[3]: 30,000x HH RBSL	SA = 1,240 yd^2 Depth Range = 0 - 3 feet Depth Average = 2 feet (0.67 yards) Volume = 830 cy	% with Vegitated Cover = 100 % Type of Vegetation = Grasses, Shrubs % with Impermeable Cover = 0 % Surface Roughness = Intermitent	Soil Texture = Medium Slope Length = 164 feet Elevation Change = 40 feet % Slope = 24	Distance From Drainage = 157 feet Depth to Groundwater >10 feet

General Notes:

1 - Background comparison concentration (MWH, 2005):
- Cadmium: 1 mg/kg
- Copper: 29 mg/kg
- Dioxin / TCDD TEQ: 0.87 pg/g
- Lead: 34 mg/kg
- Mercury: 0.09 mg/kg
- VOCs: no background comparison concentration

2 - Average exceedance depth used to estimate volume

3 - There is no background comparison criteria for TCE, but the maximum concentration of 66 mg/kg was compared to the Human Health Residential Risk-based Screening Level of 0.0022 mg/kg currently used in the RCRA Program.

1.6x BG - Analyte detected in a soil sample at a concentration approximately 1.6 times the background comparison concentration (MWH, 2005).
COCs - constituents of concern
cy - cubic yards
HH RBSL - Human Health Residential Risk-based Screening Level
mg/kg - milligrams per kilogram
pg/g - picograms per gram
SA - Surface Area
TCDD TEQ - tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)
TCE - trichloroethene
VOCs - volatile organic compounds
yd^2 - square yards

Table 4-3
Outfall 009 ISRA PEA Criteria Evaluation Matrix
(Page 1 of 1)

Site Name	ISRA Area Identification Evaluation Criteria (Rate 0 to 5)							Total	Rank
	Concentration of ISRA COCs Compared to Background[1] 0 - <1.2x BG 1 - ≥1.2x BG and <2x BG 3 - ≥2x BG and <10x BG 5 - ≥10x BG	Concentration of non-ISRA Compounds Compared to Background[1] 0 - <1.2x BG 1 - ≥1.2x BG and <2x BG 3 - ≥2x BG and <10x BG 5 - ≥10x BG	Volume of Contamination Present 1 - <200 cy 3 - ≥ 200 cy and <1,000 cy 5 - ≥ 1,000 cy	Minimum Depth of Exceedance 1 - ≥ 5 feet bgs 3 - ≥ 2 feet bgs and <5 feet bgs 5 - <2 feet bgs	Physical and Geochemical Parameters Contributing to Contaminatnt Transport (See Table 4-4) (Rate 0 to 7)	Proximity to Drainage 1 - ≥ 200 feet 3 - ≥ 50 feet and <200 feet 5 - <50 feet	% of Impervious Surface 0 - 100% Covered 1 - ≥75% and <100 % Covered 3 - ≥25% and <75 % Covered 5 - <25% Covered		
PEA-ELV-1A	**1**	**0**	**3**	**5**	**2.6**	**1**	**0**	**12.6**	**4**
PEA-ELV-1B[3]	**3**	**0**	**2**	**5**	**2.9**	**1**	**1**	**14.9**	**3**
PEA-ELV-1C	**5**	**0**	**4**	**5**	**3.8**	**1**	**5**	**23.8**	**2**
PEA-ELV-1D	**5**	**5**	**4**	**5**	**2.9**	**3**	**5**	**29.9**	**1**

General Notes:

1 - Background comparison concentration (MWH, 2005):
- Cadmium: 1 mg/kg
- Copper: 29 mg/kg
- Dioxin / TCDD TEQ: 0.87 pg/g
- Lead: 34 mg/kg
- Mercury: 0.09 mg/kg
- VOCs: no background comparison concentration

2 - There is no background comparison criteria for TCE, but the maximum concentration of 66 mg/kg was compared to the Human Health Residential Risk-based Screening Level of 0.0022 mg/kg currently used in the RCRA Program.

3 - Only one sample location within PEA-ELV-1B had a soil concentrations above background and it was located beneath pavement. This is reflected in the values assigned to the % of impervious surface and volume of contamination.

Sites are rated for each criteria based on the potential for contaminant contribution to surface water (Table 4-2 summarizes the conditions present within each PEA)

Rating Scale is from 0 to 5 or 0 to 7, with 0 representing the lowest potential for contaminant contributor to surface water and either 5 or 7 representing the highest potential

1.6x BG - Analyte detected in a soil sample at a concentration approximately 1.6 times the background comparison concentration (MWH, 2005).
COCs - constituents of concern
cy - cubic yards
feet bgs - feet below ground surface
mg/kg - milligrams per kilogram
pg/g - picograms per gram
TCDD TEQ - tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)
TCE - trichloroethene
VOCs - volatile organic compounds

Table 4-4
Outfall 009 ISRA PEA Criteria Evaluation - Physical and Geochemical Parameters
(Page 1 of 1)

Site Name	ISRA Area Identification Evaluation Criteria - Physical and Geochemical Parameters Contributing to Contaminant Transport (Rate 0 to 1)							Total (Input for Table 4-3)
	Soil Texture 0.2 - Coarse (sand, loamy sand, sandy loam, etc.) 0.6 - Medium (loam, fine sandy loam, clay loam, etc.) 1.0 - Fine (silt, silty loam, silty clay loam, etc.)	Average % Slope 0 - <2% 0.2 - ≥2% and <5% 0.4 - ≥5% and <10% 0.6 - ≥10% and <20% 0.8 - ≥20% and <30% 1.0 - ≥30%	Average Legth of Slope 0.2 - <75 feet 0.4 - ≥75 feet and <150 feet 0.6 - ≥150 feet and <500 feet 0.8 - ≥500 feet and <1,000 feet 1.0 - ≥1,000 feet	Type of Vegetation 0.2 - Grasses 0.6 - Shrubs, Bushes 1.0 - Bare	% of Vegetative Cover 0 - 100% Covered 0.2 - ≥75% and <100% Covered 0.4 - ≥50% and <75% Covered 0.6 - ≥25% and <50% Covered 0.8 - ≥10% and <25% Covered 1 - <10% Covered	Surface Roughness 0.2 - Continuous (berms, furrows, depressions, etc.) 0.6 - Intermittent (both smooth areas and berms, depressions, etc.) 1.0 - Smooth (no berms, depressions, etc.)	Depth to Groundwater 0.2 - ≥10 feet 0.4 - ≥6 feet and <10 feet 0.6 - ≥3 feet and <6 feet 0.8 - ≥1 foot and <3 feet 1.0 - <1 foot	
PEA-ELV-1A	0.2	0	0.2	1	0	1	0.2	2.6
PEA-ELV-1B[1]	0.2	0.7	0.4	0.4	0.4	0.6	0.2	2.9
PEA-ELV-1C	0.2	0.8	0.6	0.6	0.8	0.6	0.2	3.8
PEA-ELV-1D	0.2	0.8	0.6	0.5	0	0.6	0.2	2.9

General Notes:

Sites are rated for each criteria based on the potential for contaminant contribution to surface water (Table 4-2 summarizes the conditions present within each PEA)

Rating Scale is from 0 to 1 with 0 representing the lowest potential for contaminant contributor to surface water and 1 representing the highest potential

Total is input in Table 4-3

1 - Only one sample location within PEA-ELV-1B had a soil concentrations above background and it was located beneath pavement in an area where the slope is 0. This is reflected in the values assigned to the Average % Slope.

Table 4-5
Outfall 009 ISRA Area Remedial Action Summary
(Page 1 of 1)

Site Name	ISRA COCs Exceeding Background Comparison Concentrations[1]	RCRA Risk Drivers Exceeding Background Comparison Concentrations[1]	Surface Area, Range of Exceedance Depth, Average Exceedance Depth[2], and *Ex Situ* Volume Estimate[3]	Remedial Action	Soil Remediation Goals[4]
ELV-1A	Copper	--	SA = 568 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 490 cy	No Action	--
ELV-1B	Cadmium Lead Mercury	--	SA = 893 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 780 cy	No Action	--
ELV-1C	Dioxins	--	SA = 1156 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 1,010 cy	Excavation	Dioxins = 3 pg/g
ELV-1D	Cadmium Copper Dioxins Lead Mercury	TCE[5]	SA = 1,240 yd^2 Depth Range = 0 - 2 feet Depth Average = 2 feet (0.67 yards) Volume = 1,100 cy	Excavation	Cadmium = 1 mg/kg Copper = 29 mg/kg Dioxins = 3 pg/g Lead = 34 mg/kg Mercury = 0.09 mg/kg

<u>**General Notes:**</u>

1 - Background comparison concentration (MWH, 2005):
- Cadmium: 1 mg/kg
- Copper: 29 mg/kg
- Dioxin / TCDD TEQ: 0.87 pg/g
- Lead: 34 mg/kg
- Mercury: 0.09 mg/kg
- VOCs: no background comparison concentration

2 - Average exceedance depth used to estimate volume

3 - Assumes 30% fluff of *ex situ* soils

4 - Soil Remediation Goals are established only for ISRA COCs and, as noted in Section 2.3, are consistent with or near 2005 background comparison concentrations for metals and within approximately 3 times 2005 background comparison concentrations for dioxins (MWH, 2005). The values listed above are based on the 2005 background comparison concentrations of ISRA COCs, and are provided for remedial planning purposes. Also, the 2005 soil background data are being re-evaluated by DTSC and, as necessary, the Soil Remediation Goals may be revised.

5 - There is no background comparison criteria for TCE, but the maximum concentration of 66 mg/kg was compared to the Human Health Residential Risk-based Screening Level of 0.0022 mg/kg currently used in the RCRA Program.

"--" - not applicable
cy - cubic yards
mg/kg - milligrams per kilogram
pg/g - picograms per gram
SA - Surface Area
TCDD TEQ - tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)
TCE - trichloroethene
VOCs - volatile organic compounds
yd^2 - square yards

Table 5-1
Confirmation Soil Sample Analytical Reporting Limits
(Page 1 of 1)

Parameter	Laboratory Method	Reporting Limit	Units
Metals			
Arsenic	EPA 6020	0.5	mg/kg
Cadmium	EPA 6020	0.2	mg/kg
Copper	EPA 6020	0.2	mg/kg
Lead	EPA 6020	0.4	mg/kg
Mercury	EPA 7471A	0.01	mg/kg
Zinc	EPA 6020	5	pg/g
Dioxins			
2,3,7,8-TCDD	EPA 1613	1	pg/g
1,2,3,7,8-PeCDD	EPA 1613	5	pg/g
1,2,3,4,7,8-HxCDD	EPA 1613	5	pg/g
1,2,3,6,7,8-HxCDD	EPA 1613	5	pg/g
1,2,3,7,8,9-HxCDD	EPA 1613	5	pg/g
1,2,3,4,6,7,8-HpCDD	EPA 1613	5	pg/g
OCDD	EPA 1613	10	pg/g
2,3,7,8-TCDF	EPA 1613	1	pg/g
1,2,3,7,8-PeCDF	EPA 1613	5	pg/g
2,3,4,7,8-PeCDF	EPA 1613	5	pg/g
1,2,3,4,7,8-HxCDF	EPA 1613	5	pg/g
1,2,3,6,7,8-HxCDF	EPA 1613	5	pg/g
2,3,4,6,7,8-HxCDF	EPA 1613	5	pg/g
1,2,3,7,8,9-HxCDF	EPA 1613	5	pg/g
1,2,3,4,6,7,8-HpCDF	EPA 1613	5	pg/g
1,2,3,4,7,8,9-HpCDF	EPA 1613	5	pg/g
OCDF	EPA 1613	10	pg/g
Total TCDD	EPA 1613	1	pg/g
Total PeCDD	EPA 1613	5	pg/g
Total HxCDD	EPA 1613	5	pg/g
Total HpCDD	EPA 1613	5	pg/g
Total HpCDF	EPA 1613	5	pg/g

General Notes:

Parameters listed include the ISRA Area COCs for Outfall 008 and Outfall 009 presented in this work plan.
"--" - not applicable
EPA - Environmental Protection Agency
mg/kg - milligrams per kilogram
pg/g - picograms per gram

Table 5-2
Performance Sample Analytical Reporting Limits
(Page 1 of 1)

Parameter	Laboratory Method	Reporting Limit	Units
Metals			
Total Cadmium	EPA 200.8	1.0	µg/L
Dissolved Cadmium	EPA 200.8	1.0	µg/L
Total Copper	EPA 200.8	2.0	µg/L
Dissolved Copper	EPA 200.8	2.0	µg/L
Total Lead	EPA 200.8	1.0	µg/L
Dissolved Lead	EPA 200.8	1.0	µg/L
Total Mercury	EPA 245.1	0.2	µg/L
Dissolved Mercury	EPA 245.1	0.2	µg/L
Dioxins			
2,3,7,8-TCDD	EPA 1613	5.0	pg/L
1,2,3,7,8-PeCDD	EPA 1613	25	pg/L
1,2,3,4,7,8-HxCDD	EPA 1613	25	pg/L
1,2,3,6,7,8-HxCDD	EPA 1613	25	pg/L
1,2,3,7,8,9-HxCDD	EPA 1613	25	pg/L
1,2,3,4,6,7,8-HpCDD	EPA 1613	25	pg/L
OCDD	EPA 1613	50	pg/L
2,3,7,8-TCDF	EPA 1613	5.0	pg/L
1,2,3,7,8-PeCDF	EPA 1613	25	pg/L
2,3,4,7,8-PeCDF	EPA 1613	25	pg/L
1,2,3,4,7,8-HxCDF	EPA 1613	1.2	pg/L
1,2,3,6,7,8-HxCDF	EPA 1613	0.92	pg/L
2,3,4,6,7,8-HxCDF	EPA 1613	25	pg/L
1,2,3,7,8,9-HxCDF	EPA 1613	25	pg/L
1,2,3,4,6,7,8-HpCDF	EPA 1613	1.2	pg/L
1,2,3,4,7,8,9-HpCDF	EPA 1613	8.9	pg/L
OCDF	EPA 1613	50	pg/L
Total TCDD	EPA 1613	5.0	pg/L
Total PeCDD	EPA 1613	9.2	pg/L
Total HxCDD	EPA 1613	9.4	pg/L
Total HpCDD	EPA 1613	6.6	pg/L
Total HpCDF	EPA 1613	1.2	pg/L
Total HxCDF	EPA 1613	25	pg/L
Total PeCDF	EPA 1613	1.4	pg/L
Total TCDF	EPA 1613	5.0	pg/L

General Notes:

Parameters listed include the ISRA Area COCs for Outfall 008 and Outfall 009 presented in this work plan.
"--" - not applicable
EPA - Environmental Protection Agency
µg/L - micrograms per liter
pg/L - picograms per liter