TETRA TECH

# Removal Action Report

## Actions Implemented Under
## Removal Actions No. 1, No. 2, and No. 3
## Hickam Communities Remedial Action Site
## Joint Base Pearl Harbor-Hickam
## Oʻahu, Hawaiʻi

**June 7, 2012**

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**Hickam Communities Remedial Action Site**
**Joint Base Pearl Harbor-Hickam**
**O‘ahu, Hawai‘i**

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| > | greater than |
| < | less than |
| µg/m$^3$ | micrograms per cubic meter |
| ACGIH | American Conference of Governmental Industrial Hygienists |
| AL | alternative action level |
| *APRA Memo* | *Revised Analysis of Potential Removal Alternatives Memorandum* |
| COPC | chemicals of potential concern |
| CY | cubic yard |
| D/B | Design/Build |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethylene |
| DDT | dichlorodiphenyltrichloroethane |
| DU | decision unit |
| EHMP | Exposure Hazard Management Plan |
| EPA | US Environmental Protection Agency |
| HAFB | Hickam Air Force Base |
| HC | Hickam Communities LLC |
| HC Action Plan | Developed for RO #1; the actions taken under the HC Action Plan are now referred to as RO #1. |
| HDOH | Hawai‘i Department of Health |
| *HHRA* | *Summary of Human Health Risk Assessment of Chlordane (including Heptachlor and Heptachlor Epoxide), Dieldrin, and Aldrin in Soil, Hickam Community Housing Areas, Hickam Air Force Base, Hawai‘i.* |
| HHRE | Human Health Risk Evaluation |
| *HHRE WP* | *Preliminary Human Health Risk Evaluation Work Plan for Hickam Communities* |
| HI | Hazard Index |
| JBPHH | Joint Base Pearl Harbor-Hickam |
| Lend Lease | Lend Lease Americas LLC |
| LOAEL | Lowest Observable Adverse Effects Level |
| *LUCID* | *Land Use Control Inventory Document* |
| mg/kg | milligram per kilogram |
| MI | multi-incremental |
| *MPPIS* | *Management Plan for Pesticide-Impacted Soils* |
| NAAQS | National Ambient Air Quality Standard |
| NOAEL | No Observable Adverse Effects Level |
| PEL | Permissible Exposure Limit |

| | |
|---|---|
| PI | pesticide-impacted |
| PI soil | Pesticide-impacted soil is defined as soil having organochlorine pesticide concentrations, specifically aldrin, chlordane, and dieldrin, exceeding the applicable site-specific risk criteria established for HC. |
| $PM_{10}$ | fine particulate matter equal to or less than 10 microns |
| *Program Manual* | *Pesticide-Impacted Soil Investigation and Management Plan* |
| PUF | polyurethane foam |
| RAA | Remedial Alternatives Assessment |
| RAR | Removal Action Report |
| REG | Residential Exposure Goal |
| RfD | oral reference dose |
| RI | Remedial Investigation |
| RO | removal action |
| RO #1 | Removal Action No. 1 |
| RO #2 | Removal Action No. 2 |
| RO #3 | Removal Action No. 3 |
| SI | Site Investigation |
| SoFR | Summary of Findings Report |
| sq ft | square feet |
| *Tech Memo* | *Technical Memorandum for the Actions Implemented under Removal Action No. 1* |
| technical chlordane | Technical chlordane (referred to as “chlordane” in the Program Manual) is a mixture of more than 140 related compounds. Major constituents of technical chlordane include alpha- and gamma-chlordane, chlordane, and heptachlor. |
| *TGM* | *Technical Guidance Manual – Interim Final* |
| TLV | Threshold Limit Value |
| US OSHA | Occupational Safety and Health Administration |
| VSI | visual site inspection |

# 1.0 INTRODUCTION AND PURPOSE

Tetra Tech has prepared this Removal Action Report (RAR) on behalf of Hickam Communities LLC (HC) for the removal actions (ROs) conducted between October 2010 and August 2011 at the HC Remedial Action Site, Joint Base Pearl Harbor-Hickam (JBPHH), O'ahu, Hawai'i (hereinafter the "Site"). The HC Remedial Action Site consists of the neighborhoods Hale Na Koa I-1, Earhart I-2, Earhart I-3, and Onizuka II-1 (Figure 1-1). The purpose of the ROs was to immediately reduce the risk of exposure from organochlorine pesticides in soil to HC workers, residents, and guests. Soil containing organochlorine pesticides at the Site is referred to as pesticide-impacted (PI) soil throughout the RAR[1]. The ROs conducted at the Site are part of the response action process as presented in the Hawai'i Department of Health (HDOH) *Technical Guidance Manual – Interim Final* (*TGM*)[2], and were implemented as part of a long-term Remedial Action in accordance with the *Voluntary Agreement for Environmental Response Actions (Voluntary Agreement)* between HDOH and HC[3]. This RAR has been revised based on comments to the RAR which were received from the HDOH in its letters dated May 27, 2011, October 31, 2011, February 3, 2012, and April 16, 2012.[4]

The RAR documents the implementation of three ROs at the Site, which are referred to as Removal Action No. 1 (RO #1), Removal Action No. 2 (RO #2), and Removal Action No. 3 (RO #3) throughout the report. The RAR presents the rationale of the risk-based actions under which the ROs were developed, and the results of the environmental oversight conducted during RO implementation, and any other activities conducted as part of the RO process (e.g. import soil testing and air monitoring).

## 1.1 Document Organization

The report is organized as follows:

**Section 1.0:** Introduction and Purpose. Presents an introduction and overview of the three ROs conducted at the Site.

**Section 2.0:** Background. Presents the background information for the Site including the environmental setting, historic and current land use, and the applicable risk criteria used to implement the ROs.

**Section 3.0:** Description of Release. This section provides a description and discussion of the release and the conditions preceding and initiating the decision to conduct the RO.

**Section 4.0:** Removal Action Tasks. This section presents a discussion of the development and decision making process for the ROs implemented at the Site.

**Section 5.0:** Removal Action Implementation. This section contains a detailed presentation of how each of the ROs were implemented, and includes the results of import soil

[1] Pesticide-impacted soil is defined as soil having organochlorine pesticide concentrations, specifically aldrin, chlordane, and dieldrin, exceeding the applicable site-specific risk criteria established for HC.
[2] (HDOH 2009b)
[3] (HC 2011a)
[4] (HDOH 2011b, 2011e, 2012a and 2012b)

characterization, permanent soil management, and the results of the air monitoring conducted during the ROs.

**Section 6.0:** Description of Pesticide-Impacted Soil Remaining On-Site. This section discusses where PI soil remains at the Site following RO implementation.

**Section 7.0:** Conclusions and Recommendations. This section presents the conclusions and recommendations for the Site.

**Section 8.0:** References. This section presents all of the references cited in the RAR.

Appendices A through G are provided at the end of this report.

Hale Na Koa I-1

Earhart Village I-3

Soil Berm

Earhart Village I-2

Onizuka Village II-3

Onizuka Village II-2

Onizuka Village II-1

Burial Pits

Burial Pits

Remedial Action Site

Hickam Communities Project Boundary

0 1,500 3,000

Feet

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TETRA TECH

***Remedial Action Site***
***Hickam Communities***

Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i

**Figure 1-1**

## 1.2 Removal Action Report – Overview

This overview section provides a summary of the ROs implemented at the Site. The RAR should be read in its entirety; this summary is only intended to provide a general chronology and overview of the events and actions implemented.

The RO process was initiated based on the results of a Site Investigation (SI) performed at the Site between August and October 2010. The SI was conducted in response to concerns first addressed in July 2010 by HC and Tetra Tech regarding soil sampling results for the Earhart I-4 neighborhood[5]. The soil sampling results indicated that following completion of soil management and construction of new housing at the Earhart I-4, due to improperly managed soil at this neighborhood, the organochlorine pesticides aldrin, technical chlordane[6] (referred to as "chlordane"), and dieldrin were present in soil at open area decision units (DUs) at concentrations exceeding the accepted risk levels.[7] This initiated confirmation soil sampling at the newly constructed Earhart I-2, Earhart I-3, and Onizuka II-1 neighborhoods at the Site[8]. Review of the analytical results for soil from confirmation soil sampling conducted in 2010 at the Earhart I-2, Earhart I-3, and Onizuka II-1 neighborhoods at the Site indicated that PI soil was also improperly managed in these neighborhoods, which prompted discussions between HC and HDOH in July 2010. These discussions further resulted in an agreement to conduct the SI to further evaluate organochlorine pesticide concentrations at the Earhart I-2, Earhart I-3, and Onizuka II-1 neighborhoods of the Site using smaller DUs than used for the initial confirmation soil sampling.[9] The Hale Na Koa I-1 neighborhood was evaluated as part of the remedial investigation and it was determined not to require a RO. The Earhart I-4 neighborhood was not included in the SI scope since the improperly managed soil at this neighborhood was detected and mitigated in 2010. Section 3.0 provides additional information regarding the SI.

In July and August 2010, two Sampling and Analysis Plans were developed for the SI which subdivided the Site into DUs no larger than 5,500 square feet (sq ft) in size.[10] Between August and October 2010, the SI was performed using multi-incremental (MI) soil sampling, with samples collected from the 0 to 6 and 6 to 12-inch depth intervals at each DU. At the request of HDOH, following review by Tetra Tech and HC, the analytical results for pesticides from the soil samples collected for the SI were tabulated and transmitted to HDOH on a daily basis. The review of the daily analytical results from the SI indicated that organochlorine pesticides at some of the sampled DUs were present in soil at concentrations that posed an immediate human health risk to HC workers, residents, and guests. Since it was agreed that the immediate risk was posed by the non-carcinogenic risk from organochlorine pesticide concentrations in soil, the decision making process for the ROs was thus based on calculation of the Hazard Index (HI) for each MI soil sample.

The RO process was initiated in concurrence with HDOH in September 2010, and the RO #1, RO #2, and RO #3 were implemented at the Site in sequential order between October 2010 and August 2011. It should be noted that the actions implemented under the RO process were not considered complete until the PI soil remaining at the temporary soil management area was permanently managed at the PI soil berm in February 2012 (Section 6.0).

[5] (Tetra Tech 2009b)
[6] Technical chlordane is a mixture of more than 140 related compounds. Major constituents of technical chlordane include alpha- and gamma-chlordane, chlordane, and heptachlor (ATSDR 1994).
[7] (Tetra Tech 2009a)
[8] (Tetra Tech 2010b, 2010e, 2010g and 2010h)
[9] (Tetra Tech 2010a)
[10] (Tetra Tech 2010j and 2010k)

The RO #1 and RO #2 were conducted based on immediate human health concerns, while HC conducted the RO #3 voluntarily. The ROs were developed and implemented based on HIs calculated using three phases of risk criteria (referred to as "standards"):

- **RO #1/ 2006 HHRA Standard.** The RO #1 was implemented under risk criteria developed under the HC Action Plan, which was based on the *Summary of Human Health Risk Assessment of Chlordane (including Heptachlor and Heptachlor Epoxide), Dieldrin, and Aldrin in Soil, Hickam Community Housing Areas,* referred to as the 2006 HHRA Standard.[11]
- **RO #2/ 2010 APRA Standard.** The RO #2 was implemented based on the risk criteria and adjusted site-specific Environmental Action Levels (EALs) developed under the *Revised Analysis of Potential Removal Alternatives* memorandum *(APRA Memo),* referred to as the 2010 APRA Standard.[12]
- **RO #3/ 2011 HHRE Standard.** The RO #3 was implemented based on risk criteria using adjusted site-specific EALs developed under the *Preliminary Human Health Risk Evaluation Work Plan for Hickam Communities, Joint Base Pearl Harbor-Hickam, Hawai'i*, (*HHRE WP*) dated May 13, 2011, referred to as the 2011 HHRE Standard.[13, 14]

The ROs were conducted in accordance with three work plans, each of which provided the guidance for mitigating PI soil at specific DUs identified using the risk standards applied to, or developed for the Site as part of the RO process. Although none of the DUs in the Onizuka II-1 neighborhood at the Site exceeded the risk standards, and thus no ROs were performed at Onizuka II-1, this neighborhood was included in the RO work plans and the RAR since it is part of the scope of the SI and the Remedial Action for the Site. The work plans were implemented immediately upon receiving work plan approval from HDOH. Work plan implementation for each of the ROs is summarized below:

- **RO #1 Work Plan.** The RO #1 was implemented under the guidance provided in the *Removal Action Work Plan No. 1, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods*.[15] The RO activities commenced on October 15, 2010, and were completed by December 20, 2010. Minor repairs of the soil caps continued through the end of December 2010, and reseeding of select areas was completed by early January 2011. There is no exact date recorded of when the reseeding was completed.[16] On April 22, 2011, PI soil excavated during RO #1 was placed into PI soil Burial Pit No. 6b constructed in the Onizuka II-3 neighborhood.[17]
- **RO #2 Work Plan.** The RO #2 was implemented under the guidance provided in the *Removal Action No. 2 Work Plan, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods*.[18] The RO activities commenced on January 4, 2011, and were completed by April 13, 2011. Reseeding of select areas was completed by the end

[11] (Tetra Tech 2006b)
[12] (Tetra Tech 2010q)
[13] The *HHRE WP* was updated based on HDOH review on October 7, 2011. The HDOH accepted the *HHRE WP* as final in its letter dated October 31, 2011 (HDOH 2011d). The work for RO #3 was performed under the May 2011 *HHRE WP*, which is referenced throughout the RAR.
[14] (Tetra Tech 2011g)
[15] (Tetra Tech 2010n)
[16] (HC 2011c)
[17] (Tetra Tech 2011d)
[18] (Tetra Tech 2011b)

of April 2011. There is no exact date recorded of when the reseeding was completed.[19] On April 22, 2011, PI soil excavated during RO #2 was placed into a PI soil Burial Pit No. 6b constructed in the Onizuka II-3 neighborhood.[20]

- **RO #3 Work Plan.** The RO #3 was implemented under the guidance provided *Removal Action No. 3 Work Plan, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods*.[21] The RO activities commenced on July 5, 2011, and excavation of surface PI soil and soil cap installation was completed by August 4, 2011. The PI soil excavated during RO #3 was moved to a temporary PI soil management area located south-southwest of the Earhart I-4 Neighborhood. In February 2012, the soil from RO #3 was transported to the PI Soil Berm located in the Earhart I-2 neighborhood.[22]

Under each of the RO work plans, several specific actions were required based on the risk criteria that were used to develop each work plan. For the purposes of the RAR, nomenclature was adopted to indicate each required action under a RO based on the risk standard criteria and the required action, which is summarized in Table 1-1. A summary of the ROs with the DUs identified for action is provided in Section 4.0, Table 4-1.

**Table 1-1. Removal Action Criteria and Required Actions [(a)]**

| RO | Risk Standard Criteria | Description of Action |
|---|---|---|
| **RO-1A** | ▪ HHRA 2 (2006 HHRA Standard with HI >10) | Replace top 12 inches of soil |
| **RO-1B** | ▪ HHRA 3 (2006 HHRA Standard with HI from >3 to ≤10)<br>▪ PI soil in DU is in the upper (0 to 6 inch) interval | Replace top 12 inches of soil |
| **RO-1C** | ▪ 2006 HHRA Standard with HI ≤3 | No immediate action |
| **RO-2A** | ▪ APRA 3 (2011 APRA Standard with HI >1) | Replace top 12 inches of soil |
| **RO-2B1** | ▪ APRA 2 (2011 APRA Standard with HI >1)<br>▪ Landscaping strip in DU, all vegetation easily removable | Remove all vegetation, place geotextile beneath gravel bed |
| **RO-2B2** | ▪ APRA 2 (2011 APRA Standard with HI >1)<br>▪ Landscaping strip in DU, all vegetation not easily removable | Remove low ground cover vegetation, place geotextile and gravel around remaining plants |
| **RO-2C** | ▪ APRA 1 (2011 APRA Standard with HI >1)<br>▪ Exposed areas in DU | Reseed grass cover |
| **RO-3** | ▪ 2011 HHRE Standard with HI >1 | Replace top 6 inches of soil |

**Notes:**

HI Hazard Index

HHRA Human Health Risk Assessment (Tetra Tech 2006b)

APRA Analysis of Potential Removal Alternatives (Tetra Tech 2010q)

HHRE Human Health Risk Evaluation Work Plan (Tetra Tech 2011g)

(a) For the HHRA and HHRE standards, only non-carcinogenic environmental action levels used to evaluate the Site since the ROs were focused on short-term public health risk and did not consider carcinogenic effects, which are long-term.

The results for all three ROs implemented at the Site are presented in this RAR. Interim results of the RO #1 were reported in the *Technical Memorandum for the Actions Implemented under*

[19] (HC 2011c)
[20] (Tetra Tech 2011d)
[21] (Tetra Tech 2011f)
[22] (Tetra Tech 2011h)

*Removal Action No. 1, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods* (*Tech Memo*),[23] which was submitted to the HDOH on February 16, 2011. Following completion of the RO #2, a draft *Removal Action Report, Actions Implemented Under, Removal Actions No. 1, and No. 2, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods*[24] documenting the actions implemented under RO #1 and RO #2 was prepared and submitted as a draft HDOH; however since HC decided to implement RO #3, this draft RAR was updated to include RO #3, which is presented here.

[23] (Tetra Tech 2011a)
[24] (Tetra Tech 2011c)

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# 2.0 BACKGROUND

## 2.1 Environmental Setting

### *2.1.1 Climate*

The climate in the Honolulu area is mild to very warm, with dry to moderate humidity and northeasterly trade winds approximately 90 percent of the summer months, and 50 percent of the winter months. There is very little diurnal or seasonal variation in temperature on O‘ahu because of its tropical latitude, marine influence, and the prevailing northeasterly trade winds. The average daytime temperatures range between 22 to 27 degrees Celsius (72 and 81 degrees Fahrenheit), and humidity varies between 58 and 90 percent.[25]

The average annual precipitation on Hickam Air Force Base (HAFB) is approximately 56 centimeters (22 inches). December is typically the wettest month of the year, and June is the driest.[26]

### *2.1.2 Soils/Geology*

Joint Base Pearl Harbor-Hickam lies on the coastal plain on the leeward side of the Ko‘olau Range, immediately east of Pearl Harbor. The Pearl Harbor coastal plain is underlain by a succession of terrestrial alluvial and marine sedimentary layers. As the island subsided over thousands of years, alluvial sediments interspersed with volcanic flows and volcanic ash were deposited on the margin of the island, building a reef platform. During periods of lower sea levels, the reef was exposed. This so-called caprock (because it caps the underlying volcanic rock, which contains the basal aquifer), contains strata of alluvium, lagoonal mud, beach sands, volcanic tuff, and corals. At depth, these strata overlay volcanic bedrock of the Honolulu volcanic series.

Most of JBPHH soils are mapped as fill, comprising material dredged from the ocean or hauled in from elsewhere. In addition to the fill, there are five naturally occurring soil types present (Māmala stony silt clay loam, Makalapa clay, Kea‘au stony clay, Jaucus sand, and coral outcrop) that are associated with the coastal plain and coral reef substratum over which the base lies. The fill and naturally occurring soil types are considered poor for vegetation growth, and high-maintenance landscaping areas usually contain topsoil fill from off-base sources. The erosion potential for the JBPHH soils is generally slight to moderate, with the exception of Jaucus sand, which is highly erodible.[27]

### *2.1.3 Surface Water*

There are no natural lakes, rivers, or streams on the Capehart or Earhart Village housing areas; however, Manuwai Canal, which provides storm drainage for the eastern third of JBPHH, flows adjacent to the southern boundary of the Earhart Village housing area (Figure 1-1). The Manuwai Canal empties into Māmala Bay to the south.

[25] (USACE 1997)
[26] (HAFB 2006)
[27] (USAF 2002)

The housing areas are not within the area on JBPHH designated as a potential flood inundation zone. The housing areas utilize a storm drainage system that collects surface water and sends it to a series of canals that eventually empty to Māmala Bay. The sedimentary deposits are intermittent with the volcanic basalts that make up the land mass of the Hawaiian Islands.

Wetlands. No wetlands are present on the Capehart or Earhart Village housing areas properties. The Manuwai Canal, which flows adjacent to the southern boundary of the Earhart Village area, has been classified by the National Wetland Inventory as an estuarine, open water, subtidal inundation, and excavated wetland.[28]

### *2.1.4 Groundwater*

There are two groundwater aquifers below HAFB. Most of the installation is underlain at shallow depth by two brackish aquifers that are not suitable for commercial, residential, or recreational use. General groundwater flow in the area is toward the Pacific Ocean to the south. At greater depth, a small portion of JBPHH is underlain by a protected freshwater aquifer and has stringent requirements for water quality protection. Potable water is supplied to HAFB from off-site US Navy storage tanks.[29]

The project site is in the lower portion of the Southern Oʻahu Groundwater Flow System, which extends from the Koʻolau Mountains and the dike-impounded central highlands, to Pearl Harbor and the Pacific Ocean. In the low-elevation areas surrounding Pearl Harbor, high quality groundwater occurs mainly in the basal aquifer, where it is confined by 1,000 feet or more of sedimentary caprock, consisting largely of interbedded ancient reefs and volcanic deposits.[30]

The project area lies within the Moanalua Aquifer System of the greater Honolulu Aquifer Sector, and comprise two aquifers identified with aquifer codes 30104116 and 30104121. The upper, basal aquifer (aquifer code 30104116) is comprised of fresh water in contact with salt water, and it is unconfined and occurs in sedimentary (non-volcanic) deposits. This upper, basal aquifer is described as having potential for use, without specific utility, moderately saline (1,000 to 5,000 milligrams per liter chloride), replaceable, and highly vulnerable to contamination. The lower, high level aquifer (aquifer code 30103121) is comprised of freshwater not in contact with salt water, confined (under caprock) and located in flank lithology (horizontally extensive lavas).[31]

## 2.2 Historic Land Use

Hickam Field was established in 1934.[32] Prior to 1930, the area that now contains HAFB was used for agriculture and fish ponds.[33]

The entire multi-family housing area overlays what was once part of the airfield.[34] The Earhart Village housing area was constructed in the 1960s and 1970s on land that was previously part

[28] (USAF 2002)
[29] (USAF 1998)
[30] (Nichols et al. 1996)
[31] (Mink and Lau 1990)
[32] (HAFB 2006)
[33] (KJC 1991)
[34] (USAF 1946)

of the airfield. The housing area contained 168 residential buildings, 46 of which were within the boundaries of the Earhart I-2 area, 43 were within the Earhart I-3 area, and 32 were in the Earhart I-4 area. Thirty-three additional residential buildings are located in a housing area west of Earhart I-4, and 14 buildings are located in another area south of Earhart Village Park. Onizuka Village consists of two-story, multi-family dwellings that were constructed in 1975.

## 2.3 Current Land Use

Hickam Communities property (including the Site) is currently developed for military residential multi-family use. This property is being managed under a 50-year ground lease by HC, which has responsibility for maintaining the buildings and grounds. The dates of the ground lease are February 1, 2005 through July 31, 2057 for Phase I housing and August 1, 2007 through July 31, 2057 for Phase II housing.[35] There are currently 69 newly constructed multi-family housing structures in the Earhart I-2 area, 61 multi-family structures in the Earhart I-3 area, and 27 multi-family structures in the Onizuka II-1 area. The southwest corner of the Onizuka II-1 area includes the HC housing management offices and parking lots.

The residential buildings are designed with paved driveways in the front yards, and concrete lanais in the backyards. Most of the backyards of the buildings open directly onto the common areas of the Site. Residents can request that fences be installed to enclose the backyards to a specified distance from the buildings, and approximately 20 percent of the backyards at the Site are fenced. Due to the presence of residual concentrations of organochlorine pesticides in subsurface soil throughout the neighborhoods, residents are prohibited from digging, excavating, or gardening.[36] Landscaping and landscaping maintenance is provided by the HC property manager. Most of the common areas of the Site are covered by Bermuda grass, which is irrigated automatically. There are narrow landscaping strips around the perimeters of the buildings. The residential areas of the Site include children's playgrounds, and hiking and biking paths. The terrain is nearly level, with slopes to allow infiltration of rainfall. Excess surface drainage flows to local drainage swales which drain to the major storm drainage channels.

## 2.4 Applicable Environmental Action Levels (EALs)

The EALs are chemical concentration standards against which concentrations in site media can be compared to determine environmental hazards or if actions are needed at a site. Hawai'i Department of Health has developed a set of "Tier 1" EALs for a variety of chemicals. The Tier 1 EALs are concentrations considered to be protective of human health and the environment under a broad range of conditions. They are intended to be used as screening levels to determine if additional action may be needed to evaluate a site. If the actual concentrations observed on a site do not exceed the Tier 1 EALs applicable to the migration pathways and exposure scenarios present at a site, then no further action is needed. The Tier 1 EALs are based on assumptions about the exposure pathways and the amount of a chemical that will reach a receptor through the given pathway. Pathways include inhalation, soil ingestion, dermal absorption, groundwater ingestion, ingestion through food, etc., and vary depending on the type of population that may be exposed, such as children or adults who may be exposed in residential areas, or workers who may be exposed while they are at their work place. The Tier 1

[35] (HC 2011b)
[36] (HC 2010)

EALs are reviewed and periodically updated by HDOH as new information about the toxicity of chemicals and other assumptions of the exposure calculations become available.

While chemical concentrations that exceed the default Tier 1 EALs suggest that additional action may need to be taken at a site, HDOH guidance recognizes that it is not necessarily practicable or appropriate to clean up to the Tier 1 EALs. Instead, HDOH guidance allows for more detailed or site-specific "Tier 2" evaluation to determine the nature of the risk actually presented by the chemicals at a site, and to identify concentration standards that are applicable to the specific conditions at the site. Because these Tier 2 EALs are specific to the context and exposure assumptions at a particular site, they do not apply when the soil or other media of interest are taken off-site or placed in another location or context. The Tier 2 EALs developed for HC apply to current and future residents under the specified land use controls, and are referred to as site-specific EALs throughout the RAR.

Table 2-1 lists the types of standards that have been applied to soil containing organochlorine pesticides at HC. Since the inception of the Phase I Housing Project in 2005, the default standards are the HDOH Tier 1 standards, which apply to soil statewide. The site-specific EALs were developed for HC in 2006 using assumptions specific to HC property, which were presented under the 2006 HHRA Standard.[37] The 2010 APRA Standard were interim site-specific standards developed in consultation with HDOH to address concentrations exceeding the site-specific standards that were observed in samples from the Earhart I-2 and Earhart I-3 housing areas, pending further detailed health evaluation.[38] During development of the health evaluation, the *HHRE WP* was developed and implemented as the 2011 HHRE Standard.[39]

**Table 2-1. Types of Standards Applicable to Soil at Hickam Communities Property**

| Standard [(a)] | Scope | Intended Time Frame | Allowed Use Upon Completion |
|---|---|---|---|
| 2009 HDOH TIER 1 [(b)] | Statewide | long-term | unrestricted use |
| 2006 HHRA [(c)] | Hawai'i Military Housing Sites | long-term | residential with institutional controls |
| | Hickam Communities | HC Action Plan short-term (RO) | land use restrictions |
| 2010 APRA [(d)] | Hickam Communities | short-term (RO) | land use restrictions |
| 2011 HHRE [(e)] | Hickam Communities | long-term (RO) | land use restrictions |

**Notes:**

(a) Chemical-specific EALs for each standard are shown in Table 2-2.

(b) Default Residential Standard Published by HDOH (HDOH 2009a). The HDOH EALs were last updated in March 2009.

(c) Human Health Standard Based on Site-Specific Exposure Assumptions (Tetra Tech 2006b)

(d) Preliminary Standard Developed to Address Concentrations Above site-specific EALs pending formal risk assessment (Tetra Tech 2010q).

(e) Standard Based on Preliminary Human Health Risk Evaluation Work Plan (Tetra Tech 2011g).

[37] (Tetra Tech 2006b)
[38] (Tetra Tech 2010q)
[39] (Tetra Tech 2011g)

Table 2-2 presents the chemical-specific EALs for the principal organochlorine pesticides detected at the HC properties associated with each of the standards listed in Table 2-1. The principal organochlorine pesticides at the Site are aldrin, chlordane, and dieldrin and the three major compounds associated with dichlorodiphenyltrichloroethane (DDT): 4,4'-dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyldichloroethylene (DDE), and 4,4'-DDT. To improve readability, only the EALs for aldrin, chlordane, and dieldrin are shown in Table 2-2. Since the risks posed by DDD, DDE, and DDT usually comprise less than 5 percent of the total risk related to organochlorine pesticides at the Site, and never exceed HDOH target risk ($1 \times 10^{-5}$) or hazard (HI=1) thresholds for the Site, these chemicals are not included in Table 2-2.

Table 2-2 presents non-carcinogenic EALs since the ROs were focused on short-term public health risk and did not consider carcinogenic effects, which are long-term. Carcinogenic risks are discussed in the highest exposure level at which no statistically or biologically significant increases are seen in the frequency or severity of adverse effect between the exposed population and its appropriate control population.

**Table 2-2. Comparison of Default and Site-Specific Non-Carcinogenic [(a)] Residential Soil EALs for Organochlorine Pesticides Applied in Removal Actions at Hickam Communities [(b)]**

| EAL | Removal Action | Aldrin (mg/kg) | Chlordane (mg/kg) | Dieldrin (mg/kg) |
|---|---|---|---|---|
| 2005 HDOH EALs [(c)] | | 1.8 | 35 | 3.1 |
| 2009 HDOH EALs [(c)] | | 1.8 | 35 | 3.1 |
| 2006 HHRA | RO-1A<br>RO-1B | 1.8 | 35 | 3.1 |
| 2010 APRA 1 | RO-2C | 1.8 | 35 | 3.1 |
| 2010 APRA 2 | RO-2B | 4.7 | 35 | 7.7 |
| 2010 APRA 3 | RO-2A | 15 | 35 | 15 |
| 2011 HHRE | RO-3 | 12 | 64 | 9.8 |

**Notes**:

mg/kg milligrams per kilogram

(a) Only non-carcinogenic EALs are presented since the ROs were focused on short-term public health risk and did not consider carcinogenic effects, which are long-term.

(b) Values are for hazard quotient = 1

(c) 2005 and 2009 HDOH residential EALs.

The human health risks of chemicals can be divided into two classes. They are either carcinogens (known or likely to cause cancer, often over a long time period of chronic exposure), or non-carcinogens (adversely affecting certain organs or systems). These risks are usually considered to be independent of each other, and are calculated differently. The risks from many chemicals arise primarily from either one or the other of these types of risk, but some chemicals present both carcinogenic and non-carcinogenic risk. Risk standards usually consider both carcinogenic risk (long-term) and non-cancinoginic risk (short-term); however, in order to identify those areas posing immediate public health hazards, the risk standard used in RO #1 considered only the non-cancinogenic risk portion of the 2006 HHRA standard.

Additional actions were already being planned for the Site to address long-term carcinogenic risk.

While these EALs are for exposure to a single chemical, in many cases, actual exposures involve more than one chemical. Therefore, the combined or cumulative effects of the chemical must be determined. For non-carcinogens, the individual chemical EALs are based on the amount of a chemical below which adverse effects are expected to occur is called the No Adverse Effects Level (NOAEL), or the Lowest Adverse Effects Level (LOAEL).

Table 2-3 summarizes the assumptions that were used in calculating the EALs listed in Table 2-2. Long term cleanup levels are determined by the lowest of the concentrations associated with these two types of risks. However, the EALs for the removal actions were based on the non-carcinogenic risk only, because this represents the most immediate type of risk. During the course of the risk assessment for the Remedial Investigation (RI), the carcinogenic risk was assessed separately. As described in the *HHRE WP* prepared concurrently for the RI, the proposed site-specific EALs, which take carcinogenic risk into account, are generally similar to, or higher than the levels applied in the ROs.

**Table 2-3. Toxicity Criteria, Exposure Parameters, and Target Risk/Hazard Levels Associated with Hickam Communities Action Levels**

| Standard → | 2006 HHRA | 2010 APRA 1 | 2010 APRA 2 | 2010 APRA 3 | 2011 HHRE |
|---|---|---|---|---|---|
| **Oral RfD for Aldrin** | 3E-05 | 3E-05 | 3E-05 | 1E-04 | 1E-04 |
| **Oral RfD for Dieldrin** | 5E-05 | 5E-05 | 5.E-05 | 1E-04 | 8E-05 |
| **Oral RfD for Chlordane** | 5E-04 | 5E-04 | 5E-04 | 5E-04 | 5E-04 |
| **Soil Ingestion Rate** | 200 | 200 | 45 | 45 | 100 |
| **Dermal Absorption factor** | 0.1 (aldrin/dieldrin)<br>0.04 (chlordane) | 0.1 (aldrin/dieldrin)<br>0.04 (chlordane) | 0.1 (aldrin/dieldrin)<br>0.04 (chlordane) | 0.1 (aldrin/dieldrin)<br>0.04 (chlordane) | 0.05 (aldrin/dieldrin)<br>0.04 (chlordane) |
| **Does-response assessment approach** | NOAEL/ LOAEL | NOAEL/ LOAEL | NOAEL/ LOAEL | NOAEL/ LOAEL | benchmark dose[(a)] (aldrin/dieldrin)<br>NOAEL/LOAEL (chlordane) |
| **Target Hazard Index** | 1 | 1 | 1 | 1 | 1 |
| **Target Risk** | 1E-05 | NA [(b)] | NA [(b)] | NA [(b)] | 1E-04 (aldrin/dieldrin)<br>1E-05 (otherchemicals) |

**Notes:**

RfD oral reference dose

NOAEL no observable adverse effects level

LOAEL lowest observable adverse effects level

NA not applicable

(a) The benchmark dose is the dose of a substance that is expected to result in a pre-specified level of effect.

(b) APRA action levels based on non-carcinogenic effects only. The ROs were focused on short-term public health risk and did not consider carcinogenic effects, which are long-term (refer to Section 4.0).

### *2.4.1 Toxicity Criteria*

As shown in Table 2-3, the toxicity criteria (i.e. oral reference dose [RfD]) for chlordane has remained unchanged for each set of action levels. For aldrin and dieldrin, the oral RfDs remained the same for the HHRA, APRA 1, and APRA 2 action levels. For the APRA 3 action levels, a modified oral RfD of $1 \times 10^{-4}$ milligrams per kilogram (mg/kg)-day was used as an alternative to the US Environmental Protection Agency (EPA) oral RfDs for aldrin ($3 \times 10^{-5}$ mg/kg-day) and dieldrin ($5 \times 10^{-5}$ mg/kg-day). The alternative value of $1 \times 10^{-4}$ mg/kg-day was originally developed by the World Health Organization (WHO) and the New Zealand Ministry for Environment had recently identified the same dose as its chronic tolerable daily intake for developing residential action levels for soil. For the HHRE action levels, modified oral RfDs of $1 \times 10^{-4}$ mg/kg-day (aldrin) and $8 \times 10^{-5}$ mg/kg-day (dieldrin) were used as alternatives to the EPA oral RfDs. These alternative RfDs were developed by Tetra Tech to reflect current EPA risk assessment guidelines that had evolved substantially since 1988 and 1999 when the EPA RfDs for aldrin and dieldrin had been derived. Specifically, a benchmark dose methodology was used to derive the oral RfDs for aldrin and dieldrin.

### *2.4.2 Exposure Parameters*

As indicated in Table 2-3, the default HDOH and EPA soil ingestion rate of 200 mg/day for a residential child was used to derive the HHRA and APRA 1 action levels. For the APRA 2 and 3 action levels, which were developed to be protective of short-term exposures (i.e. until the formal risk evaluation associated with the RI Report could be completed), an alternative soil ingestion rate of 45 mg/day was used due to the short-term exposure duration being evaluated and the fact that there is a restriction on digging associated with the residential leases at HC[40], and because engineering controls, such as maintaining good lawn cover were going to be implemented as part of the long-term management of the Site. For the HHRE action levels, a higher (i.e., more conservative) child soil ingestion rate of 100 mg/day was used because these action levels were developed to be protective of residents over a chronic long-term exposure period.

The default HDOH and EPA dermal absorption factor of 0.1 was used to develop the HHRA and APRA action levels for aldrin and dieldrin. For the HHRE action levels, an alternative dermal absorption factor of 0.05 was used for aldrin and dieldrin because the absorption factor of 0.1 is a generic default value recommended by EPA for organic compounds for which chemical-specific dermal absorption studies are not available. For chlorinated pesticides such as aldrin and dieldrin, a dermal absorption factor of 0.05 is commonly used as a default value (e.g. it is recommended default value used by California Environmental Protection Agency for chlorinated pesticides[41]). For chlordane, the HDOH default value of 0.04 was used to derive all action levels.

### *2.4.3 Target Risk and Hazard Levels*

As shown in Table 2-3, HDOH default values for the target HI of 0.2 and target risk of ($1 \times 10^{-6}$) were used to develop the HHRA action levels.[42] The HDOH default target HI of 0.2 is conservative value used to be protective of cumulative effects when screening a small number

[40] (HC 2010)
[41] [Cal/EPA 1999 and 2005]
[42] (HDOH 2009a)

of chemicals (5 or less) on an individual basis. For the APRA and HHRE action levels, the EPA recommended target HI of 1 for evaluating cumulative non-cancer effects was used. For the HHRE action levels, which are protective of current and future residents, a target risk of $1 \times 10^{-4}$ was used for aldrin and dieldrin based on the results of a toxicological review conducted by Tetra Tech, which indicated that aldrin and dieldrin made very little, if any, contribution to the incidence of cancer in humans. For all other carcinogenic compounds, a target risk of $1 \times 10^{-5}$ was used, which is consistent with HDOH risk assessment guidelines for calculating site-specific EALs.

# 3.0 DESCRIPTION OF RELEASE

The release occurred during redevelopment of the Site when PI soil that originated from excavating footprints of former buildings was improperly placed or graded into open areas, and not subsequently covered by hardscapes. This PI soil was not detected until after construction at the Site was completed or nearing completion. The PI soil at the Hale Na Koa I-1 neighborhood was detected and mitigated in 2007. Based on the results of confirmation soil sampling conducted in 2010,[43] the Hale Na Koa I-1 neighborhood was included in the *Voluntary Agreement* in February 2011,[44] and subsequently evaluated as a part of the remedial action[45]. Further evaluation by HC and HDOH of the analytical results from 2010 confirmation soil sampling at the Hale Na Koa I-1 determined that this neighborhood did not a require a RO.[46] The PI soil at the Earhart I-4 neighborhood was detected and mitigated in 2010. Based on the results of the confirmation soil sampling conducted 2010, the PI soil at Earhart I-4 neighborhood was considered to have been addressed prior to the initiation of the *Voluntary Agreement.* However, due to the PI soil detected at Earhart I-4, confirmation soil sampling was conducted at the remaining three Site neighborhoods Earhart I-2, Earhart I-3, and Onizuka II-1. These results of this confirmation soil sampling indicated that PI soil was present in some of the DUs sampled at these neighborhoods; the detection of this PI soil initiated the remedial action process implemented by HC and HDOH in July 2010, and the inclusion of these neighborhoods into the scope of the *Voluntary Agreement.*[47] As part of the remedial action, a SI was conducted at these three neighborhoods. The conditions preceding and initiating the decision to conduct the ROs is presented below.

## 3.1 Conditions Preceding Decision to Conduct Removal

### *3.1.1 Historic Use of Pesticides / Housing Development Activities*

In buildings constructed at military installations from the 1940s to the 1980s, organochlorine pesticides were routinely applied to soil under and around the perimeter of building foundations to control subterranean termites. Although use of organochlorine pesticides was cancelled by the EPA by the late-1980s, because these pesticides are persistent in the environment, residual concentrations can still be present in the soil beneath building foundations, and subsequently exposed when the buildings are demolished to prepare for construction of new housing, or during renovation of existing homes. The principal organochlorine pesticides identified in soil at the Site are aldrin, chlordane, and dieldrin, although overall concentrations for aldrin and dieldrin are generally higher than chlordane. In addition to the termiticides aldrin, chlordane, and dieldrin, constituents or metabolites of technical DDT which are 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT, were also detected in Site soil; however, these chemicals comprise less than 5 percent of the total risk related to organochlorine pesticides at the Site and never exceed HDOH target risk ($1 \times 10^{-5}$) or hazard (HI=1) thresholds for the Site. To determine where PI soil is present, and how much will require management at an HC project site, either pre-demolition sampling of soil from beneath structures or post-demolition sampling of building footprint soil is

[43] (Tetra Tech 2010f)
[44] (HC 2011a)
[45] (HDOH 2011a)
[46] (HDOH 2011d)
[47] (HC 2011a)

conducted. Pre-demolition soil sampling of the undeveloped areas around the existing housing is also performed to evaluate the presence (if any) of PI soil.

### *3.1.2 Pesticide-Impacted Soil Management*

A series of management practices were implemented at HC since any PI soil detected at a HC project site would require management during demolition, renovation, and/or construction of military housing. The first plan developed for HC was the *Management Plan for Pesticide-Impacted Soils* (*MPPIS*) which was implemented at HC in 2006.[48] To capture changes in the HC redevelopment and construction processes, the *MPPIS* was updated and renamed the *Pesticide-Impacted Soils Investigation and Management Program Manual (Program Manual)* in 2009.[49] Under the most recent version of the HC *Program Manual* dated August 31, 2011,[50] the procedures call for excavation of PI soil to a depth of at least 1-foot below final grade in areas that would not be covered by hardscapes after new construction is completed. The excavated areas are then capped by at least 1-foot of clean soil to bring the HC project site to final grade. Any PI soil under hardscapes (e.g. roads, building foundations, sidewalks, driveways, and parking lots), would not need to be removed because the hardscapes provide a long-term barrier to exposure. Placement of excavated PI soil under new hardscapes is also used as a method to permanently manage PI soil and prevent the exposure pathways of direct contact, inhalation, and ingestion that may be associated with exposed soil.

### *3.1.3 Investigations at the Hale Na Koa I-1 Neighborhood (2004 through 2010)*

Based on the preliminary findings of the Phase I ESA conducted in 2004 (and finalized in January 2005)[51], and the known application methods used to treat building foundations with organochlorine pesticides, a discrete soil sampling investigation was conducted at Hale Na Koa I-1 (the former Capehart neighborhood) in 2004.[52] For this investigation, discrete soil samples were collected within the building driplines and close to the foundations of the existing buildings prior to demolition.

The results of the 2004 discrete soil sampling investigation indicated that organochlorine pesticides were present in Hale Na Koa I-1 soil at concentrations exceeding the HDOH EALs.[53] In 2006, a soil investigation to characterize the extent of the PI soil at the Hale Na Koa I-1 was performed, whereby DUs were delineated to distinguish a 10-foot zone of soil around the buildings.[54] It is important to note that the entire Site was characterized during this investigation; that is, some of the DUs included this 10-foot zone around the buildings, while others were located in open areas between the buildings and backyards. The results of this investigation indicated that nineteen of the sampled DUs were identified as having exposed PI soil. The soil in these nineteen DUs was managed by excavation of the soil to 1-foot below planned final grade, and placement of a 1-foot thick clean soil cap which was completed in 2007.

[48] (Tetra Tech 2006d)
[49] (Tetra Tech 2009a)
[50] (Tetra Tech 2011i)
[51] (Tetra Tech 2005)
[52] (Tetra Tech 2004)
[53] (HDOH 2005)
[54] (Tetra Tech 2006a)

Confirmation soil sampling of Hale Na Koa I-1 was performed in 2010.[55] For this confirmation soil sampling investigation, the Hale Na Koa I-1 neighborhood was divided into eleven DUs and sampled using MI soil sampling methodology.[56] Five of these DUs included the nineteen DUs where PI soil was previously identified and managed; these DUs were sampled at the 0 to 6 and 6 to 12-inch depth intervals. The remaining six DUs for the areas that had previously tested as not being PI were sampled from the 0 to 6-inch depth interval only. The results of the confirmation soil sampling investigation indicated that organochlorine pesticide detections in the MI soil samples do not exceed the applicable risk criteria[57], and concludes that there is no exposed PI soil at Hale Na Koa I-1.

### *3.1.4 Investigations at the Earhart I-2, Earhart I-3, Earhart I-4, and Onizuka II-1 Neighborhoods (2006 through 2010)*

Prior to demolition, open area soil sampling around the existing buildings was conducted at the Earhart I-2, Earhart I-3, and Earhart I-4 neighborhoods, and limited open area sampling was conducted at the Onizuka II-1 neighborhood.[58] The results of the soil sampling indicated that PI soil was not present in the upper 6 inches of soil in these neighborhoods. Demolition and redevelopment of Earhart I-2 was conducted between March 2007 and August 2008, Earhart I-3 from March 2008 and August 2009, and Onizuka II-1 from February 2008 to June 2009. Demolition of the Earhart I-4 neighborhood began in June 2008. Since demolition and soil management at the Earhart I-4 neighborhood was underway when environmental oversight was implemented, HC decided to conduct verification soil sampling during ongoing construction in areas at Earhart I-4 where PI soil had already been managed. Based on previous oversight, Tetra Tech performed confirmation soil sampling in open areas at Earhart I-4 between August and December 2009.[59] The confirmation soil sampling identified that organochlorine pesticides were present in surface soil. Based on these results, the upper 1-foot of open area soil at Earhart I-4 was removed and placed into burial pits at the Onizuka II-2 neighborhood. Clean soil removed from Onizuka II-2 to create the burial pits was used to install a 1-foot clean soil cap at Earhart I-4. Confirmation soil sampling was performed at Earhart I-4 after the cap was installed which indicated that no PI soil remained in surface soil at Earhart I-4.[60]

Confirmation soil sampling was also conducted following completion of new housing construction at the Earhart I-2, Earhart I-3, and Onizuka I-1 neighborhoods.[61] Ten open area DUs were sampled at Earhart I-2, six open area DUs were sampled at Earhart I-3, and five open area DUs were sampled at Onizuka II-1. The results of the confirmation soil sampling indicated that organochlorine pesticides were present in soil at all ten open area DUs at Earhart I-2, all six open area DUs at Earhart I-3, and two of five open area DUs at Onizuka II-1.[62]

[55] (Tetra Tech 2010f)
[56] (Tetra Tech 2010b)
[57] (Tetra Tech 2009a)
[58] (Tetra Tech 2006c and 2007)
[59] (Tetra Tech 2009c)
[60] (Tetra Tech 2010a, 2010c, 2010d, 2010i, 2010L, and 2010m)
[61] (Tetra Tech 2010b)
[62] (Tetra Tech 2010e, 2010g, and 2010h)

## 3.2 Conditions Initiating the Decision to Conduct Removal

### *3.2.1 Site Investigation (2010)*

As a result of the confirmation soil sampling at the Site, meetings between HDOH and HC were conducted in July 2010, and the SI was planned. Two Sampling and Analysis Plans were developed. The entire exposed ground surfaces within the Earhart I-2, Earhart I-3, and Onizuka II-1 neighborhoods were subdivided into DUs of up to 5,500 sq ft in size.[63] The area of each DU only included the exposed surface area, including landscaped areas, but excluded the measured areas of hardscapes. The DUs were also defined by the nature of the land use, so that they corresponded to front yards, back yards, play areas, or common areas (such as pedestrian corridors) used by residents and guests. The soil in each DU was sampled using MI sampling methodology, which involves collecting 30 to 50 individual soil samples (or "increments") from points spread out across the DU. These increments are combined into a single composite sample; and mixing and processing the composite sample is conducted during laboratory preparation to ensure that a representative subsample of the composite sample is analyzed. The MI soil samples are a means of directly estimating the average concentration of pesticides within the DU. For the SI, the Earhart I-2 neighborhood was divided into a total of 330 DUs, the Earhart I-3 neighborhood was divided into 180 DUs, and the Onizuka II-1 neighborhood was divided into 21 DUs. The MI soil samples were collected from the 0 to 6 and 6 to 12-inch depth intervals, resulting in samples representing the average concentrations of pesticides within these depth intervals for each DU. The SI was conducted from August through October 2010.

### *3.2.2 Site-Specific Environmental Action Level Screening*

The analytical results for the SI indicated that many of the DUs contained soil with concentrations of organochlorine pesticides, primarily aldrin and dieldrin, exceeding the 2006 site-specific EALs.[64] The analytical results for the SI are provided in summary tables in Appendix A. The analytical results were reported immediately to HDOH both in tabulated form and graphically, using a color-coding system to indicate the risk level associated with the soil from each depth in each DU, based on the risk assumptions on which the 2006 site-specific EALs were developed. The risk assumptions have since been re-evaluated based on more sophisticated toxicological analysis, which is described in detail in the Environmental Health Evaluation (EHE), which was included as an appendix of the RI Report prepared for the project.[65]

Based on preliminary interpretation of the SI results consistent with the 2006 site-specific EALs, the HC Action Plan was developed in consultation with HDOH, which identified DUs containing soil that HDOH determined required immediate action to protect the health of residents. The actions taken under the HC Action Plan are now referred to as RO #1. Hawai'i Department of Health determined that DUs containing soil with concentrations corresponding to a an HI greater than (>) 10 times the acceptable 2006 site-specific EAL should be addressed immediately through an RO process by excavating and replacing the soil. Soil corresponding to an HI between 3 and 10 were considered to present an intermediate hazard, where immediate action was needed only if significant areas of bare soil were exposed, such as in areas not well

[63] (Tetra Tech 2010j and 2010k)
[64] (Tetra Tech 2006b)
[65] (Tetra Tech 2012b)

covered by turf. The immediate action taken to address DUs containing intermediate concentrations of organochlorine pesticides was to inspect the DUs and evaluate the quality of grass cover, and any DUs with poor cover were scheduled for additional action. The remaining DUs, with concentrations corresponding to HIs less than (<) 3 were determined not to require immediate action, and would be evaluated in the RI and addressed in any final Remedial Action required for the Site. A copy of the HC Action Plan protocol is provided in Appendix B1.

### *3.2.3 Removal Action Identification and Planning Documents*

The ROs were performed sequentially in three separate events, designated as RO #1, RO #2, and RO #3, to correct conditions considered to require more immediate action in response to the results of the SI. The ROs were implemented under three specific work plans[66] to address DUs that presented the highest levels of risk to HC workers, residents, and guests, and identify which DUs had organochlorine pesticide concentrations that were expected to require remediation in the long-term (i.e. during the Remedial Action). Although included in the RO work plans since it is part of the scope of the SI and the Remedial Action for the Site, none of the DUs in the Onizuka II-1 neighborhood exceeded the risk standards and no ROs were performed at Onizuka II-1.

An EHE, which is a detailed evaluation of the risks presented by the chemicals of potential concern (COPCs), was concurrently undertaken as part of the RI of the Site, which would be used to develop the selection of a long-term remedy for the Site provided in a Remedial Alternatives Assessment (RAA). Therefore, pending the results of the EHE, interim action levels were defined to identify the scopes of the ROs, which are discussed in detail in Section 4.0. Removal Action implementation under the work plans is discussed in Section 5.0.

[66] (Tetra Tech 2010n, 2011b, and 2011f)

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# 4.0 REMOVAL ACTION TASKS

## 4.1 Removal Action Alternatives Considered

The ROs at the Site were performed in three separate events. Following completion of confirmation soil sampling of Earhart I-2, Earhart I-3, and Onizuka II-1, conducted from April to June 2010,[67] an Action Plan (referred to as the "HC Action Plan") was developed and the SI initiated. Based on which DUs were identified as requiring immediate action from evaluation of the SI results, the RO process was used to effectively reduce the risk at the Site to acceptable levels.

The types of actions considered under the RO process included:

- No Action;
- Institutional controls (such as educating residents to avoid contact with soil, or restricting certain activities in affected areas);
- Engineering controls (such as installing fencing or other means of limiting direct contact with soil containing COPCs);
- Maintaining existing exposure barriers such as turf grass and other landscaping;
- Excavating and replacing soil with elevated concentrations of COPCs;
- Relocating residents; and
- Any combinations of these actions.

The housing in each of the three neighborhoods was occupied at the time of RO implementation, and thus there was the potential for exposing HC workers, residents, guests, and especially children, to organochlorine pesticides by introducing additional sources of risk beyond direct exposure to PI soil at the Site. For example, since excavation to remove PI soil at the Site could potentially create windblown dust impacted with organochlorine pesticides, areas where soil-disturbing activities would occur needed to be secured and monitored to prevent exposure to HC residents. In addition, the use of heavy equipment and truck traffic used to excavate and transport PI soil to a temporary management area could also potentially increase, not only contaminant exposure risks, but also present potential physical hazards. As a result, all of the work areas needed to be secured, and any trucks leaving the Site inspected to prevent tracking of PI soil outside of the work areas. These and other short-term risk factors associated with conducting ROs in the occupied neighborhoods were evaluated as part of the preparation of the work plan for the initial and subsequent ROs conducted at the Site.

During the planning process and development of the ROs, consideration was given to how to prioritize the DUs so that appropriate actions would be taken based on the level of risk posed by the concentrations of organochlorine pesticides in Site soil. The ROs were focused on short-term public health risk standards and did not consider carcinogenic effects, which are long-term. Since the ROs were intended to address potential health risks posed over a short-term time period (i.e. time until the EHE could be completed under HDOH oversight as part of the RI report), the non-carcinogenic risk was identified early in the process as the appropriate criterion to use in prioritizing the DUs. Unlike carcinogenic health risks which are evaluated the long-

[67] (Tetra Tech 2010e, 2010g and 2010h)

term (generally greater than 6 years), non-carcinogenic health risks can affect public health over short-term time frames, and are therefore identified as the primary criteria of concern for RO #1 and RO #2. Non-carcinogenic risk can be summarized by an HI calculated from the sum of the non-carcinogenic risks posed by multiple COPCs, where the individual risks from each COPC is measured relative to an acceptable risk threshold that corresponds to a Hazard Quotient (HQ) of 1. A summary explanation and sample HI calculations are provided in Appendix A1.

To identify which DUs may require expedited action, in prioritizing the risks from the Site it was determined that DUs with concentrations corresponding to an HI >10 would require immediate action under RO #1. The RO #2 was initiated based on HDOH concerns that PI soil present at the Site could pose short-term public health risks may not have been adequately managed by RO #1. Under RO #2, DUs with soil concentrations corresponding to an HI greater than 1 (based on action levels presented under the 2010 APRA Standard) required immediate action. All DUs not addressed under RO #1 and RO #2 were evaluated further in the formal risk evaluation that is part of the RI, and would then be addressed in the long-term remedy for the Site (i.e., RO #3). Under RO #3, the DUs with soil concentrations corresponding to a cumulative risk or HI exceeding the 2011 HHRE Standard required remediation or mitigation.

Table 4-1 lists the number of DUs that exceeded the EALs associated with each type of action. Sections 4.2 through 4.4 present a summary of the risk standard documents developed to evaluate and identify the actions to be implemented at the Site under each RO.

## Table 4-1. Number of DUs Identified Under Each Removal Action Type [a]

| RO | EAL (HQ = 1) [b] (mg/kg) | | | Standard Action Implemented [c] | Number of DUs Affected [d] DUs Identified and RO Implemented | | | |
|---|---|---|---|---|---|---|---|---|
| | Chlor-dane | Aldrin | Dieldrin | | EAR2 | EAR3 | ONI | Total |
| **RO-1A** | 35 | 1.8 | 3.1 | 2006 HHRA Standard<br>If HI >10, replace top 12 inches of soil. | 4 identified<br>4 completed[e] | 1 identified<br>1 completed | 0 identified | **5 identified**<br>**5 completed** |
| **RO-1B** | 35 | 1.8 | 3.1 | 2006 HHRA Standard<br>If 3 > HI ≤ 10, inspect grass cover, and if bare soil area is greater than 200 square feet, replace top 12 inches of soil | 17 identified<br>1 completed | 5 identified<br>0 implemented | 0 identified | **22 identified**<br>**1 completed** |
| **RO-2A** | 35 | 15 | 15 | 2010 APRA Standard<br>If HI > 1, replace top 6 inches of soil. | 1 identified<br>1 completed | 0 identified<br>0 implemented | 0 identified | **1 identified**<br>**1 completed** |
| **RO-2B1** | 35 | 4.7 | 7.7 | 2010 APRA Standard<br>If HI > 1, remove vegetation, place geotextile beneath gravel in landscaping strips. | 33 identified<br>11 completed | 8 identified<br>0 implemented | 0 identified | **41 identified**<br>**11 completed** |
| **RO-2B2** | 35 | 4.7 | 7.7 | 2010 APRA Standard<br>If HI > 1 and large, well-established plants or dense growth present, remove low ground cover, place geotextile, gravel in landscaping strips. | 33 identified<br>4 completed | 8 identified<br>4 completed | 0 identified | **41 identified**<br>**8 completed** |
| **RO-2C** | 35 | 1.8 | 3.1 | 2010 APRA Standard<br>If HI > 1, inspect and reseed damaged grass areas. | 147 identified<br>13 completed | 48 identified<br>8 completed | 0 identified | **195 identified**<br>**21 completed** |
| **RO-3** | 64 | 12 | 9.8 | 2011 HHRE Standard<br>If HI > 1, remove top 6 inches of soil, install geotextile and replace with new fill. | 10 identified<br>10 completed | 4 identified<br>4 completed | 0 identified | **14 identified**<br>**14 completed** |

**Notes:**

HQ Hazard Quotient

RO Removal Action

EAR2 Earhart I-2 Neighborhood

EAR3 Earhart I-3 Neighborhood

ONI Onizuka II-1 Neighborhood

(mg/kg) milligrams per kilogram

[a] For the HHRA and HHRE standards, only non-carcinogenic EALs were used to evaluate the Site since the ROs were focused on short-term public health risk and did not consider carcinogenic effects, which are long-term.

[b] HQ of 1 is concentration at non-cancer no-effects level

[c] Initiate action if Hazard Index (sum of hazard quotients based on detected concentrations of principal compounds in each DU

[d] Top value is number of DUs identified as exceeding an action level; bottom value is the number of DUs where the RO was implemented.

[e] Soil in additional adjacent DUs was also excavated, though not required (see Table 5-1 in Section 5.1 for explanation).

## 4.2 2006 Human Health Risk Assessment (HHRA) / HC Action Plan

The HC Action Plan, which presented the actions to be implemented under the RO #1 work plan, was developed based on the 2006 HHRA Standard. The HC Action Plan identified three response actions based on the HIs calculated for the organochlorine pesticides detected in the 0 to 6-inch depth interval, and subsequent response actions to be implemented based on the range of the HIs (Appendix B1).

The three Response Actions under the HC Action Plan were:

- **Response Action I: HI of less than 3.** No RO required under the HC Action Plan.
- **Response Action 2 (RO-1B): HI between 3 and 10.** The RO under the HC Action Plan was to conduct a visual site inspection (VSI) of the affected DU(s) to evaluate the presence of exposed soil. Areas of exposed or sparsely grass-covered soil with an area <200 sq ft required reseeding (Section 4.4). For areas of exposed soil >200 sq ft, excavation of the area was implemented, as specified in Response Action 3 below.
- **Response Action 3 (RO-1A): HI greater than 10.** The RO was to secure affected DU(s) by placing fencing around the perimeter, followed by excavation to 1-foot below grade and replacement with clean backfill material.

### *4.2.1 Description of Removal Action No.1*

Based on the concentrations of organochlorine pesticides in the upper 6-inches of soil in each DU, under RO-1A, five DUs (four DUs in Earhart I-2, and one DU in Earhart I-3) were identified with an HI >10 requiring excavation and replacement of the upper 1-foot of clean backfill material in accordance with Response Action 3.

Twenty two DUs (seventeen at Earhart I-2 and five at Earhart I-3) were identified under RO-1B with an HI between 3 and 10, requiring VSIs to be conducted in accordance with Response Action 2. After inspection of these 22 DUs under RO-1B, one DU was identified as having an area of low-quality grass cover >200 sq ft that was added to the list of DUs to be addressed by Response Action 3. Based on the criteria discussed above, a work plan was developed to implement RO #1.[68] HDOH approved the work plan for RO #1 on September 24, 2010[69].

Although the RO #1 work plan developed based on the HC Action Plan protocol only called for Response Action 3 to be implemented at six DUs, HC elected to apply actions under RO-1A to three additional DUs in Earhart I-2 because they were adjacent to DUs having an HI >10. As a result a total of eight DUs in Earhart I-2 and one DU in Earhart I-3 were included in RO-1A. In addition, three DUs at Earhart 1-2 were over excavated which affected small areas of four adjacent DUs. These over excavated areas are shown in Figure 5-1. No DUs in the Onizuka II-1 neighborhood were identified for immediate action under Response Actions 2 or 3.

[68] (Tetra Tech 2010n)
[69] (HDOH 2010a)

Table 5-1 in Section 5.0 lists the DUs addressed in RO #1 by Response Actions 2 and 3. The locations of the DUs addressed by Response Actions 2 and 3 are provided in the *Tech Memo* prepared after completion of RO #1.[70]

## 4.3 Analysis of Potential Removal Alternatives (APRA) Memorandum

Following development of the HC Action Plan described in Section 4.2, HDOH and HC continued to assess the need to further reduce risks to residents in advance of completing the RI, the evaluation of possible alternatives recommendation of a remedy for the Site under the RAA, and selection of the final remedy in the RAM.

As a result of this continued assessment, some of the exposure and toxicity assumptions used to calculate risk associated with the COPCs at the Site were modified, resulting in adjusted alternative action levels (ALs). The results of this reassessment were summarized in a memorandum dated November 10, 2010 entitled *Revised Analysis of Potential Removal Alternatives, Earhart I-2, Earhart I-3 and Onizuka II-1 Neighborhoods* (*APRA Memo*)[71], which HDOH approved in its November 23, 2010 letter[72]. A copy of the *APRA Memo* is provided in Appendix B2.

Building upon the general approach initiated in the HC Action Plan that guided RO #1, three types of Removal Action Types were identified in the *APRA Memo* forming the basis for the development of the RO #2 work plan[73]. Using the ALs presented in the *APRA Memo*, the Removal Action Types were each defined using different concentration criteria, as described below:

1. **Removal Action Type 1 (RO-2C): Inspect and Repair Grass Cover.** Removal Action Type 1 was designed to address risks associated with remaining areas with either bare areas of exposed soil or poor quality grass cover in areas underlain by PI soil. Under this scenario site-specific residential soil ALs[74] for aldrin and dieldrin of 1.8 milligrams per kilogram (mg/kg) and 3.1 mg/kg, respectively, were used as a basis for the HI of 1. Under Removal Action Type 1, VSIs of grass-covered areas would be conducted for DUs with an HI >1. The Response Action under RO-2C addressed areas where poor grass cover was documented, referred to as grass cover repair areas, requiring reseeding of the exposed soil.
2. **Removal Action Type 2 (RO-2B1 and RO-2B2): Inspect and Remediate Landscaping Strips.** Removal Action Type 2 was designed to address risks associated with exposed soil in landscaping strips adjacent to buildings. Landscaping strips were not sampled during the SI, or mitigated during the RO #1. The soil in these strips may pose a direct exposure risk based on the nature of activities in these areas. For this scenario, site-specific ALs were developed based on an alternative child soil ingestion rate. The aldrin and dieldrin residential soil ALs[3] associated with an HI of 1 under this scenario were 4.7 mg/kg and 7.7 mg/kg, respectively. For DUs where an HI >1 was

[70] (Tetra Tech 2011a)
[71] (Tetra Tech 2010q)
[72] (HDOH 2010b)
[73] (Tetra Tech 2011b)
[74] The listed aldrin and dieldrin ALs represent aldrin-only or dieldrin-only situations. In accordance with standard risk assessment practices, when multiple chemicals are present, the risk posed by an individual DU was evaluated using a cumulative HI based on all detected chemicals. The HI represents the sum of the chemical-specific hazard quotients (i.e., individual pesticide soil concentration divided by the chemical-specific AL) for all detected chemicals.

identified based on the revised ALs, the Response Action under was to conduct a VSI of the landscaping strips (referred to as "VSI planter"), and under RO-2B1 and RO-2B2, place a geotextile fabric barrier over any exposed soil in the landscaping strips adjacent to buildings, and to cover the fabric with gravel (to hold the fabric in place).

3. **Removal Action Type 3 (RO-2A): Replacement of the Top 6-inches of Soil:** For this scenario, ALs were developed based on an alternative child soil ingestion rate and alternative RfD. The aldrin and dieldrin residential soil ALs[3] associated with an HI of 1 under this scenario were both 15 mg/kg. The Response Action under RO-2A was excavation of the DU to a minimum of 6-inches below grade and placement of a geotextile fabric barrier overlain by clean fill.

As shown in Table 4-1, under RO-2C, 195 DUs (147 at Earhart I-2 and 48 at Earhart I-3) were identified as needing inspection of grass cover, and potential grass cover repair involving reseeding if the cover was inadequate. Under RO-2B1 and RO-2B2, landscaping strips in 41 DUs were identified for VSI with possible remediation of exposed soil, and under RO-2A. Only one DU (in the Earhart I-2 neighborhood) was identified for excavation and replacement of the upper 6-inches of soil under RO-2A. The DUs identified under each of these scenarios are presented in Table 4-2 and shown in Figure 4-1.

**Table 4-2. Decision Units that Exceed 2010 APRA Standard for RO #2 - Listed by Action Type**

| Earhart I-2 | | | | | | Earhart I-3 | |
|---|---|---|---|---|---|---|---|
| DU Name | RO Type | DU Name | RO Type | DU Name | RO Type | DU Name | RO Type |
| EAR2-DU-03c | 1 | EAR2-DU-25b | 1 | EAR2-DU-40a | 1 | EAR3-DU-01a | 1 |
| EAR2-DU-04c | 1 | EAR2-DU-25d | 1 | EAR2-DU-40b | 1 | EAR3-DU-01c | 1 |
| EAR2-DU-06a | 1 | EAR2-DU-26a | 1 | EAR2-DU-40c | 1,2 | EAR3-DU-02b | 1 |
| EAR2-DU-06b | 1,2 | EAR2-DU-26c | 2 | EAR2-DU-41a | 1 | EAR3-DU-03a | 1 |
| EAR2-DU-07a | 1 | EAR2-DU-26d | 1 | EAR2-DU-41b | 1 | EAR3-DU-03b | 1 |
| EAR2-DU-07b | 1 | EAR2-DU-26e | 1,2 | EAR2-DU-41c | 1,2 | EAR3-DU-03d | 1 |
| EAR2-DU-11a | 1,2 | EAR2-DU-26g | 1 | EAR2-DU-41e | 1 | EAR3-DU-04b | 1 |
| EAR2-DU-11b | 1,2 | EAR2-DU-27a | 1,2 | EAR2-DU-42a | 1,2 | EAR3-DU-05a | 1,2 |
| EAR2-DU-11c | 1 | EAR2-DU-27b | 1 | EAR2-DU-42b | 1,2 | EAR3-DU-06a | 1 |
| EAR2-DU-11d | 1 | EAR2-DU-27c | 1,2 | EAR2-DU-42e | 1,2 | EAR3-DU-10b | 1 |
| EAR2-DU-12b | 1 | EAR2-DU-27d | 1,2 | EAR2-DU-43a | 1 | EAR3-DU-12b | 1,2 |
| EAR2-DU-12c | 1,2 | EAR2-DU-28a | 1 | EAR2-DU-43b | 1 | EAR3-DU-13a | 1 |
| EAR2-DU-13a | 1,2 | EAR2-DU-28b | 1 | EAR2-DU-44b | 1 | EAR3-DU-14a | 1 |
| EAR2-DU-13a | 1,2 | EAR2-DU-28c | 1,2 | EAR2-DU-44c | 1 | EAR3-DU-16d | 1 |
| EAR2-DU-13b | 1 | EAR2-DU-28d | 1 | EAR2-DU-44d | 1 | EAR3-DU-18a | 1 |
| EAR2-DU-13c | 1 | EAR2-DU-29a | 1,2 | EAR2-DU-48a | 1 | EAR3-DU-19a | 1 |
| EAR2-DU-13d | 1 | EAR2-DU-29a | 1,2 | EAR2-DU-48b | 1 | EAR3-DU-19b | 1 |
| EAR2-DU-13e | 1 | EAR2-DU-29b | 1 | EAR2-DU-48c | 1 | EAR3-DU-19d | 1 |
| EAR2-DU-13f | 1 | EAR2-DU-29c | 1 | EAR2-DU-48d | 1 | EAR3-DU-20a | 1,2 |
| EAR2-DU-13g | 1,2 | EAR2-DU-30b | 1 | EAR2-DU-50a | 1 | EAR3-DU-20b | 1 |
| EAR2-DU-14b | 1 | EAR2-DU-30e | 1 | EAR2-DU-50e | 1 | EAR3-DU-23c | 1 |
| EAR2-DU-14c | 1,2 | EAR2-DU-30f | 1,2 | EAR2-DU-50f | 1 | EAR3-DU-24c | 1 |
| EAR2-DU-14d | 1 | EAR2-DU-33a | 1,2 | EAR2-DU-50g | 1 | EAR3-DU-24d | 1 |
| EAR2-DU-14f | 1,2 | EAR2-DU-33b | 1,2 | EAR2-DU-50h | 1 | EAR3-DU-24e | 1 |

**Table 4-2. Decision Units that Exceed 2010 APRA Standard for RO #2 - Listed by Action Type**

| Earhart I-2 | | | | | | Earhart I-3 | |
|---|---|---|---|---|---|---|---|
| DU Name | RO Type | DU Name | RO Type | DU Name | RO Type | DU Name | RO Type |
| EAR2-DU-15b | 1,2 | EAR2-DU-33c | 1 | EAR2-DU-50k | 1 | EAR3-DU-28a | 1 |
| EAR2-DU-15b | 1,2 | EAR2-DU-34a | 1 | EAR2-DU-51d | 1 | EAR3-DU-28b | 1 |
| EAR2-DU-15c | 1,2 | EAR2-DU-34b | 1 | EAR2-DU-51e | 1 | EAR3-DU-29c | 1 |
| EAR2-DU-16a | 1 | EAR2-DU-34c | 1 | EAR2-DU-53f | 1 | EAR3-DU-29d | 1 |
| EAR2-DU-17a | 1 | EAR2-DU-34d | 1,2 | EAR2-DU-53g | 1 | EAR3-DU-30c | 1 |
| EAR2-DU-17b | 1 | EAR2-DU-34e | 1 | EAR2-DU-54a | 1 | EAR3-DU-31d | 1 |
| EAR2-DU-19a | 1 | EAR2-DU-34g | 1 | EAR2-DU-54b | 1 | EAR3-DU-32b | 1 |
| EAR2-DU-19b | 1,2 | EAR2-DU-34h | 1 | EAR2-DU-54c | 1 | EAR3-DU-32e | 1 |
| EAR2-DU-19c | 1 | EAR2-DU-35a | 1,2 | EAR2-DU-54d | 1 | EAR3-DU-33a | 1,2 |
| EAR2-DU-19e | 1 | EAR2-DU-35b | 1,2 | EAR2-DU-54e | 1 | EAR3-DU-33c | 1,2 |
| EAR2-DU-19f | 1 | EAR2-DU-35c | 1 | EAR2-DU-54f | 1 | EAR3-DU-33d | 1 |
| EAR2-DU-20a | 1 | EAR2-DU-35d | 1 | EAR2-DU-54h | 1 | EAR3-DU-33e | 1 |
| EAR2-DU-21a | 1 | EAR2-DU-36a | 1 | EAR2-DU-56i | 1 | EAR3-DU-34c | 1,2 |
| EAR2-DU-21c | 1 | EAR2-DU-36b | 1 | EAR2-DU-56j | 1 | EAR3-DU-34d | 1 |
| EAR2-DU-21d | 1 | EAR2-DU-36c | 1,2 | EAR2-DU-56k | 1 | EAR3-DU-35a | 1 |
| EAR2-DU-22a | 1 | EAR2-DU-36d | 1,2 | EAR2-DU-56n | 1 | EAR3-DU-35b | 1 |
| EAR2-DU-22b | 1 | EAR2-DU-37a | 1,2 | EAR2-DU-57a | 1 | EAR3-DU-35d | 1 |
| EAR2-DU-22c | 1 | EAR2-DU-37c | 1 | EAR2-DU-57b | 1 | EAR3-DU-36a | 1 |
| EAR2-DU-22d | 1 | EAR2-DU-37d | 1 | EAR2-DU-58a | 1 | EAR3-DU-36b | 1 |
| EAR2-DU-23a | 1,2 | EAR2-DU-38c | 1 | EAR2-DU-58b | 1 | EAR3-DU-38c | 1 |
| EAR2-DU-23b | 1,2 | EAR2-DU-38d | 1,2 | EAR2-DU-58c | 1 | EAR3-DU-38d | 1 |
| EAR2-DU-23b | 1,2 | EAR2-DU-38e | 1 | EAR2-DU-58e | 1 | EAR3-DU-40a | 1 |
| EAR2-DU-23c | 1 | EAR2-DU-39a | 3 | EAR2-DU-58f | 1 | EAR3-DU-40b | 1 |
| EAR2-DU-23d | 1 | EAR2-DU-39b | 1 | EAR2-DU-59b | 1 | EAR3-DU-40c | 1,2 |
| EAR2-DU-24b | 1 | EAR2-DU-39c | 1 | EAR2-DU-59c | 1 | EAR3-DU-40d | 1 |
| EAR2-DU-24c | 1 | EAR2-DU-39d | 1 | EAR2-DU-60a | 1,2 | EAR3-DU-40e | 1,2 |
| EAR2-DU-25a | 1 | EAR2-DU-39e | 1 | EAR2-DU-61d | 1 | EAR3-DU-40g | 1 |
| | | | | | | EAR3-DU-42i | 1 |
| | | | | | | EAR3-DU-42k | 1 |

**Notes:**

Type 1: RO-2C -grass cover VSI and repair

Type 2: RO-2B1 or RO-2B2 -landscaping strip VSI and remediation

Type 3: RO-2A -full DU soil excavation / replacement

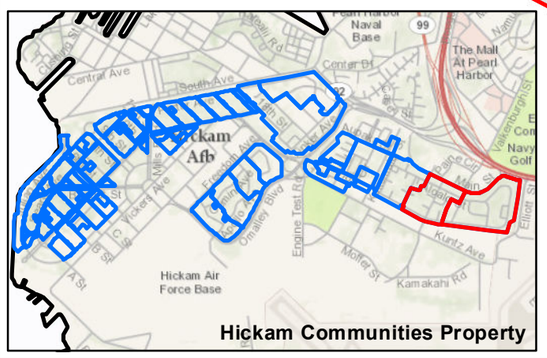
### *4.3.1 Description of Removal Action No.2*

Following conditional approval of the RO #2 work plan[75] VSIs were conducted of each of the 195 DUs identified under RO-2C, on January 4, 2011. From this initial list, a total of 21 DUs (thirteen at Earhart I-2 and eight at Earhart I-3), were identified that had bare areas required reseeding (by hydroseeding) of exposed soil. Each of these bare areas was designated as an individual DU and a total of 23 bare area DUs were addressed under RO-2C are shown in Table 4-3.

[75] (HDOH 2010c)

Earhart Village I-3

Earhart Village I-2




DU Previously Sampled

N

0 100 200

Feet

Earhart Village I-2/I-3

Hardscapes

1 0 b Decision Unit Numbers

TETRA TECH

Action Type 1:
Inspect Grass and Re-Seed as Needed

Action Type 2:
Decision Units likely to have 2 to 3 foot wide landscaping strips adjacent to buildings. These landscaping strips would be excavated and replaced with geotextile and gravel.

Action Type 3:
Decision unit requiring excavation and subsequent backfill with clean soil.

Decision unit excavated and backfilled under RO# 1.

No Action Planned Under RO#2

**Notes:**

- Inset map shows Hickam Communities Property Boundary Line.

# *Removal Action No. 2 Alternatives*
# *Earhart I-2 and Earhart I-3 Neighborhoods*
# *Hickam Communities - 2012*

Joint Base Pearl Harbor-Hickam, Hawai'i

**Figure 4-1**

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**Table 4-3. Bare Area DUs – Results of Grass Cover Repair Inspections for RO-2C**

| RO | Bare Area DU Name | Inspection Date | Contiguous Bare Areas [(a)] >200 sq ft | Bare Areas [(b)] | Field Observations [(c)] |
|---|---|---|---|---|---|
| *Earhart I-2 Neighborhood* | | | | | |
| RO-2C | EAR2-DU-03c-BA01 | 4-Jan-11 | No | Yes | Bare earth due east of playground |
| RO-2C | EAR2-DU-03c-BA02 | 4-Jan-11 | No | Yes | Area is about 30 feet northeast of playground |
| RO-2C | EAR2-DU-13a-BA01 | 5-Jan-11 | No | Yes | Bare earth surrounds tree behind building 6355 |
| RO-2C | EAR2-DU-13c-BA01 | 5-Jan-11 | No | Yes | Adjacent to back lanai of building 6353 |
| RO-2C | EAR2-DU-14d-BA01 | 5-Jan-11 | No | Yes | Area north of and between buildings 6380 and 6381 |
| RO-2C | EAR2-DU-15b-BA01 | 5-Jan-11 | No | Yes | Area contiguous and behind back lanai of building 6343 |
| RO-2C | EAR2-DU-23b-BA01 | 5-Jan-11 | No | Yes | Soil exposed beneath swing set behind building 6368 |
| RO-2C | EAR2-DU-24b-BA01 | 5-Jan-11 | No | Yes | Soil beneath tree in two large patches behind building 6373 |
| RO-2C | EAR2-DU-24c-BA01 | 5-Jan-11 | No | Yes | Small patch behind building 6374 |
| RO-2C | EAR2-DU-25d-BA01 | 5-Jan-11 | No | Yes | Adjacent to lanai inside “Yard of the Year” |
| RO-2C | EAR2-DU-28b-BA01 | 4-Jan-11 | No | Yes | Area consists of roughly 50% soil and 50% patchy grass |
| RO-2C | EAR2-DU-29b-BA01 | 5-Jan-11 | No | Yes | Area consists of roughly 50% soil and 50% patchy grass |
| RO-2C | EAR2-DU-56j-BA01 | 5-Jan-11 | No | Yes | Bare earth beneath basketball net behind building 6368 |
| RO-2C | EAR2-DU-58b-BA01 | 5-Jan-11 | No | Yes | Large area with patchy grass cover in northeast corner of neighborhood. |
| *Earhart I-3 Neighborhood* | | | | | |
| RO-2C | EAR3-DU-01c-BA01 | 4-Jan-11 | No | Yes | Area surrounding tree trunks, 20 x 40 feet of patchy grass |
| RO-2C | EAR3-DU-02b-BA01 | 4-Jan-11 | No | Yes | Patchy grass adjacent to trunk of papaya tree |
| RO-2C | EAR3-DU-14a-BA01 | 4-Jan-11 | No | Yes | 3 x 3 foot patch in swale behind building 6303 |
| RO-2C | EAR3-DU-16d-BA01 | 4-Jan-11 | No | Yes | Bare earth beneath children’s swings behind building 6393 |
| RO-2C | EAR3-DU-19d-BA01 | 4-Jan-11 | No | Yes | 5 x 10 foot area beneath child's play table behind building 6406 |
| RO-2C | EAR3-DU-19d-BA02 | 4-Jan-11 | No | Yes | 5 x 15 foot area along back patch of building 6406 |
| RO-2C | EAR3-DU-20b-BA01 | 4-Jan-11 | No | Yes | Patchy grass adjacent to HiTel and TV boxes behind building 6407 |
| RO-2C | EAR3-DU-28a-BA01 | 4-Jan-11 | No | Yes | Patchy grass along west side of building 6426 |

**Table 4-3. Bare Area DUs – Results of Grass Cover Repair Inspections for RO-2C**

| RO | Bare Area DU Name | Inspection Date | Contiguous Bare Areas [a] >200 sq ft | Bare Areas [b] | Field Observations [c] |
|---|---|---|---|---|---|
| RO-2C | EAR3-DU-35d-BA01 | 4-Jan-11 | No | Yes | Patchy grass adjacent to HiTel and TV boxes behind building 6407 |

**Notes** Only bare area decision units requiring action are listed

sq ft square feet

[a] Excavation of DU only required if a single area of exposed soil >200 sq ft

[b] Area of one or more exposed soil areas have a combined area of >200 sq ft, but since individual areas of exposed soil are <200 sq ft, only reseeding of exposed soil areas is required.

[c] All measurements were made in the field and are an approximate.

There were 41 DUs identified under the scenario for RO-2B1 and RO-2B2 (33 in Earhart I-2 and eight in Earhart I-3) with landscaping strips (i.e. the planter boxes located in the 2 to 3-foot strips around building perimeters) requiring inspection. Each landscaping strip was designated as its own DU, and visually inspected. Based on these inspections, a total of 29 landscaping strip DUs were identified for either total replacement or installation of geotextile fabric and gravel. The landscaping strips at some of the initially identified locations were found to contain sufficiently dense vegetation cover that placement of geotextile fabric was deemed unnecessary. The results of the VSIs and actions taken at the 29 landscaping DUs are summarized in Table 4-4.

**Table 4-4. Landscaping Strip DUs – Replacement Assessment and Management for RO-2B1 and RO-2B2**

| RO | Landscaping Strip DU Name | Inspection Date | Landscaping Strip Building-Unit Number | Landscaping Strip Replacement [a] | Management Date |
|---|---|---|---|---|---|
| *Earhart I-2 Neighborhood* | | | | | |
| RO-2B2 | EAR2-DU-27a-LS811 | 4-Jan-11 | 6338-811 | No | 15-Feb-11 |
| RO-2B1 | EAR2-DU-27a-LS817 | 4-Jan-11 | 6338-817 | Yes | 15-Feb-11 |
| RO-2B1 | EAR2-DU-27c-LS791 | 4-Jan-11 | 6336-791 | Yes | 14-Feb-11 |
| RO-2B2 | EAR2-DU-27c-LS797 | 4-Jan-11 | 6336-797 | No | 14-Feb-11 |
| RO-2B1 | EAR2-DU-28c-LS903 | 4-Jan-11 | 6347-903 | Yes | 15-Feb-11 |
| RO-2B1 | EAR2-DU-29a-LS921 | 4-Jan-11 | 6349-921 | Yes | 15-Feb-11 |
| RO-2B1 | EAR2-DU-30f-LS542 | 4-Jan-11 | 6380-542 | Yes | 18-Feb-11 |
| RO-2B1 | EAR2-DU-30f-LS548 | 4-Jan-11 | 6380-548 | Yes | 17-Feb-11 |
| RO-2B2 | EAR2-DU-33a-LS858 | 4-Jan-11 | 6357-858 | No | NA* |
| RO-2B1 | EAR2-DU-33b-LS864 | 4-Jan-11 | 6356-864 | Yes | 15-Feb-11 |
| RO-2B2 | EAR2-DU-34d-LS932 | 4-Jan-11 | 6353-932 | No | 15-Feb-11 |
| RO-2B2 | EAR2-DU-34d-LS938 | 4-Jan-11 | 6353-938 | No | 16-Feb-11 |
| RO-2B1 | EAR2-DU-35a-LS835 | 4-Jan-11 | 6340-835 | Yes | 15-Feb-11 |

**Table 4-4. Landscaping Strip DUs – Replacement Assessment and Management for RO-2B1 and RO-2B2**

| RO | Landscaping Strip DU Name | Inspection Date | Landscaping Strip Building-Unit Number | Landscaping Strip Replacement [(a)] | Management Date |
|---|---|---|---|---|---|
| RO-2B1 | EAR2-DU-36c-LS1022 | 4-Jan-11 | 6360-1022 | Yes | 16-Feb-11 |
| RO-2B1 | EAR2-DU-36d-LS1036 | 4-Jan-11 | 6359-1036 | Yes | 16-Feb-11 |
| RO-2B1 | EAR2-DU-36d-LS1038 | 4-Jan-11 | 6359-1038 | Yes | 16-Feb-11 |
| RO-2B1 | EAR2-DU-37a-LS562 | 4-Jan-11 | 6379-562 | Yes | 18-Feb-11 |
| RO-2B2 | EAR2-DU-37a-LS564 | 4-Jan-11 | 6379-564 | No | 18-Feb-11 |
| RO-2B2 | EAR2-DU-37a-LS566 | 4-Jan-11 | 6379-566 | No | 18-Feb-11 |
| RO-2B2 | EAR2-DU-38d-LS863 | 4-Jan-11 | 6342-863 | No | 16-Feb-11 |
| RO-2B2 | EAR2-DU-38d-LS865 | 4-Jan-11 | 6342-865 | No | 16-Feb-11 |
| RO-2B2 | EAR2-DU-40c-LS758 | 4-Jan-11 | 6369-758 | No | 22-Feb-11 |
| RO-2B2 | EAR2-DU-42a-LS722 | 4-Jan-11 | 6372-722 | No | 18-Feb-11 |
| RO-2B2 | EAR2-DU-42a-LS728 | 4-Jan-11 | 6372-728 | No | 22-Feb-11 |
| *Earhart I-3 Neighborhood* | | | | | |
| RO-2B2 | EAR3-DU-33a-LS948 | 4-Jan-11 | 6397-948 | No | 24-Feb-11 |
| RO-2B2 | EAR3-DU-33c-LS922 | 4-Jan-11 | 6391-922 | No | 24-Feb-11 |
| RO-2B2 | EAR3-DU-33c-LS928 | 4-Jan-11 | 6391-928 | No | 24-Feb-11 |
| RO-2B2 | EAR3-DU-34c-LS402 | 4-Jan-11 | 6401-402 | No | 24-Feb-11 |
| RO-2B2 | EAR3-DU-40e-LS332 | 4-Jan-11 | 6303-332 | No | 24-Feb-11 |

**Notes:**

Only landscaping strip decision units requiring action are listed

NA* No management date. Gravel was already in place when VSI was conducted.

[(a)] Yes=Remove all plants to install geotextile
No=partial removal

## 4.4 Preliminary Human Health Risk Evaluation Work Plan (HHRE WP)

In May 2011, the *HHRE WP*[76] presented adjusted site-specific EALs for aldrin and dieldrin, and four risk criteria for assessing PI soil referred to as the "2011 HHRE Standard". Hawai'i Department of Health accepted the *HHRE WP* in its letter dated June 7, 2011[77] (Appendix B3).

The four criteria presented under the 2011 HHRE Standard is the current cleanup standard in effect for the Site, and was applied to soil analytical results from the 0 to 6-inch depth interval for the remaining DUs not remediated under the RO #1 and RO #2. The four criteria in the 2011 HHRE Standard are:

(1) the cumulative excess cancer risk for aldrin plus dieldrin must not exceed $1 \times 10^{-4}$;

[76] (Tetra Tech 2011g)
[77] (HDOH 2011a)

(2) the cumulative excess cancer risk for all other organochlorine pesticides must not exceed 1 x $10^{-5}$;

(3) the cumulative excess cancer risk for all COPCs must not exceed 1 x $10^{-4}$; and

(4) the HI for all COPCs must not exceed 1.

Thus, for risk management purposes, areas with organochlorine pesticide concentrations meeting all four criteria of the 2011 HHRE Standard, would support the conclusion that potential human health risks are within acceptable risk and hazard levels, and the soil in not PI soil.

If any of the four criteria of the 2011 HHRE Standard are not met, the soil must be managed as PI soil. For the RO #3, a total of fourteen DUs were identified as being PI soil requiring action under RO-3 (Table 5-3).

### *4.4.1 Description of Removal Action No.3*

The RO conducted under RO-3[78] was for fourteen DUs identified using the 2011 HHRE Standard as having PI soil requiring remediation. Ten of these DUs were located in the Earhart 1-2 neighborhood and four were located within the Earhart I-3 Neighborhood. Following resident notification, these fourteen DUs were initially inspected by Tetra Tech and secured using orange construction fencing. Each of these fourteen DUs was remediated by excavation and backfilling with clean soil, which is described in Section 5.3.1.

[78] (Tetra Tech 2011f)

# 5.0 REMOVAL ACTION IMPLEMENTATION

The ROs were conducted in the Earhart I-2 and Earhart I-3 neighborhoods only. No ROs were performed in the Onizuka II-1 Neighborhood since no site-specific EALs were exceeded. The following sections summarize the work that was performed in each of the RO implemented at the Site.

## 5.1 Removal Action No.1

### *5.1.1 RO-1A and RO-1B – Excavation and Backfill*

Table 5-1 lists the DUs excavated and backfilled during RO-1A and RO-1B.

**Table 5-1. Decision Units Excavated and Backfilled During RO-1A and RO-1B**

| RO | DU Name | Reason for Action | Date Excavated and Backfilled | Approximate in-situ Volume (CY) |
|---|---|---|---|---|
| *Earhart I-2 Neighborhood* | | | | |
| RO-1A | EAR2-DU-42c | HI >10 | October 15 to 20, 2010 | 166 |
| RO-1A | EAR2-DU-9d | HI >10 | October 20 to 25, 2010 | 139 |
| RO-1A | EAR2-DU-9e | Adjacent to 9d | | 126 |
| RO-1A | Parts of: EAR2-DU-4c, EAR2-DU-30f, EAR2-DU-37a, EAR2-DU-37d | Small areas adjacent to DU removals | October 20 to 25, 2010 | 66 |
| RO-1A | EAR2-DU-6b | Adjacent to DU 6c | October 25 to November 2, 2010 | 154 |
| RO-1A | EAR2-DU-6c | HI >10 | | 178 |
| RO-1A | EAR2-DU-52a | HI >10 | October 25 to November 2, 2010 | 181 |
| RO-1A | EAR2-DU-52b | Adjacent to 52a | | 152 |
| RO-1B | EAR2-DU-15d | HI=3 to 10: bare soil >200 sq ft | November 5, 2010 | 84 |
| *Earhart I-3 Neighborhood* | | | | |
| RO-1A | EAR3-DU-2a | HI >10 | November 18 to 22, 2010 | 72 |
| | | | ***Total*** | ***1,318*** |

**Notes:**

DU decision unit
CY cubic yard
HI Hazard Index
sq ft square feet

The procedures used for the excavation and soil replacement under RO-1A and RO-1B were the same for each RO. At least two days prior to excavation, HC notified residents whose property was directly affected by, or adjacent to, the DUs requiring excavation by email, hand-delivered letter, telephone call, and in person. Once HC had completed resident notification, the DUs identified for excavation were secured. The DUs were initially secured by placing orange

plastic snow fencing around the DU boundary. The orange construction fencing was subsequently replaced by chain-link fencing before the start of the excavation activities.

The HC Design/Build (D/B) Contractor excavated and removed PI soil from a total of nine full DUs and parts of three adjacent DUs. Four DUs in the Earhart I-2 Area and one DU in the Earhart I-3 Area were included to address concentrations of pesticides corresponding to an HI >10, based on the 2006 HHRA Standard. One DU in the Earhart I-2 neighborhood (15d) was excavated even though the pesticide concentrations corresponded to an HI of between 3 and 10, because visual inspection of grass cover revealed an area of more than 200 sq ft of exposed soil within the DU. Three additional whole DUs and small parts of four other DUs were excavated were because they were adjacent to DUs that required excavation. The excavated DUs are shown in Figure 5-1.

As shown in Table 5-1, a total of approximately 1,318 in-place cubic yards (CY) of soil, equivalent to approximately 1,986 CY ex-situ (assuming an expansion factor of 1.5), were excavated from the DUs during RO #1. The soil was transported to the temporary PI soil management area prior placement in a permanent on-site burial pit, as described in in Sections 5.4 and 5.5.

Table 2 of the *Tech Memo* for RO #1 in Appendix C, contains a list of the visual inspection results for the DUs that were identified as having HI between 3 and 10. As indicated above, only DU-15d had bare soil areas greater than 200 sq ft.

## 5.2 Removal Action No.2

### *5.2.1 RO-2A – Excavation and Backfill*

As described in Section 4.3, the HC D/B Contractor excavated and removed PI soil from one DU (in the Earhart I-2 neighborhood) based on an HI >1 under RO-2A, as indicated in Table 5-2. Resident notifications were performed in accordance with the standard notification protocol, and the DU perimeter was fenced and secured as described in Section 5.1, above. The location of DU 39a is shown in Figure 5-4.

**Table 5-2. Decision Unit Excavated and Backfilled During RO-2A**

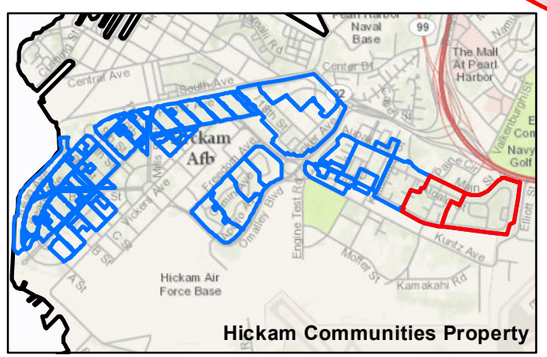
| RO | DU Name | Reason for Action | Date Excavated and Backfilled |
|---|---|---|---|
| *Earhart I-2 Neighborhood* | | | |
| RO-2A | EAR2-DU-39a | HI >1 | February 15 to 22, 2011 |

**Notes:**
DU decision unit
HI Hazard Index

Approximately 162 in-place CY (approximately 245 CY ex-situ, assuming an expansion factor of 1.5) of PI soil was transported to the temporary PI soil management area prior placement in a permanent on-site burial pit, as described in Sections 5.4 and 5.5.

Earhart Village I-3

Earhart Village I-2




DU Previously Sampled

N

0 100 200
Feet

Earhart Village I-2/I-3

Hardscapes

1 0 b Decision Unit Numbers

Decision Units excaved under RO1

Decision Units excaved under RO2

Decision Unit excaved under RO3

**Notes:**

- Inset map shows Hickam Communities Property Boundary Line.

TETRA TECH

# *Decision Units Excavated under RO1, RO2, and RO3 Earhart I-2 and Earhart I-3 Neighborhoods Hickam Communities - 2012*

Joint Base Pearl Harbor-Hickam, Hawai'i

**Figure 5-1**

R:\NEW\28936\Layouts\Earhart I-2 and I-3 Decision Units Excavated under RO1, RO2, and RO3.mxd 04/26/12 - YE

### *5.2.2 RO-2B1 and RO-2B2 – Landscaping Strip Management*

Approximately 2 to 3 feet wide landscaping strips (also referred to as "planters") around the perimeters of buildings are planted with shrubs and other plants, rather than grass, resulting in exposed soil that could present an increased potential for exposure to PI soil by HC workers, residents, and guests. The soil in the landscaping strips was identified as a potential source of exposure in DUs that had HI>1 as calculated using the assumptions of Removal Action Type 2, as discussed in Section 4.3.

Following the conditional approval of the RO #2 work plan[79], VSIs of the landscaping strips were conducted on January 4 and 5, 2011, at 40 DUs at the Site. These landscaping strips were designated as individual DUs, and were visually inspected to assess the density and types of plantings present in each landscaping strip DU. Landscaping strip DUs without vegetation, or where bare earth was exposed by insufficient vegetative cover, were identified as potential PI soil exposure sites, while landscaping strip DUs with dense vegetative cover were considered unlikely exposure sites.

Based on the VSIs, the 29 landscaping strip DUs located at a total of 18 buildings were identified for PI soil management. Vegetation was completely removed from the landscaping strips at 10 of the housing units prior to placement of geotextile and gravel. No soil was removed from the landscaping strips. Instead, following removal of the plantings, a marker layer of black landscaping (in lieu of orange geotextile) fabric was placed over the soil, followed by a layer of gravel to hold the landscaping fabric in place. At the remaining 16 housing units, low ground cover plants were removed, but taller, thick stemmed vegetation (e.g.: Ti plants) were left in place. In these cases, geotextile and gravel cover were placed around the stems of the taller plants to the extent of the landscaping strips. The results of the VSIs of landscaping strips were recorded in the field and are presented in Table 4-3. Photographic documentation of RO #2 and RO #3 are included as Appendix D (photographic documentation of RO #1 is provided with the *Tech Memo* in Appendix C). The field records for RO #1, RO #2, and RO #3 are provided Appendix D.

### *5.2.3 RO-2C – Grass Cover Inspection and Repair*

As described in Section 4.3, following conditional approval of the RO #2 work plan,[80] VSIs were conducted on January 4, 2011 of each of the 155 DUs (147 DUs in Earhart I-2 and 48 DUs in Earhart I-3), identified based on the assumptions of Removal Action Type 1. From the initial list of 195 DUs, a total of 23 bare area DUs, were identified that required reseeding of exposed soil areas. No DUs had >200 sq ft of contiguous exposed soil and required excavation. The remaining DUs had no areas of exposed soil and did not require further action. The results of the VSIs of DUs were recorded in the field notes presented in Appendix E.

[79] (HDOH 2010c, Tetra Tech 2011b)
[80] (HDOH 2010c)

## 5.3 Removal Action No. 3

### *5.3.1 RO-3 – Excavation and Backfill*

The RO #3 work plan specified that PI soil would be excavated at fourteen DUs to a depth of between 6 to 12 inches of soil and replaced with 6 to 12 inches of clean fill.[81] The HC D/B Contractor removed and replaced the soil from the 0 to 9 inch depth interval at these fourteen DUs, including ten DUs at the Earhart I-2 and four DUs at the Earhart I-3 neighborhoods identified as having concentrations of pesticides representing an HI >1 using risk assumptions defined in the *HHRE WP*[82]. The timeline for the work is shown in Table 5-3, and the locations of the DUs are shown in Figure 5-1

**Table 5-3. Decision Units Excavated and Backfilled During RO-3**

| RO | DU Name | Reason for Action | Date Excavated and Backfilled |
|---|---|---|---|
| *Earhart I-2 Neighborhood* | | | |
| RO-3 | EAR2-DU-11b | HI >1 | July 15, 2011 |
| RO-3 | EAR2-DU-14c | HI >1 | July 19, 2011 |
| RO-3 | EAR2-DU-15b | HI >1 | July 15, 2011 |
| RO-3 | EAR2-DU-23a | HI >1 | July 19, 2011 |
| RO-3 | EAR2-DU-23b | HI >1 | July 19, 2011 |
| RO-3 | EAR2-DU-27d | HI >1 | July 8, 2011 |
| RO-3 | EAR2-DU-29a | HI >1 | August 3, 2011 |
| RO-3 | EAR2-DU-37a | HI >1 | August 1, 2011 |
| RO-3 | EAR2-DU-38d | HI >1 | August 11, 2011 |
| RO-3 | EAR2-DU-42b | HI >1 | August 15, 2011 |
| *Earhart I-3 Neighborhood* | | | |
| RO-3 | EAR3-DU-12b | HI >1 | August 3, 2011 |
| RO-3 | EAR3-DU-20a | HI >1 | August 3, 2011 |
| RO-3 | EAR3-DU-33c | HI >1 | August 3, 2011 |
| RO-3 | EAR3-DU-34c | HI >1 | August 3, 2011 |

**Notes:**
DU decision unit
HI Hazard Index

Approximately 1,390 CY of soil were transported to the temporary soil stockpile area south-southwest of the Earhart I-4 neighborhood, pending final on-site management in the PI soil berm, which will be constructed in the Earhart I-2 neighborhood (Section 5.3).

Table 5-4 shows the estimated volume of PI soil transported to the temporary soil stockpile area from each DU based on removal of 9 inches of soil.

[81] (Tetra Tech 2011f)
[82] (Tetra Tech 2011g)

**Table 5-4. Excavated Soil Volumes for RO-3**

| DU Name | Building Number | DU Area (sq ft) | Soil Volume (CY) |
|---|---|---|---|
| *Earhart I-2 Neighborhood* | | | |
| EAR2-DU-11b | 6346 | 3,640 | 101 |
| EAR2-DU-14c | 6381 | 4,316 | 110 |
| EAR2-DU-15b | 6343 | 3,058 | 85 |
| EAR2-DU-23a | 6367 | 2,345 | 65 |
| EAR2-DU-23b | 6368 | 3,032 | 85 |
| EAR2-DU-27d | 6335 | 2,327 | 67 |
| EAR2-DU-29a | 6349 | 4,357 | 121 |
| EAR2-DU-37a | 6379 | 4,279 | 67 |
| EAR2-DU-38d | 6342 | 3,617 | 100 |
| EAR2-DU-42b | 6375 | 4,948 | 136 |
| *Earhart I-3 Neighborhood* | | | |
| EAR3-DU-12b | 6417 | 3,932 | 113 |
| EAR3-DU-20a | 6408 | 3,190 | 87 |
| EAR3-DU-33c | 6391 | 4,377 | 133 |
| EAR3-DU-34c | 6401 | 4,198 | 120 |
| | | ***Total*** | ***1,390*** |

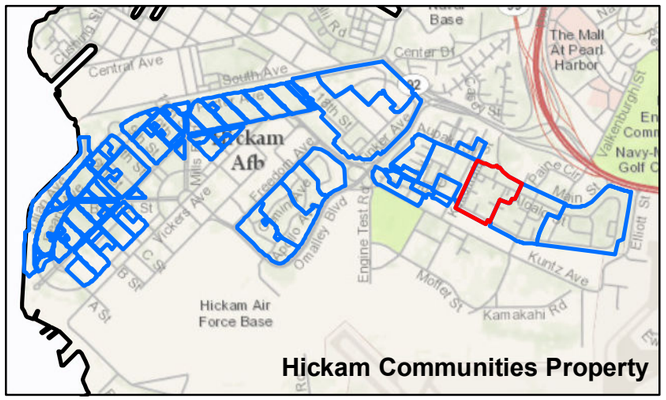
**Notes:**

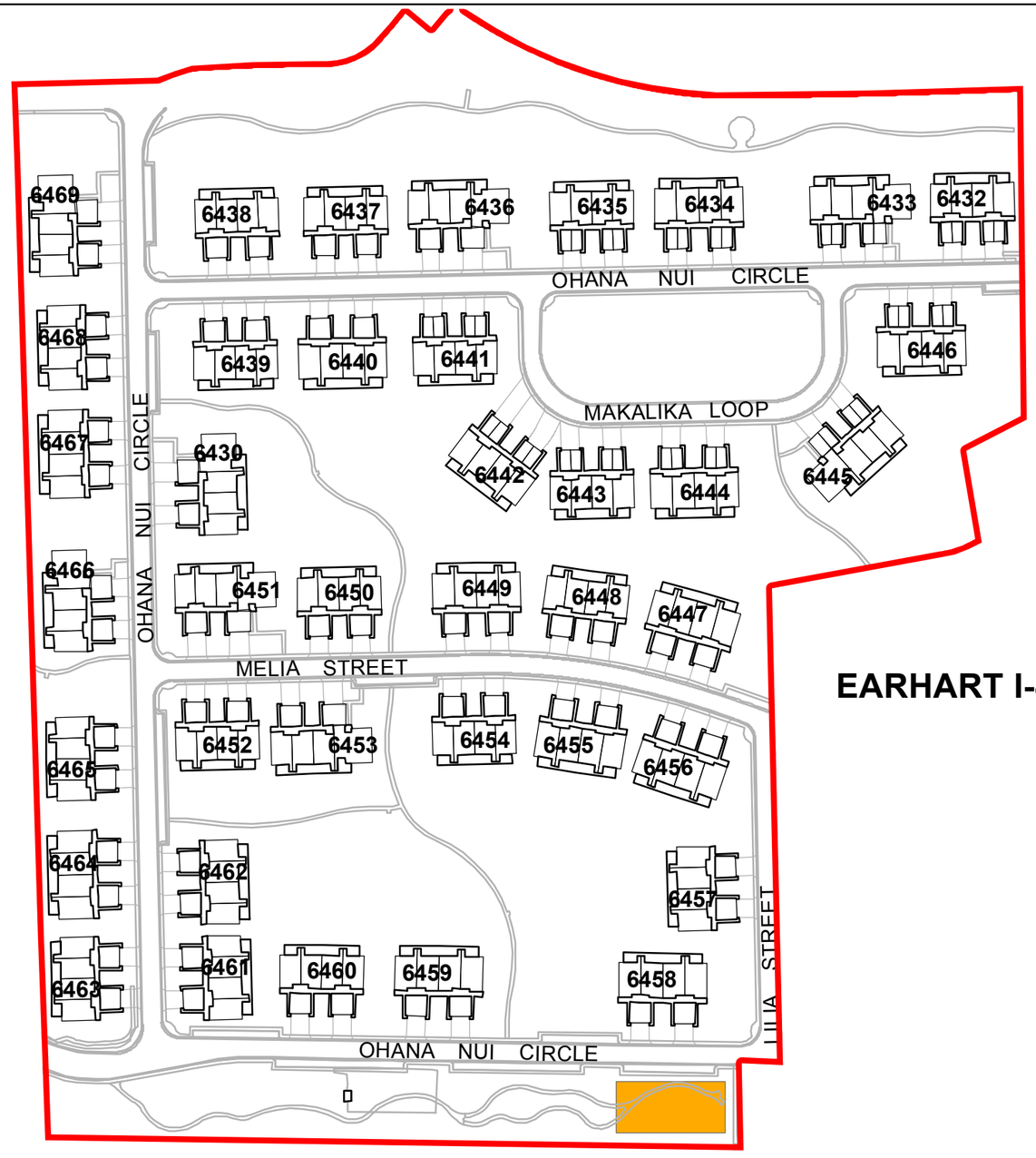
DU decision unit
sq ft square feet
CY cubic yards

## 5.4 Temporary PI Soil Management

In accordance with the RO #1, RO #2, and RO #3 work plans no PI soil was staged, stockpiled, or managed within the residential neighborhoods. All PI soil generated during the ROs was transported to the temporary soil management area located south-southwest of Ohana Nui Circle opposite the Earhart I-4 neighborhood (Figure 5-2). The temporary soil management area consisted of an approximate ½-acre site enclosed by a 6-foot chain link fence and locking gate. Prior to use, the interior of the temporary PI soil management area was graded, with a 6 to 12-inch soil berm to prevent runoff from leaving the area, and lined with 40-millimeter geotextile fabric. Once PI soil was stockpiled in the temporary management area, stockpiled PI soil was covered by a minimum 6-millimeter (mm) polyethylene sheeting and geotextile fabric and secured with anchors or sand bags to prevent wind or water erosion. Excavators used to regrade the PI stockpile were decontaminated with shovels, brooms, and wire brushes before leaving the lined soil management area.

All potential PI materials excavated during RO #1, RO #2, and RO #3 were segregated by material (e.g. soil, debris, and removed vegetation) and stockpiled pending further management or disposal. Tetra Tech monitored the excavation and backfill activities during each of the ROs. One instance was observed during the initial implementation of the RO #1, where a small volume of soil removed from around tree bases was being staged on the Site by temporarily placing it within the fenced area of a DU planned for excavation. This was necessitated when




# EARHART I-4

0 75 150
Feet

Earhart I-4 Boundary
Buildings
Roads
Stockpile Fooprint Decision Unit

**Notes:**

- Inset map shows Hickam Communities Property Boundary Line.
- All remaining soil in the temporary stockpile location removes as of February 15, 2012.

## *Temporary Pesticide-Impacted Soil Stockpile Location Hickam Communities - 2012*

Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i

TETRA TECH

**Figure 5-2**

R:\NEW\29265\Layouts\Temporaty Pesticide-Impacted Soil Stockpile Location.mxd 4/26/12 - YE

weather conditions caused a delay in soil transport trucks arriving on the Site. The soil was subsequently transported from the Site the same day[83] (Appendix E). No further staging of soil within the residential area occurred during the remainder of the RO effort.

In February 2012, the remaining PI soil being managed from RO #3 was transported to the PI soil berm for permanent management. The footprint of the former temporary stockpile was scraped, and this removed layer was also managed at the berm. Following scraping of the footprint, confirmation soil sampling was conducted, which indicated that no PI soil remained in the temporary PI soil management area[84]. A copy of the Summary of Findings Report (SoFR) for the confirmation soil sampling is provided in Appendix F1.

## 5.5 Permanent PI Soil Management

No PI soil was transported off of the JBPHH for permanent management or disposal. At the date of issue of the RAR, the PI soil has either been permanently managed or will be permanently managed on HC property as described below:

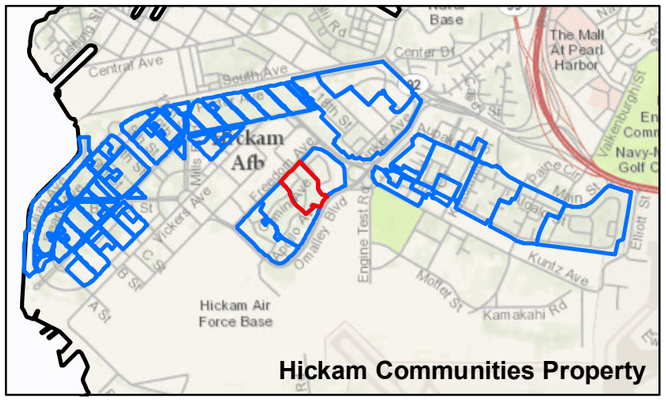
- Burial Pit No. 6b. The soil generated from RO #1 and RO #2 was transported to the Onizuka II-3 Neighborhood for permanent management in Burial Pit No. 6b (Figure 5-3).
- PI Soil Berm. The soil generated from RO #3 was permanently managed in a PI soil berm constructed in the Earhart I-2 Neighborhood (Figure 5-4).

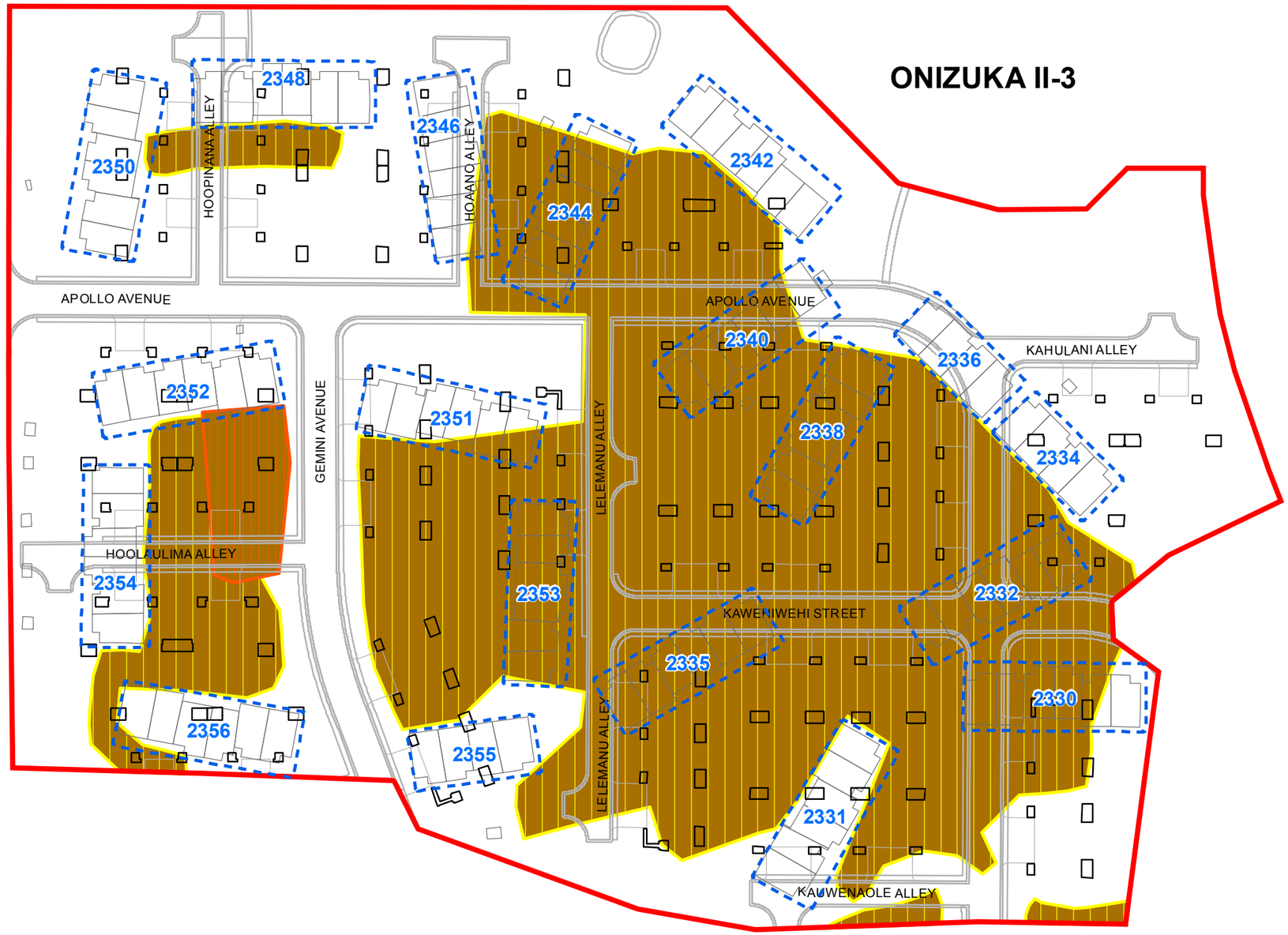
In July 2011, the Burial Pit No. 6b at the Onizuka II-3 Neighborhood was filled to capacity. To permanently manage PI soil generated during construction and renovation at HC project sites (e.g. Historic Homes District), and the soil from RO #3, the construction of a soil berm at the Earhart I-2 Neighborhood was proposed to permanently manage PI soil. The *Soil Management Plan for Pesticide-Impacted Soil Berms, Earhart I-2 Neighborhood, DCN: 2626001.0002.F01*[85] was approved by HDOH in its letter dated August 22, 2011[86]. The soil excavated from RO #3 was transported to Earhart I-2 Soil Berm in February 2012.[87]

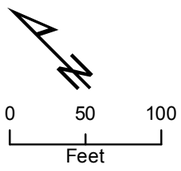
## 5.6 Backfill Soil Characterization and Backfilling

In accordance with the RO #1, RO #2, and RO #3 work plans, any soil identified for use as backfill was characterized prior to placement into excavations at the Site.[88] Soil used for backfill was primarily from sources within HC; however, two off-site sources were tested for suitability as backfill at the Site. The analytical results for the tested soil stockpiles were compared to the respective HDOH Tier 1 EALs for soil with an unrestricted land use at a distance greater than 150 meters from surface water, where groundwater is not a drinking water resource (Table A-1)[89],the respective site-specific EALs established for HC, and the site-specific EAL-based

[83] (Tetra Tech 2011a)
[84] (Tetra Tech 2012c)
[85] (Tetra Tech 2011h)
[86] (HDOH 2011b)
[87] (Tetra Tech 2012c)
[88] (Tetra Tech 2010h, 2011b, and 2011d)
[89] (HDOH 2009b)




*This is a draft map. The final topographic map for the burial pits is still outstanding.*

Onizuka II-3 Boundary
New Building Footprints
Roads
Burial Pits
Old Building Footprints
Burial Pit #6b

**Notes:**

- **Inset map shows Hickam Communities Property Boundary Line.**
- **Within the burial pits, PI soil is expected under building foundations and in utility trenches**
- **An orange geotextile marker layer has been installed between the clean soil cap and the PI soil**
- **Within burial pits, all soil removed from deeper than 1 foot has to be assumed pesticide-impacted unless tested**
- **Within burial pits, PI soil has been placed up to an elevation of 5 feet amsl**

TETRA TECH

# *Onizuka II-3 Burial Pits*
# *Onizuka II-3 Neighborhood*
# *Hickam Communities - 2012*

Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i

**Figure 5-3**

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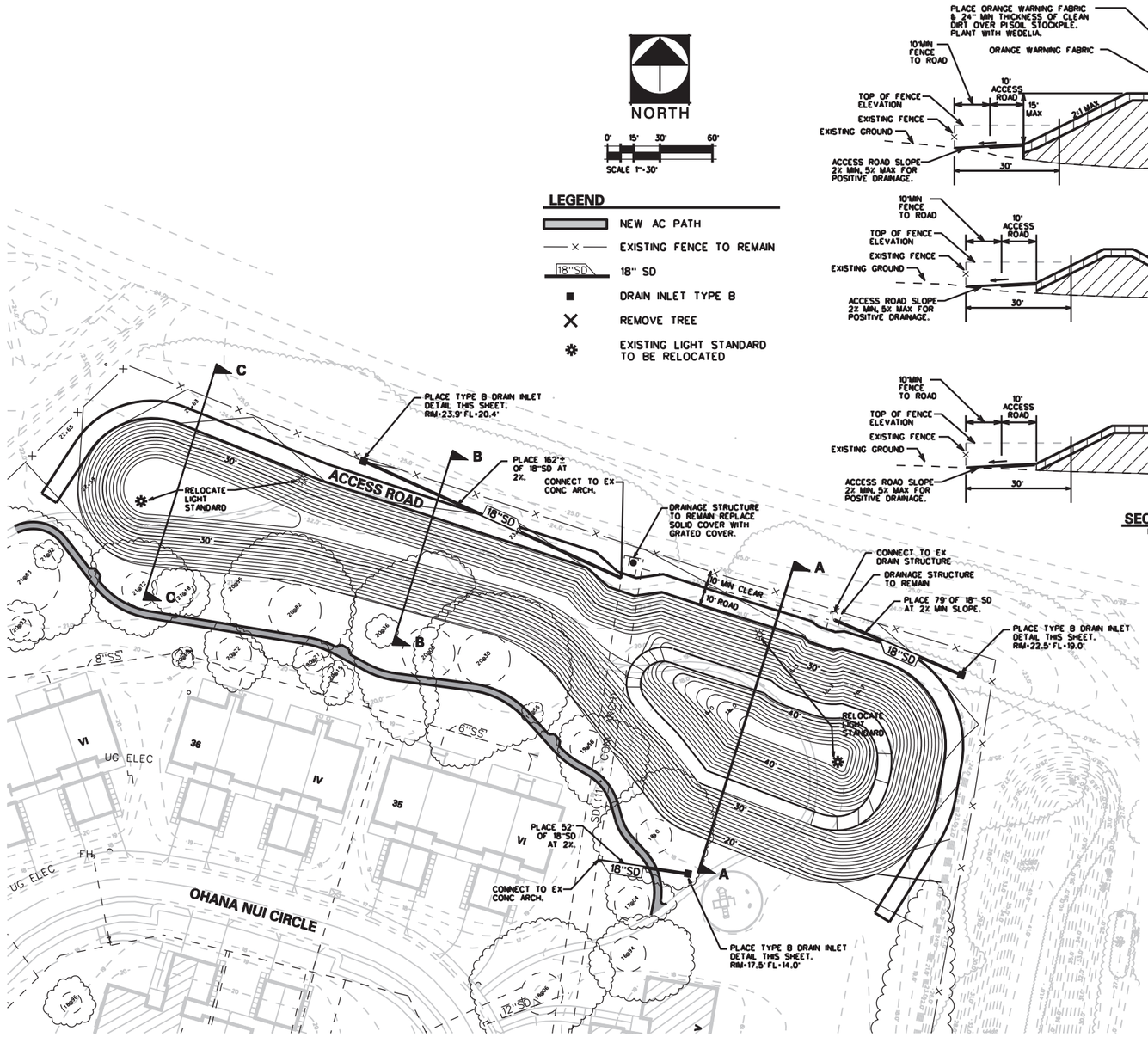
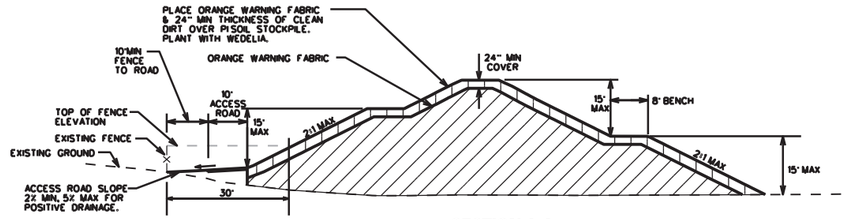
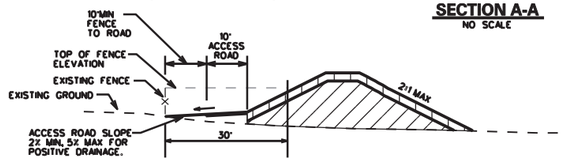
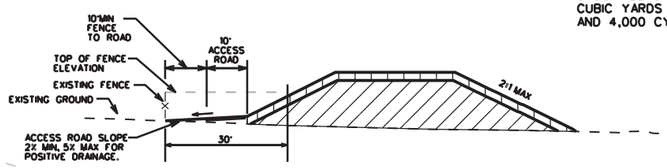


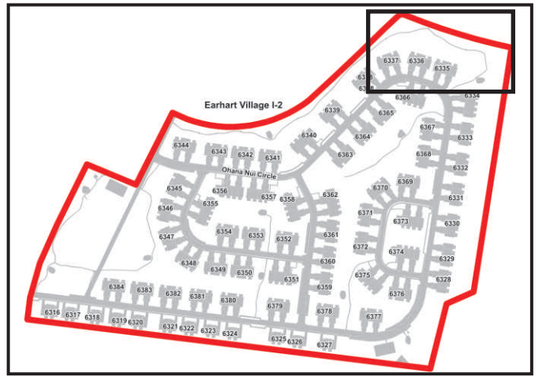

SECTION A-A
NO SCALE

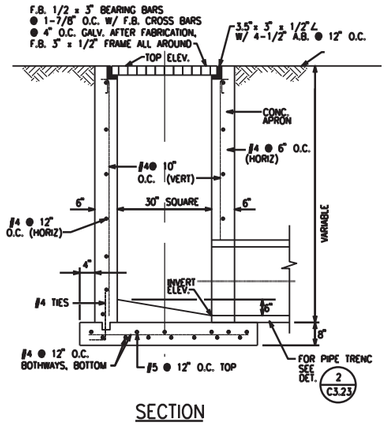



SECTION C-C
NO SCALE

NOTE:
STOCKPILE CAPACITY 15,500± CUBIC YARDS OF PISOILS AND 4,000 CY CLEAN SOILS.




SECTION

Earhart Village I-2

Hardscapes

TETRA TECH

# *Berm Location at Earhart I-2 Neighborhood Hickam Communities - April 2012*

Joint Base Pearl Harbor-Hickam O'ahu, Hawai'i

**Figure 5-4**

Source: KASL March 2011

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calculated cumulative risk compared to the 1 x $10^{-5}$ risk threshold[90].

The HC D/B Contractor backfilled the excavated DUs at the Site within two business days following completion of the PI soil removal from within each affected DU. Each DU was backfilled with a 1-foot thick layer of topsoil that was subsequently reseeded for lawns.

### *5.6.1 Removal Action No. 1*

Stockpiled soil identified for use as backfill at the Site was sampled by Tetra Tech between October 6 and November 22, 2010. The results of the stockpile soil testing indicated that the soil in all of the sampled stockpiles was not PI in accordance with the RO #1 work plan, and was suitable for reuse on HC property. Soil from Hawaiian Earth stockpiles tested as suitable for use as backfill and was imported and used for topsoil[91] (Appendix C).

The field methods and analytical results from stockpile soil testing conducted under the RO #1 are presented in separate SoFRs. Copies of the SoFRs for backfill soil are included in Appendix F2.

The soil from the characterized stockpiles was used to backfill the excavated DUs at the Site. In December 2010, each of the backfilled DUs was covered by geotextile and a 1-foot thick layer of topsoil that was subsequently reseeded for lawns; however, rain events throughout December created rills in the newly installed and reseeded soil caps. These areas are currently being monitored and will be reseeded as necessary.

### *5.6.2 Removal Action No. 2*

The soil used as backfill for the excavation of DU-39a in Earhart I-2 was taken from one of two source stockpiles that were characterized by sampling prior to use. Stockpiles located at two different locations, the D/B Contractor Office and Onizuka II-3 neighborhood, were sampled between October 6 and 8, 2010. The D/B Contractor Stockpile was an approximately 1,200-CY soil stockpile located west of the D/B Contractor's Office. The soil in this stockpile was generated during grading operations at various HC residential sites within JBPHH. The Onizuka II-3 Stockpile was an approximately 1,600-CY soil stockpile located in a parking lot off Apollo Avenue at JBPHH. The soil in this stockpile was generated during burial pit excavation within open areas at the Onizuka II-3 Neighborhood.

Based on Tetra Tech's evaluation of the analytical results, the soil in both stockpiles was identified as suitable for unrestricted use on HC property. The analytical results are included in the SOFRs for each source site (Appendix F2).

- **D/B Contractor Stockpile.** Organochlorine pesticides were detected at concentrations at or above laboratory reporting limits in all of the MI soil samples collected from the D/B Contractor Stockpile. Detections for dieldrin were at concentrations exceeding the HDOH Tier 1 EAL for dieldrin. No pesticide concentrations exceeded the site-specific EALs, and the site-specific EAL-based calculated cumulative risk associated with aldrin,

[90] (Tetra Tech 2009a)
[91] (Tetra Tech 2010p, 2010r and 2010s)

chlordane, and dieldrin concentrations was below the 1 x $10^{-5}$ risk threshold established for HC property[92].

- **Onizuka II-3 Stockpile.** Organochlorine pesticides were not detected at concentrations at or above laboratory reporting limits in the MI soil samples collected from the Onizuka II-3 Stockpile.

In March 2011, the backfilled DU was covered by a marker layer of orange geotextile fabric and a 1-foot thick layer of topsoil that was subsequently reseeded for lawn.

### *5.6.3 Removal Action No. 3*

The fourteen DUs excavated at the Site in accordance with the RO #3 work plan were backfilled with soil from the stockpiles discussed in Section 5.4.2. No soil was imported from sources outside of JBPHH for use as backfill for these DUs. Once the DUs were excavated to 9-inches below grade, a marker layer of orange geotextile fabric was placed on the floor of the excavation pit, followed by 9 inches of clean backfill soil.

## 5.7 Residential Air and Dust Monitoring

The purpose of the residential dust and air monitoring was to evaluate any potential exposure to HC residents from any dust and airborne pesticides (aldrin, chlordane, dieldrin, and heptachlor) generated during excavation activities. Residential air monitoring was also conducted during soil stockpiling activities at the temporary PI soil management area located near the Earhart I-4 neighborhood. The residential dust and air monitoring activities are summarized in this Section; the analytical results and a detailed discussion of the methods and results are presented in separate Air Monitoring Reports for each of the ROs. Copies of the Air Monitoring Reports are included in Appendix G and the methods and results are briefly summarized below.

### *Environmental Screening Levels*

Analytical results for the air monitoring conducted during the soil excavation ROs were compared to the following environmental screening levels:

- **HC Workers – PELs and TLVs.** For workers within the excavation area, the US Occupational Safety and Health Administration (US OSHA) Permissible Exposure Levels (PELs) (for aldrin, dieldrin, and chlordane)[93] and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) (for heptachlor) are applied.[94] These screening levels are 8-hour time-weighted average concentrations.
- **HC Residents and Guests – REGs.** The Residential Exposure Goals (REGs) were developed for ambient air monitoring in residential neighborhoods.[95] The REGs are site-specific thresholds which were determined using the standard EPA approach for calculating acceptable airborne chemical concentrations, a target risk of 1 x $10^{-5}$, and site-specific exposure parameters. For the Site, it was assumed that residents

[92] (Tetra Tech 2009a)
[93] (US OSHA 2010)
[94] (ACGIH 2011)
[95] (Tetra Tech 2011a)

could potentially be exposed to airborne pesticides (via inhalation) for 8-hours per day (i.e., during excavation activities) for 6 years (i.e., the residency period for military housing).[96]

- **Airborne Dust – $PM_{10}$.** The environmental screening level for dust is based on the National Ambient Air Quality Standard (NAAQS) for 10 micrometer of particulate matter ($PM_{10}$).[97]

### *5.7.1 Removal Action No. 1 – Air and Dust Monitoring*

In accordance with the RO #1 work plan, residential dust and air monitoring was conducted during excavation activities at the Site on October 15, 18 through 22, 25 through 28 and November 9, 12, 15 and 23, 2010.

Tetra Tech contracted with Quinn Consultants, Inc. to perform dust and air monitoring at the Site. In order to collect representative samples, two residential monitoring stations were placed at the perimeter of the excavation areas. A personal sampler for the collection of airborne pesticide samples was worn by select Site personnel working within some of the excavation areas. For the residential dust and air monitors placed at the excavation perimeters, one was located "reasonably" upwind and outside of the soil removal activities, but sufficiently close enough to the excavation work to ensure that monitoring data were representative of the neighborhood. The second sampler was placed downwind of the excavation areas and as close to the affected housing units as feasible, such that the collected air samples would be as representative as possible of potential exposures of nearby residents. During excavation activities at the Site:

- **RO #1: HC Workers – Personal Air Monitoring Results.** For workers within the excavation area, the US OSHA PELs (for aldrin, dieldrin, and chlordane) and the ACGIH TLVs (for heptachlor) were applied. There was one detection of dieldrin in a personal monitor that slightly exceeded the REG for dieldrin, but all of the detections were below the respective US OSHA PELs (Appendix G).
- **RO #1: HC Residents and Guests – Residential Air Monitoring Results.** Analytical results for airborne pesticides were compared to REGs calculated for the Site, based on site-specific determinations of risk-based air concentrations (Appendix G). Airborne pesticides were detected in some of the residential air monitoring samples collected during excavation work, but all of the detections were below the respective site-specific REGs.
- **RO #2: Residential Dust Monitoring Results.** Dust monitoring data from October 2010 was compared to the NAAQS for $PM_{10}$. Detections of dust were reported as average, minimum and maximum readings recorded over each 8-hour day during excavation activities. The average and minimum readings for dust at the Site were below the $PM_{10}$ threshold, and maximum dust readings exceeded the $PM_{10}$ threshold in three of the upwind samples and four of the downwind samples.

[96] (USAF RL 1998)
[97] (EPA 2010)

### *5.7.2 Removal Action No. 2 – Air and Dust Monitoring*

In accordance with the RO #2 work plan, residential air monitoring was conducted during excavation activities at the at the Earhart I-2 neighborhood from February 15 through 17, 2011. The purpose of the air monitoring was to evaluate the potential exposure to HC workers and the public (i.e. HC residents and guests) from airborne pesticides (if any) during PI soil excavation activities being performed at the Site under the RO #2.[98] A copy of the *Air Monitoring Report, Removal Action No. 2, Earhart I-2 Neighborhood*[99] is provided in Appendix G.

The work scope for conducting the air monitoring was as follows:

- **RO #2: HC Workers – Personal Air Monitoring Scope of Work.** Air samples were collected in the breathing zones of two HC workers using personal air monitors. One personal monitor was placed on an HC laborer and one on an equipment operator within the work zone. The results of the personal air monitoring were used to evaluate the health impact on the HC workers from exposure to pesticides.
- **RO #2: HC Residents and Guests – Residential Air Monitoring Scope of Work.** For the exposure assessment, air samples were collected at upwind and downwind locations near the excavation Site boundary line. Sampling locations were moved periodically depending on excavation work locations and the prevailing wind direction at the time of sampling.
- **RO #2: Residential Dust Monitoring Scope of Work.** Residential dust monitoring was conducted during excavation activities at the Site. The dust monitoring samples were collected from one upwind and one downwind air monitoring station that coincided with the residential air monitors. Dust data was collected at a rate of one reading per minute during excavation activities over an 8-hour work day.

The monitoring results are summarized as follows:

- **RO #2: HC Workers – Personal Air Monitoring Results.** Tetra Tech collected a total of seven personal air monitor samples for RO #2. For HC worker health and safety monitoring, the organochlorine pesticides aldrin and dieldrin were detected in the air samples collected from the personal air monitors. The detected pesticide concentrations were below the US OSHA PELs and the ACGIH TLVs. The health risk screening concluded that the potential for health effects to HC workers due to exposure of pesticides is low.
- **RO #2: HC Residents and Guests – Residential Air Monitoring Results.** The organochlorine pesticides aldrin, dieldrin and chlordane were detected in the air samples collected at residential air monitoring stations located upwind and downwind from excavation activities at the Site. The detected concentrations were below the REGs established for HC (Appendix G).[100] The health risk screening concludes that the potential for health effects to HC residents and guests due to exposure of pesticides is low.
- **RO #2: Residential Dust Monitoring Results.** The average and minimum dust levels for excavation activities conducted under the RO #2 are below the NAAQS $PM_{10}$ threshold for particulate dust. The maximum dust detections exceeded the

[98] (Tetra Tech 2011b)
[99] (Tetra Tech 2011e)
[100] (Tetra Tech 2011a)

$PM_{10}$ threshold in all of the upwind and downwind samples; however since the average daily readings being below the $PM_{10}$ threshold, and the dust samples were collected at a rate of one reading per minute during excavation activities, the exceedances in the maximum detections are likely due short dust emission bursts and not the result of prolonged dust emissions.

### *5.7.3 Removal Action No. 3 – Air and Dust Monitoring*

Air and dust monitoring during RO #3 was similar to monitoring during RO #2, except that due to having simultaneous excavation activities ongoing at more than one site, air sampling was performed at more than one site during RO #3.

In accordance with the RO #3 work plan,[101] residential air monitoring was conducted during excavation activities from July 6 through 26, 2011. As for RO #2, the purpose of the air monitoring was to document the effectiveness of dust suppression during excavation activities, and to identify any exposures to HC workers and the public (i.e. HC residents and guests) from airborne pesticides during PI soil excavation activities. The work scope for conducting the air monitoring was as follows:

- **HC Workers – Personal Air Monitoring Scope of Work**. Air samples were collected in the breathing zones of two HC workers using personal air monitors. One personal monitor was placed on an HC laborer and one on an equipment operator within the work zone. The results of the personal air monitoring were used to evaluate the health impact on the HC workers from exposure to pesticides.
- **HC Residents and Guests – Residential Air Monitoring Scope of Work.** For the exposure assessment, air samples were collected at upwind and downwind locations near the excavation Site boundary line. Sampling locations were moved periodically depending on excavation work locations and the prevailing wind direction at the time of sampling.
- **Residential Dust Monitoring Scope of Work.** Residential dust monitoring was conducted during excavation activities at the Site. The dust monitoring samples were collected from one upwind and one downwind air monitoring station that coincided with the residential air monitors. Dust data was collected at a rate of one reading per minute during excavation activities over an 8-hour work day.

### *5.7.4 Worker Health & Safety Monitoring*

The air monitoring for HC workers was conducted using personal air monitors place on two HC workers, one laborer and one equipment operator, while they were working with PI soil within the excavation area. The goal of the monitoring was to obtain an average exposure based on a typical workday with a typical workload.

The sample collection apparatus used to monitor the breathing zone consists of a pump attached to the belt of a worker using a belt clip. A nylon tube connected the pump to a filter cassette and cartridge is situated at about the worker's neck height. The pump draws air through the filter and cartridge at a specific flow rate. The flow rate, types of filters, cartridge, and sampling times are specified in the National Institute for Occupational Safety and Health

[101] (Tetra Tech 2011f)

Guideline.[102] For the air monitoring conducted under the RO #2 and RO #3, the filter and cartridge were subsequently analyzed for organochlorine pesticides.

The air sampling pumps are standard equipment used in industrial hygiene exposure sampling. Prior to air monitoring, the sampling pumps are calibrated using a drycal calibrator. The pumps are also calibrated after the air monitoring event to detect any drift in the pump rate during the sampling period. The pre- and post-pump rates were averaged to obtain the average flow rate for data analysis. The filter and cartridge samples were marked and numbered for identification.

For the breathing zone air monitoring, the personal air samplers were attached to HC workers within the excavation area at the Site. The HC workers included one laborer and one equipment operator. Specific directions were given to each HC worker to notify Tetra Tech personnel if any problems occurred during sampling, such as pump failure or filter to pump disconnection. Tetra Tech personnel checked with the workers on an hourly basis to ensure proper air sampling was in progress.

For the air monitoring at the Site, a field blank sample was also collected. Since the field blank is installed, removed and handled in the same manner as the air samples, the procedure of taking a field blank provides the level of mass loading that may occur from the sample handling process alone. As a result, any mass found on the field blank is considered an artifact of the sampling process, and the amounts are subtracted from the sample mass loading for each air sample collected. Tetra Tech conducted the monitoring on three consecutive days, and did not detect significant problems in air sample collection over the 3-day event. There was no mass loading found in the blank samples.

After the air sampling was completed, the air samplers were shut off, the shut down time recorded. The filter and cartridge samples were removed from the pumps. The inlet and outlet of the filter cassettes and cartridge were immediately capped to prevent any increase or decrease in the mass loading of the filters and cartridge samples. The filter and cartridge samples were bagged and placed in ice boxes and sent to Torrent Laboratory, Inc., Milpitas, California (the laboratory) with chain of custody.

## 5.8 Analytical Methods and Results – Personal Monitors

Tetra Tech collected a total of 32 air samples for RO #3. Aldrin and dieldrin were detected in the personal air monitoring samples at concentrations well below the US OSHA PELs. The analytical results are presented in Table 2 of the Air Monitoring Report, and a copy of the analytical report is available in Appendix G.

### *5.8.1 HC Residential Exposure Monitoring*

The air sampling protocol for RO #3 was developed based on the actual site operational and physical characteristics, including site activities, receptor locations, and wind direction. A polyurethane foam (PUF) sampler was used for collection of airborne pesticides. The PUF sampler is designed to simultaneously collect suspended airborne particulates and trap airborne vapors at flow rates up to 0.28 cubic meters per minute. Ambient air is forced through a dual chambered module, which contains both a particulate and vapor filtering system. The filter and

[102] (NIOSH 2005)

foam are removed and sent to an analytical laboratory for analysis to provide the concentrations of chemicals.

Prior to beginning the air monitoring event, the air sampling pumps were calibrated using a manometer and calibration kit supplied by the equipment vendor.

The air sampling stations were placed upwind and downwind of key activity areas at the Site. To minimize other sources of fugitive emissions between the sampler and the excavation area, the air sampling stations were placed as close to the excavation area as feasible. The air sampling stations were periodically moved so that the air samplers would be nearest to the activities generating dust emissions. This placement was done in order to capture any upwind and downwind airborne pesticides. Any pesticides detected in upwind samples are considered background, while the difference in the collected pesticide concentrations between upwind and downwind samples is considered the net offsite airborne pesticide concentration resulting from onsite excavation activities.

To establish optimal locations for the upwind and downwind air sampler stations, meteorological data collected at Honolulu International Airport, which is immediately to the west of JBPHH (HNL 2011), were reviewed. Figure 1 of the Air Monitoring Report shows the Wind Rose Graph indicating the prevailing wind is from the northeast with an average wind speed of 9.11 knots.

## 5.9 Field Methods – Residential Monitors

A small gasoline generator was used to power the sampler. Monitoring activities included calibrating the sampling equipment, verifying initial and final sampler flow rates, replacing the exposed filter cassettes and PUF modules, and setting timers for the sampling duration. The samplers were operated during excavation activities for up to 8 hours each day over a 3 or 4-day period. The collected samples are thus composite samples for the residential air monitoring (e.g. the sample dated February 17, 2011, was collected from February 15 through 17, 2011).

The collected air samples were processed, stored in a cooler with ice for sample preservation, and transported under a chain-of-custody form to a certified analytical laboratory for analyses. A copy of the field records for the Air Monitoring report is available in Appendix G.

## 5.10 Analytical Methods and Results – Residential Ambient Air Monitoring

A total of ten ambient air samples were shipped to Torrent Laboratory, Inc., Milpitas, California for analysis. The laboratory provided the total mass contained on each sample filter. Mass of pesticides detected was converted to units of concentration in air by dividing the mass by the total volume of air that flowed through the filters.

The analytical results are presented in the Air Monitoring Report for RO #3, included in Appendix G. The concentrations of pesticides in air were compared to the standard REGs developed for HC. The concentrations of the organochlorine pesticides aldrin, chlordane, and dieldrin in both upwind and downwind air monitoring stations were well below the respective REG values.

### *5.10.1 Ambient Dust Monitoring*

Ambient real time dust monitoring was conducted during excavation activities at the Site from July 6 through 26, 2011. The dust monitoring samples were collected from one upwind and one downwind air monitoring station placed in conjunction with the residential air monitors. Dust data were collected at a rate of one reading per minute during excavation activities over an 8-hour work day.

The dust monitoring results from July 2011 were compared to the NAAQS $PM_{10}$ screening level for airborne dust. The results were reported as average, minimum, and maximum values for each 8-hour monitoring period, where the dust readings were collected at a rate of one reading per minute. These results are summarized below and presented in Appendix G.

- The average dust concentrations recorded by the upwind monitor ranged from 9 to 43 micrograms per cubic meter ($\mu g/m^3$), and in the downwind dust monitors from 7 to 40 $\mu g/m^3$. All of which are below the NAAQS $PM_{10}$ standard (150 $\mu g/m^3$).
- The minimum dust concentrations recorded by the upwind monitor ranged from 0 to 15 $\mu g/m^3$, and in the downwind dust monitors from 7 to 17 $\mu g/m^3$. All of which are below the NAAQS $PM_{10}$ standard.
- The maximum dust concentrations recorded by the upwind monitor ranged from 24 to 39,000 $\mu g/m^3$, and in the downwind dust monitors from 42 to 10,100 $\mu g/m^3$. All of the upwind and downwind dust samples had detections exceeding the NAAQS $PM_{10}$ standard. The exceedances in the maximum detections are likely due to short dust emission bursts and are not the result of prolonged dust emissions.

# 6.0 DESCRIPTION OF PESTICIDE-IMPACTED (PI) SOIL REMAINING ON-SITE

Following implementation of RO #1, RO #2, and RO #3, as described in this report, any PI soil identified at the Site as requiring immediate action is no longer exposed at the ground surface. Although PI soil remaining at the Site was permanently managed under hardscapes prior to the RO, the PI soil generated during the ROs was either permanently managed by placement in the Burial Pit No. 6b at the Onizuka II-3 Neighborhood (Figure 5-3), or after being temporarily managed at the temporary PI soil stockpile located adjacent to the Earhart I-4 neighborhood (Figure 5-2), was transported for permanent management at the PI soil berm at the Earhart I-2 Neighborhood in February 2012 (Figure 5-4).

Long-term management of PI soil at the Site is evaluated within the RAA and the *Exposure Hazard Management Plan (EHMP)*,[103] and will be incorporated into the HC *Land Use Control Inventory Document* (*LUCID*).[104] The purpose of the *LUCID* is to provide information to HC maintenance personnel and contractors regarding the location of PI soil left in place at HC project sites, and to provide a protocol for managing PI soil in completed and occupied neighborhoods on HC property. The *LUCID* is used during project planning and the HC review process to ensure that maintenance personnel and contractors performing the work are aware of areas where PI soil is located, and the work can be conducted safely and in accordance with any installation-specific institutional or engineering controls.

[103] (Tetra Tech 2012b)
[104] (Tetra Tech 2012a)

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# 7.0 CONCLUSIONS AND RECOMMENDATIONS

## 7.1 Conclusions

Three ROs were implemented at the Site between September 2010 and August 2011 to reduce risks of residential exposure from PI soil present in surface. The organochlorine pesticides used at HC were aldrin, chlordane, and dieldrin, although overall concentrations for aldrin and dieldrin are generally higher than chlordane. Although DDD, DDE, and DDT were also detected in Site soil, these chemicals comprise less than 5 percent of the total risk related to organochlorine pesticides at the Site and never exceed HDOH target risk ($1 \times 10^{-5}$) or hazard (HI=1) thresholds for the Site. Organochlorine pesticides are present in Site soil since they were likely applied to subfoundation soil prior to the mid-1970s to control subterranean termites. The subfoundation soil was disturbed during demolition and site preparation (grading) activities related to construction of new housing at the Site, and despite efforts to permanently manage the PI soil beneath hardscapes or capping with clean soil, some of the PI soil became dispersed and was exposed at the surface throughout the Site.

Confirmation soil sampling was conducted in March and April 2010 at the Site. The confirmation soil sampling results prompted meetings between HC and HDOH in June and July 2010 to discuss the findings. The results of these discussions initiated the development and implementation of a comprehensive SI conducted from August to October 2010 at the Site. The Site soil was characterized during the SI using MI soil sampling. The MI soil samples were collected from the 0 to 6 and 6 to 12-inch depth intervals in DUs that were 5,500 square feet or smaller. These DUs were selected to represent front yards, back yards, play areas, and common areas at the Site.

Based on the analytical results from SI sampling of these smaller DUs, it was determined that detections of organochlorine pesticides in surface soil at some of the DUs in the Earhart I-2 and Earhart I-3 neighborhoods were at concentrations considered high enough to pose an immediate risk to HC workers, residents, and guests. Hickam Communities, in consultation with HDOH, used interim site-specific EALs to screen the soil sample results. Based on the results of this screening, the RO was initiated in September 2010, and HC went on to conduct two ROs (RO #1 and RO #2) to address soil with organochlorine pesticide concentrations that presented the highest health risks at the Site. The third RO (RO #3) was conducted voluntarily by HC.

As a result of these ROs, all DUs with combined organochlorine pesticide concentrations representing HI >1 that were identified based on results of the comprehensive shallow soil investigations of Earhart I-2, Earhart I-3, and Onizuka II-1 have been remediated. Surface soil from a total of nineteen DUs in the Earhart I-2 area, and five DUs in the Earhart I-3 area have been removed, lowering the short term non-carcinogenic risk from soil in these neighborhoods to acceptable levels. The additional measures to improve grass cover and to prevent exposure to soil in landscape strips have further reduced the risk of exposure to PI soil.

### *7.1.1 Removal Action No. 1*

The RO #1 was implemented starting in October 15, 2010 and completed by early January 2011. For RO #1, two actions (RO-1A and RO-1B) were taken based on the risk criteria. Under RO-1A, soil that contained concentrations associated with a combined non-carcinogenic risk described by an HI >10 were targeted for excavation and replacement of the upper 1-foot of soil

with clean soil. A total of four DUs in Earhart I-2, and one DU in Earhart I-3 met this criterion and were selected for action under RO-1A. At the same time, a second response action was initiated under RO-1B to ensure that turf grass in areas with soil presenting an intermediate level of risk was maintained so that the grass cover would act as an effective barrier to exposure. Under RO-1B, one DU in the Earhart I-2 neighborhood was identified where a large enough area of grass cover was inadequate and the DU was selected for excavation and replacement of the upper 1-foot of soil.

During planning of RO #1, HC decided to excavate and replace soil in three additional DUs in the Earhart I-2 area that were adjacent to the selected DUs, and to remove soil from small parts of three other adjacent DUs. All PI soil removed during RO-1A and RO-1B was stockpiled at a temporary PI soil management area, and placed into a PI soil Burial Pit No. 6b constructed in the Onizuka II-3 neighborhood on April 22, 2011.

### *7.1.2 Removal Action No. 2*

The RO #2 was implemented starting on January 4, 2011 and completed by the end of April 2011. Following completion of RO #1, RO #2 was designed to address DUs in which organochlorine pesticide concentrations with an HI >1, based on modified exposure assumptions that were developed as part of the HHRE.

On the basis of this analysis, for RO #2, three actions were implemented. Under RO-2A, one additional DU in the Earhart I-2 area was selected for excavation and replacement of the upper 1-foot of soil. A second response action was undertaken under RO-2B (RO-2B1 and RO-2B2) to inspect landscaping strips adjacent to homes in 41 DU and identify specific landscaping strip DUs requiring installation geotextile barriers in landscape strips. Under RO-2B1 and RO-2B2, actions were implemented at a total of 29 landscaping strip DUs. For the third response action, which was undertaken under RO-2C, a total of 195 DUs with intermediate pesticide concentrations were identified for inspection. The inspection was to evaluate if bare areas were present in the DUs that required hydroseeding to improve grass cover. Under RO-2C, actions were implemented at a total of 23 bare area DUs. All PI soil removed during RO #2 was stockpiled at a temporary PI soil management area, and placed into a PI soil Burial Pit No. 6b constructed in the Onizuka II-3 neighborhood on April 22, 2011.

### *7.1.3 Removal Action No. 3*

The RO #3 was implemented starting on January 5, 2011 and completed August 4, 2011. The RO #3 was developed based on reevaluation of the human health risks associated with dieldrin and aldrin as part of the *HHRE WP*, and formed the foundation modification of the site-specific EALs applicable to the HC properties. Based on these modified EALs, one action (RO-3) was conducted to address DUs with an HI >1. Under RO-3, ten DUs in Earhart I-2 and four DUs in Earhart I-3, which identified with combined pesticide concentrations representing an HI >1, were excavated to a depth of 6 inches and the soil was replaced and reseeded. The PI soil excavated during RO-3 was temporarily managed at the PI soil management area located south-southwest of the Earhart I-4 Neighborhood, and was transported to the Earhart I-2 Soil Berm for permanent management in February 2012.

## 7.2 Recommendations

Although the ROs described in this report have reduced the short-term human health risks from exposure to organochlorine pesticides to acceptable levels, further documentation and evaluation of the effectiveness of the measures completed to date will be addressed as part of the RI process implemented at the Site. This process is expected to culminate in a comprehensive permanent remedy for the soil at the Site, including implementation of a long-term management program to ensure the maintenance of effective barriers to exposure to the remaining PI soil at the Site. PI soil remaining at the Site following the implementation of the ROs will be addressed by the RAA and the remedy selected for the Site presented in the RAM. It should be noted that the actions under the RO process were not considered complete until the PI soil remaining at the temporary soil management area was permanently managed at the PI soil berm in February 2012(Section 6.0).

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# APPENDIX A

## Summary Tables for the Removal Actions at the Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods

***Appendix A1 – Summary Sheet for Hazard Index Calculations***
***Appendix A2 – Summary Tables A-1 through A-4***

# APPENDIX A1

## Summary Sheet for Hazard Index Calculations

### *Appendix A1 – Summary Sheet for the Calculation of the Hazard Index*

Where multiple chemicals of potential concern (COPCs) are present in a sample, the combined effects from each COPC detected in the sample must be considered. For non-carcinogenic effects, this is done by adding the proportional contributions of each COPC to a hazard index (HI). An HI of 1 represents the highest level of non-cancer risk at which adverse effects are not expected to occur from multiple COPCs. For the Removal Actions (ROs) conducted at the Hickam Communities Remedial Action Site, the HI values corresponding to the concentrations of COPCs in each sample were calculated based on the criteria of each of the standards applied to each RO. The HI values are calculated using the site-specific non-cancer Environmental Action Levels (EALs) associated with the applicable site-specific standard (e.g. 2006 HHRA Standard), by adding together the individual risks or hazard quotients (HQs) calculated for each COPC as shown in equation (1). The HQ is the measured concentration divided by the non-cancer EAL as shown in equation (2). For chemicals that are not detected, the corresponding HQ is considered to be 0.

$$HI = HQ(COPC_1) + HQ(COPC_2) + HQ(COPC_3) + \ldots \quad (1)$$

$$HQ = [\text{COPC in sample}] / \text{Non-cancer EAL for that COPC} \quad (2)$$

Example calculations for the MI soil sample results shown in Table 1 are provided in Tables 2a and 2b.

**Table 1. Analytical Results for DU EAR2-DU-6c.**

| Sample | Analytical Results (mg/kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Aldrin | Chlordane | Dieldrin | 4,4-DDD | 4,4-DDE | 4,4-DDT | Endrin | Endrin Ketone | Methoxychlor | delta-BHC |
| ***Res. Child – Non-cancer EALs (2006 HHRA Standard)*** | ***1.8*** | ***35*** | ***3.1*** | ***----*** | ***----*** | ***36*** | ***18*** | ***18*** | ***310*** | ***21*** |
| EAR2-RA-6c-06 | 46 | <5 | 10 | <0.24 | <0.24 | <0.4 | <0.28 | 0.3 | <0.31 | <0.25 |
| EAR2-RA-6c-12 | 36 | <5 | 6.7 | <0.24 | <0.24 | <0.4 | <0.28 | <0.2 | <0.31 | <0.25 |

**Table 2a. Sample Calculation for EAR2-DU-6c-06**
**$HI = HQ_{aldrin} + HQ_{dieldrin} + HQ_{endrinketone}$**

| Sample | | Aldrin | Chlordane | Dieldrin | 4,4-DDD | 4,4-DDE | 4,4-DDT | Endrin | Endrin Ketone | Methoxychlor | delta-BHC | HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EAR2-RA-6c-06** | ***HQ:*** | 46/1.8 | +0 | +10/3.1 | +0 | +0 | +0 | +0 | +0.3/18 | +0 | +0 | **=29** |

**Table 2b. Sample Calculation for EAR2-DU-6c-12**
**$HI = HQ_{aldrin} + HQ_{dieldrin}$**

| Sample | | Aldrin | Chlordane | Dieldrin | 4,4-DDD | 4,4-DDE | 4,4-DDT | Endrin | Endrin Ketone | Methoxychlor | delta-BHC | HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EAR2-RA-6c-12** | ***HQ:*** | 36/1.8 | +0 | +6.7/3.1 | +0 | +0 | +0 | +0 | +0 | +0 | +0 | **=22** |

# APPENDIX A2

## Summary Tables A-1 through A-4


**Table A-1** Summary of Confirmation Sample Results (mg/kg) for Earhart I-2

**Table A-2** Summary of Confirmation Sample Results (mg/kg) for Earhart I-3

**Table A-3** Summary of Confirmation Sample Results (mg/kg) for Onizuka II-1

**Table A-4** Summary of Hazard Indices for and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endo-sulfan I | Endo-sulfan II | Endo-sulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Hepta-chlor | Hepta-chlor epoxide | Meth-oxychlor | Toxa-phene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-01a-06 | 0.14 | 0.12 | 4.8 | 0.088 U | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 0.085 U | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-01a-12 | 0.2 | 0.29 | 7 | 0.088 U | 0.088 U | 0.072 | 0.073 U | 2 U | 0.098 U | 0.085 U | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-01b-06 | 0.0094 U | 0.17 | 0.19 | 0.11 | 0.0088 U | 0.093 | 0.0073 U | 0.83 | 0.0098 U | 0.47 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.093 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-01b-12 | 0.0094 U | 0.54 | 1 | 0.05 | 0.0088 U | 0.33 | 0.0073 U | 2.2 | 0.0098 U | 0.22 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.3 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-02a-06 | 0.0047 U | 0.037 | 0.063 | 0.04 | 0.0044 U | 0.18 | 0.0036 U | 1.2 | 0.0049 U | 0.17 | 0.0059 U | 0.015 U | 0.0049 U | 0.0083 | 0.01 U | 0.004 U | 0.004 U | 0.12 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-02a-12 | 0.0094 U | 0.048 | 0.044 | 0.012 | 0.0088 U | 0.57 | 0.0073 U | 3.3 | 0.0098 U | 0.11 | 0.012 U | 0.031 U | 0.0098 U | 0.022 | 0.021 U | 0.008 U | 0.0079 U | 0.49 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-02b-06 | 0.0019 U | 0.048 | 0.065 | 0.013 | 0.0018 U | 0.086 | 0.0015 U | 0.6 | 0.002 U | 0.081 | 0.0024 U | 0.0061 U | 0.002 U | 0.005 | 0.0041 U | 0.0016 U | 0.0016 U | 0.07 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-02b-12 | 0.0047 U | 0.058 | 0.037 | 0.0044 U | 0.0044 U | 0.33 | 0.0036 U | 1.9 | 0.0049 U | 0.023 | 0.0059 U | 0.015 U | 0.0049 U | 0.018 | 0.01 U | 0.004 U | 0.004 U | 0.27 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-02c-06 | 0.0094 U | 0.091 | 0.53 | 0.17 | 0.0088 U | 0.093 | 0.0073 U | 0.71 | 0.0098 U | 0.51 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.085 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-02c-12 | 0.0047 U | 0.077 | 0.087 | 0.057 | 0.0044 U | 0.074 | 0.0036 U | 0.57 | 0.0049 U | 0.27 | 0.0059 U | 0.015 U | 0.0049 U | 0.0074 | 0.01 U | 0.004 U | 0.004 U | 0.068 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-03a-06 | 0.0094 U | 0.019 | 0.016 U | 0.18 | 0.0088 U | 0.04 | 0.0073 U | 0.25 | 0.0098 U | 0.6 | 0.012 U | 0.031 U | 0.0098 U | 0.016 | 0.021 U | 0.008 U | 0.0079 U | 0.037 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-03a-12 | 0.0094 U | 0.045 | 0.023 | 0.18 | 0.0088 U | 0.034 | 0.0073 U | 0.22 | 0.0098 U | 0.57 | 0.012 U | 0.031 U | 0.0098 U | 0.012 | 0.021 U | 0.008 U | 0.0079 U | 0.031 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-03b-06 | 0.0047 U | 0.028 | 0.015 | 0.043 | 0.0044 U | 0.019 | 0.0036 U | 0.18 | 0.0049 U | 0.29 | 0.0059 U | 0.015 U | 0.0049 U | 0.01 | 0.01 U | 0.004 U | 0.004 U | 0.016 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-03b-12 | 0.0047 U | 0.042 | 0.025 | 0.038 | 0.0044 U | 0.014 | 0.0036 U | 0.14 | 0.0049 U | 0.24 | 0.0059 U | 0.015 U | 0.0049 U | 0.0099 | 0.01 U | 0.004 U | 0.004 U | 0.011 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-03c-06 | 0.024 U | 0.046 | 0.068 | 0.67 | 0.022 U | 0.2 | 0.018 U | 1.5 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.033 | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-03c-12 | 0.024 U | 0.048 | 0.074 | 0.31 | 0.022 U | 0.067 | 0.018 U | 0.5 U | 0.025 U | 0.89 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.055 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-04a-06 | 0.0019 U | 0.015 | 0.018 | 0.016 | 0.0018 U | 0.0047 | 0.0015 U | 0.04 U | 0.002 U | 0.073 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.0044 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-04a-12 | 0.002 | 0.015 | 0.019 | 0.016 | 0.0018 U | 0.0045 | 0.0015 U | 0.04 U | 0.002 U | 0.04 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.0026 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-04b-06 | 0.0019 U | 0.016 | 0.012 | 0.021 | 0.0018 U | 0.003 | 0.0015 U | 0.04 U | 0.002 U | 0.072 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.0025 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-04b-12 | 0.0078 | 0.035 | 0.14 | 0.0076 | 0.0018 U | 0.0023 | 0.0015 U | 0.04 U | 0.002 U | 0.056 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.002 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-04c-06 | 0.024 U | 0.031 | 0.04 U | 0.65 | 0.022 U | 0.065 | 0.018 U | 0.5 U | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.05 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-04c-12 | 0.024 U | 0.046 | 0.04 U | 0.43 | 0.022 U | 0.12 | 0.018 U | 0.89 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-05a-06-1 | 0.024 U | 0.03 | 0.04 U | 0.23 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-05a-06-2 | 0.024 U | 0.034 | 0.04 U | 0.2 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.92 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-05a-06-3 | 0.024 U | 0.047 | 0.04 U | 0.34 | 0.022 U | 0.021 | 0.018 U | 0.5 U | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.023 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-05a-12 | 0.0073 | 0.16 | 0.18 | 0.073 | 0.0044 U | 0.0057 | 0.0036 U | 0.1 U | 0.0049 U | 0.3 | 0.0059 U | 0.015 U | 0.0049 U | 0.0064 | 0.01 U | 0.004 U | 0.004 U | 0.008 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-05b-06 | 0.0094 U | 0.095 | 0.038 | 0.26 | 0.0088 U | 0.049 | 0.0073 U | 0.34 | 0.0098 U | 1.1 | 0.012 U | 0.031 U | 0.0098 U | 0.015 | 0.021 U | 0.008 U | 0.0079 U | 0.042 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-05b-12 | 0.024 U | 0.19 | 0.065 | 0.81 | 0.022 U | 0.039 | 0.018 U | 0.5 U | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.037 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-05c-06 | 0.024 U | 0.11 | 0.063 | 0.34 | 0.022 U | 0.031 | 0.018 U | 0.5 U | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.025 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-05c-12 | 0.013 | 0.21 | 0.085 | 0.2 | 0.011 U | 0.015 | 0.0091 U | 0.25 U | 0.012 U | 0.79 | 0.015 U | 0.038 U | 0.012 U | 0.014 U | 0.026 U | 0.01 U | 0.0099 U | 0.016 | 0.028 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR2-RA-05d-06 | 0.012 U | 0.081 | 0.057 | 0.13 | 0.011 U | 0.013 | 0.0091 U | 0.25 U | 0.012 U | 0.72 | 0.015 U | 0.038 U | 0.012 U | 0.014 U | 0.026 U | 0.01 U | 0.0099 U | 0.017 | 0.028 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR2-RA-05d-12 | 0.0047 U | 0.14 | 0.061 | 0.042 | 0.0044 U | 0.0096 | 0.0036 U | 0.1 U | 0.0049 U | 0.27 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0096 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-'05e-06 | 0.047 U | 0.11 | 0.081 U | 0.35 | 0.044 U | 0.055 | 0.036 U | 1 U | 0.049 U | 1.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-'05e-12 | 0.024 U | 0.11 | 0.049 | 1 | 0.022 U | 0.032 | 0.018 U | 0.5 U | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.026 | 0.02 U | 0.03 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-06a-06 | 0.024 U | 0.036 | 0.04 U | 1.4 | 0.022 U | 0.071 | 0.018 U | 0.5 U | 0.025 U | 3.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.066 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-06a-12 | 0.094 U | 0.095 U | 0.16 U | 5.8 | 0.088 U | 0.073 | 0.073 U | 2 U | 0.098 U | 3.9 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-06b-06 | 0.047 U | 0.21 | 0.34 | 3.6 | 0.044 U | 0.085 | 0.036 U | 1 U | 0.049 U | 3.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.077 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-06b-12 | 0.065 | 0.22 | 0.47 | 3.4 | 0.044 U | 0.055 | 0.036 U | 1 U | 0.049 U | 1.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.051 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-06c-06 | 0.24 U | 0.24 U | 0.4 U | 46 | 0.22 U | 0.18 U | 0.18 U | 5 U | 0.25 U | 10 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.3 | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-06c-12 | 0.24 U | 0.24 U | 0.4 U | 36 | 0.22 U | 0.18 U | 0.18 U | 5 U | 0.25 U | 6.7 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-07a-06 | 0.024 U | 0.058 | 0.053 | 1.1 | 0.022 U | 0.16 | 0.018 U | 1.1 | 0.025 U | 2.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-07a-12 | 0.024 U | 0.041 | 0.04 U | 0.82 | 0.022 U | 0.16 | 0.018 U | 1.2 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-07b-06 | 0.024 U | 0.06 | 0.04 U | 1.2 | 0.022 U | 0.26 | 0.018 U | 2 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.022 | 0.02 U | 0.33 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-07b-12 | 0.024 U | 0.053 | 0.04 U | 0.42 | 0.022 U | 0.19 | 0.018 U | 1.3 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-08a-06 | 0.012 U | 0.017 | 0.02 U | 0.11 | 0.011 U | 0.009 U | 0.0091 U | 0.25 U | 0.012 U | 0.42 | 0.015 U | 0.038 U | 0.012 U | 0.014 U | 0.026 U | 0.01 U | 0.0099 U | 0.011 U | 0.028 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR2-RA-08a-12 | 0.012 U | 0.017 | 0.02 U | 0.08 | 0.011 U | 0.069 | 0.0091 U | 0.48 | 0.012 U | 0.45 | 0.015 U | 0.038 U | 0.012 U | 0.014 U | 0.026 U | 0.01 U | 0.0099 U | 0.066 | 0.028 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR2-RA-08b-06 | 0.024 U | 0.024 U | 0.04 U | 1.3 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.94 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-08b-12 | 0.047 U | 0.048 U | 0.081 U | 0.99 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 3.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-09a-06 | 0.024 U | 0.11 | 0.13 | 0.4 | 0.022 U | 0.19 | 0.018 U | 1.3 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-09a-12 | 0.024 U | 0.12 | 0.042 | 0.57 | 0.022 U | 0.14 | 0.018 U | 1 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-09b-06 | 0.027 | 0.18 | 0.28 | 0.09 | 0.0088 U | 0.085 | 0.0073 U | 0.63 | 0.0098 U | 0.46 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.077 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-09b-12 | 0.0024 U | 0.11 | 0.023 | 0.022 | 0.0022 U | 0.05 | 0.0018 U | 0.34 | 0.0025 U | 0.15 | 0.003 U | 0.0076 U | 0.0024 U | 0.0028 U | 0.0051 U | 0.002 U | 0.002 U | 0.04 | 0.0055 U | 0.0016 U | 0.0031 U | 0.05 U |
| EAR2-RA-09c-06 | 0.024 U | 0.029 | 0.04 U | 0.21 | 0.022 U | 0.12 | 0.018 U | 0.86 | 0.025 U | 0.93 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-09c-12 | 0.024 U | 0.029 | 0.04 U | 0.088 | 0.022 U | 0.11 | 0.018 U | 0.76 | 0.025 U | 0.52 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.089 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-09d-06 | 0.24 U | 0.24 U | 0.4 U | 25 | 0.22 U | 0.18 U | 0.18 U | 5 U | 0.25 U | 5.8 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-09d-12 | 0.047 U | 0.048 U | 0.081 U | 3.2 | 0.044 U | 0.06 | 0.036 U | 1 U | 0.049 U | 3.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.057 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-'09e-06 | 0.24 U | 0.24 U | 0.4 U | 8.7 | 0.22 U | 0.18 U | 0.18 U | 5 U | 0.25 U | 7.9 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-'09e-12 | 0.24 U | 0.24 U | 0.4 U | 11 | 0.22 U | 0.18 U | 0.18 U | 5 U | 0.25 U | 4.8 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-10a-06-1 | 0.017 J | 0.12 | 0.036 J | 0.33 | 0.0088 U | 0.15 | 0.0073 U | 1.1 | 0.0098 U | 0.83 | 0.012 U | 0.031 U | 0.0098 U | 0.023 J | 0.021 U | 0.008 U | 0.0079 U | 0.2 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-10a-06-2 | 0.017 J | 0.079 | 0.026 J | 0.34 | 0.0088 U | 0.13 | 0.0073 U | 0.86 | 0.0098 U | 0.83 | 0.012 U | 0.031 U | 0.0098 U | 0.023 J | 0.021 U | 0.008 U | 0.0079 U | 0.17 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-10a-06-3 | 0.0094 U | 0.052 | 0.02 J | 0.19 | 0.0088 U | 0.092 | 0.0073 U | 0.62 | 0.0098 U | 0.53 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.12 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-10a-12 | 0.012 J | 0.079 | 0.02 J | 0.62 | 0.0088 U | 0.11 | 0.0073 U | 0.9 | 0.0098 U | 0.94 | 0.012 U | 0.031 U | 0.0098 U | 0.024 J | 0.021 U | 0.008 U | 0.0079 U | 0.15 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-10b-06 | 0.071 | 0.55 | 0.36 | 0.36 | 0.0088 U | 0.54 | 0.0073 U | 2.8 | 0.0098 U | 0.95 | 0.012 U | 0.031 U | 0.0098 U | 0.04 J | 0.021 U | 0.008 U | 0.0079 U | 0.49 | 0.022 U | 0.0098 J | 0.012 U | 0.2 U |
| EAR2-RA-10b-12 | 0.032 J | 0.6 | 0.2 | 0.14 | 0.0088 U | 0.32 | 0.0073 U | 1.8 | 0.0098 U | 0.31 | 0.012 U | 0.031 U | 0.0098 U | 0.028 J | 0.021 U | 0.008 U | 0.0079 U | 0.32 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-11a-06 | 0.024 U | 0.15 | 0.14 | 3 | 0.022 U | 0.058 | 0.018 U | 0.5 U | 0.025 U | 5.9 | 0.03 U | 0.076 U | 0.024 U | 0.047 | 0.051 U | 0.067 | 0.02 U | 0.061 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-11a-12 | 0.03 | 0.15 | 0.19 | 1.9 | 0.022 U | 0.049 | 0.018 U | 0.5 U | 0.025 U | 5.1 | 0.03 U | 0.076 U | 0.024 U | 0.033 | 0.051 U | 0.041 | 0.02 U | 0.056 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-11b-06 | 0.038 | 0.13 | 0.32 | 5.3 | 0.022 U | 0.061 | 0.018 U | 0.5 U | 0.025 U | 8.8 | 0.03 U | 0.076 U | 0.024 U | 0.06 | 0.051 U | 0.046 | 0.02 U | 0.054 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-11b-12 | 0.024 U | 0.091 | 0.12 | 5.9 | 0.022 U | 0.051 | 0.018 U | 0.5 U | 0.025 U | 7.8 | 0.03 U | 0.076 U | 0.024 U | 0.061 | 0.051 U | 0.057 | 0.02 U | 0.046 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-11c-06 | 0.024 U | 0.049 | 0.04 U | 1.1 | 0.022 U | 0.11 | 0.018 U | 0.84 | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.029 | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-11c-12 | 0.024 U | 0.044 | 0.04 U | 0.89 | 0.022 U | 0.1 | 0.018 U | 0.83 | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.031 | 0.051 U | 0.02 U | 0.02 U | 0.092 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-11d-06 | 0.047 U | 0.064 | 0.081 U | 0.72 | 0.044 U | 0.076 | 0.036 U | 1 U | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.063 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-11d-12 | 0.024 U | 0.06 | 0.052 | 0.6 | 0.022 U | 0.074 | 0.018 U | 0.63 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.071 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-12a-06 | 0.024 U | 0.046 | 0.052 | 0.22 | 0.022 U | 0.099 | 0.018 U | 0.74 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.096 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-12a-12 | 0.024 U | 0.065 | 0.082 | 0.25 | 0.022 U | 0.14 | 0.018 U | 0.88 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-12b-06 | 0.024 U | 0.031 | 0.04 U | 1.1 | 0.022 U | 0.13 | 0.018 U | 1 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-12b-12 | 0.024 U | 0.026 | 0.04 U | 0.97 | 0.022 U | 0.099 | 0.018 U | 0.82 | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.094 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-12c-06 | 0.024 U | 0.027 | 0.04 U | 5.4 | 0.022 U | 0.48 | 0.018 U | 3.6 | 0.025 U | 3.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.49 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-12c-12 | 0.024 U | 0.027 | 0.04 U | 1.2 | 0.022 U | 0.34 | 0.018 U | 2.5 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.34 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-13a-06 | 0.047 U | 0.048 U | 0.081 U | 2.3 | 0.044 U | 0.11 | 0.036 U | 1 U | 0.049 U | 7.6 | 0.059 U | 0.15 U | 0.049 U | 0.058 | 0.1 U | 0.04 U | 0.04 U | 0.095 | 0.11 U | 0.032 U | 0.062 U | 1 U |

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-13a-12 | 0.047 U | 0.057 | 0.081 U | 2 | 0.044 U | 0.1 | 0.036 U | 1 U | 0.049 U | 5.2 | 0.059 U | 0.15 U | 0.049 U | 0.068 | 0.1 U | 0.041 | 0.04 U | 0.097 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-13b-06 | 0.047 U | 0.059 | 0.081 U | 0.84 | 0.044 U | 0.12 | 0.036 U | 1 U | 0.049 U | 4.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.12 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-13b-12 | 0.047 U | 0.048 U | 0.081 U | 1.8 | 0.044 U | 0.11 | 0.036 U | 1 U | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.087 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-13c-06-1 | 0.024 U | 0.048 | 0.045 | 1.2 | 0.022 U | 0.039 | 0.018 U | 0.5 U | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.037 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-13c-06-2 | 0.024 U | 0.061 | 0.087 | 0.51 | 0.022 U | 0.04 | 0.018 U | 0.5 U | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.041 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-13c-06-3 | 0.024 U | 0.033 | 0.04 U | 0.42 | 0.022 U | 0.033 | 0.018 U | 0.5 U | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.031 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-13c-12 | 0.024 U | 0.04 | 0.04 U | 0.82 | 0.022 U | 0.027 | 0.018 U | 0.5 U | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.029 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-13d-06 | 0.047 U | 0.12 | 0.081 U | 0.89 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 3.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-13d-12 | 0.047 U | 0.086 | 0.081 U | 0.73 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 2.5 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-13e-06 | 0.058 | 0.14 | 0.081 U | 0.94 | 0.044 U | 0.066 | 0.036 U | 1 U | 0.049 U | 3.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.078 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-13e-12 | 0.047 U | 0.065 | 0.081 U | 0.43 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 1.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-13f-06 | 0.047 U | 0.048 U | 0.081 U | 0.69 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 2.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-13f-12 | 0.047 U | 0.048 U | 0.081 U | 1.1 | 0.044 U | 0.036 | 0.036 U | 1 U | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-13g-06 | 0.094 U | 0.095 U | 0.16 U | 2 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 5.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-13g-12 | 0.047 U | 0.053 | 0.081 U | 2.2 | 0.044 U | 0.055 | 0.036 U | 1 U | 0.049 U | 4.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.06 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-14a-06 | 0.047 U | 0.076 | 0.085 | 0.39 | 0.044 U | 0.21 | 0.036 U | 1.3 | 0.049 U | 2.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.18 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-14a-12 | 0.047 U | 0.1 | 0.085 | 0.64 | 0.044 U | 0.39 | 0.036 U | 2.5 | 0.049 U | 2.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.37 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-14b-06 | 0.047 U | 0.22 | 0.25 | 1.5 | 0.044 U | 0.12 | 0.036 U | 1 U | 0.049 U | 4.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.081 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-14b-12 | 0.3 | 0.47 | 3.8 | 2 | 0.044 U | 0.078 | 0.036 U | 1 U | 0.049 U | 4.5 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.078 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-14c-06 | 0.12 U | 0.12 U | 0.2 U | 2.6 | 0.11 U | 0.17 | 0.091 U | 2.5 U | 0.12 U | 8.4 | 0.15 U | 0.38 U | 0.12 U | 0.14 U | 0.26 U | 0.1 U | 0.099 U | 0.17 | 0.28 U | 0.079 U | 0.15 U | 2.5 U |
| EAR2-RA-14c-12 | 0.047 U | 0.072 | 0.081 U | 1.5 | 0.044 U | 0.086 | 0.036 U | 1 U | 0.049 U | 3.5 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.069 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-14d-06 | 0.094 U | 0.095 U | 0.16 U | 1.6 | 0.088 U | 0.2 | 0.073 U | 2 U | 0.098 U | 4.8 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.18 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-14d-12 | 0.047 U | 0.048 U | 0.081 U | 4.5 | 0.044 U | 0.11 | 0.036 U | 1 U | 0.049 U | 4.6 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.11 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-14e-06 | 0.024 U | 0.056 | 0.071 | 7.1 | 0.022 U | 0.073 | 0.018 U | 0.55 | 0.025 U | 3.8 | 0.03 U | 0.076 U | 0.024 U | 0.034 | 0.051 U | 0.058 | 0.02 U | 0.062 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-14e-12 | 0.094 U | 0.095 U | 0.16 U | 5.1 | 0.088 U | 0.1 | 0.073 U | 2 U | 0.098 U | 3.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-15a-06-1 | 0.024 U | 0.098 | 0.058 | 0.43 | 0.022 U | 0.1 | 0.018 U | 0.76 | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.097 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-15a-06-2 | 0.024 U | 0.17 | 0.085 | 0.4 | 0.022 U | 0.095 | 0.018 U | 0.67 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.087 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-15a-06-3 | 0.024 U | 0.16 | 0.15 | 0.38 | 0.022 U | 0.1 | 0.018 U | 0.71 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.094 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-15a-12 | 0.024 U | 0.19 | 0.096 | 0.44 | 0.022 U | 0.099 | 0.018 U | 0.69 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.088 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-15b-06 | 0.024 U | 0.035 | 0.04 U | 5.6 | 0.022 U | 0.049 | 0.018 U | 0.5 U | 0.025 U | 8.6 | 0.03 U | 0.076 U | 0.024 U | 0.07 | 0.051 U | 0.053 | 0.02 U | 0.043 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-15b-12 | 0.041 | 0.041 | 0.04 U | 23 | 0.022 U | 0.042 | 0.018 U | 0.5 U | 0.025 U | 11 | 0.03 U | 0.076 U | 0.024 U | 0.089 | 0.051 U | 0.1 | 0.02 U | 0.034 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-15c-06 | 0.024 U | 0.024 U | 0.04 U | 3 | 0.022 U | 0.026 | 0.018 U | 0.5 U | 0.025 U | 4.6 | 0.03 U | 0.076 U | 0.024 U | 0.049 | 0.051 U | 0.044 | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-15c-12 | 0.024 U | 0.024 U | 0.04 U | 5.6 | 0.022 U | 0.037 | 0.018 U | 0.5 U | 0.025 U | 6.8 | 0.03 U | 0.076 U | 0.024 U | 0.055 | 0.051 U | 0.045 | 0.02 U | 0.03 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-15d-06 | 0.024 U | 0.044 | 0.047 | 5.1 | 0.022 U | 0.058 | 0.018 U | 0.5 U | 0.025 U | 8.8 | 0.03 U | 0.076 U | 0.024 U | 0.068 | 0.051 U | 0.059 | 0.02 U | 0.05 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-15d-12 | 0.024 U | 0.034 | 0.04 U | 4.9 | 0.022 U | 0.038 | 0.018 U | 0.5 U | 0.025 U | 7.1 | 0.03 U | 0.076 U | 0.024 U | 0.065 | 0.051 U | 0.07 | 0.02 U | 0.034 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-16a-06-1 | 0.047 U | 0.093 | 0.081 U | 1 | 0.044 U | 0.061 | 0.036 U | 1 U | 0.049 U | 4.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.054 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-16a-06-2 | 0.094 U | 0.11 | 0.21 | 1.1 | 0.088 U | 0.12 | 0.073 U | 2 U | 0.098 U | 4.6 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.13 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-16a-06-3 | 0.047 U | 0.074 | 0.12 | 0.69 | 0.044 U | 0.076 | 0.036 U | 1 U | 0.049 U | 3.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.067 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-16a-12 | 0.047 U | 0.066 | 0.081 U | 0.93 | 0.044 U | 0.041 | 0.036 U | 1 U | 0.049 U | 4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-16b-06 | 0.024 U | 0.044 | 0.052 | 0.32 | 0.022 U | 0.073 | 0.018 U | 0.56 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.024 | 0.02 U | 0.068 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-16b-12 | 0.024 U | 0.024 U | 0.04 U | 0.42 | 0.022 U | 0.034 | 0.018 U | 0.5 U | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.029 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-17a-06 | 0.094 U | 0.095 U | 0.16 U | 1.3 | 0.088 U | 0.099 | 0.073 U | 2 U | 0.098 U | 4.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.11 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-17a-12 | 0.094 U | 0.095 U | 0.16 U | 0.83 | 0.088 U | 0.18 | 0.073 U | 2 U | 0.098 U | 4.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.2 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-17b-06 | 0.024 U | 0.041 | 0.042 | 1.1 | 0.022 U | 0.13 | 0.018 U | 0.92 | 0.025 U | 5 | 0.03 U | 0.076 U | 0.024 U | 0.028 | 0.051 U | 0.036 | 0.02 U | 0.13 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-17b-12 | 0.024 U | 0.061 | 0.062 | 0.99 | 0.022 U | 0.25 | 0.018 U | 1.6 | 0.025 U | 4.7 | 0.03 U | 0.076 U | 0.024 U | 0.029 | 0.051 U | 0.034 | 0.02 U | 0.25 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-18a-06 | 0.024 U | 0.17 | 0.16 | 0.32 | 0.022 U | 0.089 | 0.018 U | 0.69 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.077 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-18a-12 | 0.024 U | 0.15 | 0.1 | 0.27 | 0.022 U | 0.037 | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.034 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-18b-06 | 0.02 | 0.11 | 0.1 | 0.059 | 0.0088 U | 0.028 | 0.0073 U | 0.2 U | 0.0098 U | 0.38 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.028 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-18b-12 | 0.019 | 0.11 | 0.13 | 0.045 | 0.0044 U | 0.015 | 0.0036 U | 0.1 U | 0.0049 U | 0.18 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.015 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-18c-06 | 0.031 | 0.15 | 0.09 | 0.32 | 0.022 U | 0.089 | 0.018 U | 0.52 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.074 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-18c-12 | 0.024 U | 0.12 | 0.085 | 0.14 | 0.022 U | 0.051 | 0.018 U | 0.5 U | 0.025 U | 0.83 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.047 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-18d-06 | 0.024 | 0.13 | 0.099 | 0.52 | 0.022 U | 0.15 | 0.018 U | 0.87 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-18d-12 | 0.067 | 0.14 | 0.37 | 0.5 | 0.022 U | 0.11 | 0.018 U | 0.61 | 0.025 U | 0.97 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.09 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19a-06 | 0.047 U | 0.078 | 0.081 U | 0.85 | 0.044 U | 0.082 | 0.036 U | 1 U | 0.049 U | 3.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.073 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-19a-12 | 0.024 U | 0.063 | 0.044 | 0.52 | 0.022 U | 0.1 | 0.018 U | 0.65 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.069 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19b-06-1 | 0.024 U | 0.034 | 0.04 U | 2.3 | 0.022 U | 0.071 | 0.018 U | 0.56 | 0.025 U | 6.7 | 0.03 U | 0.076 U | 0.024 U | 0.029 | 0.051 U | 0.033 | 0.02 U | 0.062 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19b-06-2 | 0.024 U | 0.032 | 0.04 U | 2 | 0.022 U | 0.1 | 0.018 U | 0.79 | 0.025 U | 7 | 0.03 U | 0.076 U | 0.024 U | 0.044 | 0.051 U | 0.044 | 0.02 U | 0.087 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19b-06-3 | 0.024 U | 0.053 | 0.04 U | 1.4 | 0.022 U | 0.1 | 0.018 U | 0.83 | 0.025 U | 6.2 | 0.03 U | 0.076 U | 0.024 U | 0.041 | 0.051 U | 0.052 | 0.02 U | 0.09 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19b-12 | 0.024 U | 0.024 U | 0.04 U | 10 | 0.022 U | 0.083 | 0.018 U | 0.6 | 0.025 U | 9.4 | 0.03 U | 0.076 U | 0.024 U | 0.037 | 0.051 U | 0.083 | 0.02 U | 0.064 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19c-06 | 0.024 U | 0.033 | 0.04 U | 1.6 | 0.022 U | 0.038 | 0.018 U | 0.5 U | 0.025 U | 4.4 | 0.03 U | 0.076 U | 0.024 U | 0.029 | 0.051 U | 0.02 U | 0.02 U | 0.032 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19c-12 | 0.024 U | 0.025 | 0.04 U | 1.1 | 0.022 U | 0.028 | 0.018 U | 0.5 U | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.022 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19d-06 | 0.024 U | 0.046 | 0.087 | 0.37 | 0.022 U | 0.046 | 0.018 U | 0.5 U | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.053 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19d-12 | 0.024 U | 0.036 | 0.061 | 0.78 | 0.022 U | 0.035 | 0.018 U | 0.5 U | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.039 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19e-06 | 0.024 U | 0.064 | 0.041 | 0.94 | 0.022 U | 0.091 | 0.018 U | 0.69 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.088 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19e-12 | 0.024 U | 0.046 | 0.04 U | 0.67 | 0.022 U | 0.078 | 0.018 U | 0.58 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.073 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19f-06 | 0.024 U | 0.066 | 0.04 U | 0.82 | 0.022 U | 0.14 | 0.018 U | 0.95 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19f-12 | 0.024 U | 0.059 | 0.04 U | 0.86 | 0.022 U | 0.14 | 0.018 U | 0.95 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19g-06 | 0.024 U | 0.024 | 0.04 U | 0.4 | 0.022 U | 0.11 | 0.018 U | 0.83 | 0.025 U | 0.98 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-19g-12 | 0.024 U | 0.033 | 0.04 U | 0.81 | 0.022 U | 0.2 | 0.018 U | 1.4 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20a-06-1 | 0.024 U | 0.036 J | 0.045 J | 0.49 | 0.022 U | 0.18 | 0.018 U | 1.2 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20a-06-2 | 0.024 U | 0.081 J | 0.04 U | 0.57 | 0.022 U | 0.15 | 0.018 U | 0.79 J | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20a-06-3 | 0.036 J | 0.058 J | 0.041 J | 0.51 | 0.022 U | 0.22 | 0.018 U | 1.1 | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20a-12 | 0.024 U | 0.037 J | 0.04 U | 0.21 | 0.022 U | 0.17 | 0.018 U | 0.81 J | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20b-06 | 0.024 U | 0.05 J | 0.048 J | 0.25 | 0.022 U | 0.26 | 0.018 U | 1.3 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.03 J | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20b-12 | 0.024 U | 0.04 J | 0.04 U | 0.18 | 0.022 U | 0.16 | 0.018 U | 0.78 J | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20c-06 | 0.024 U | 0.071 J | 0.044 J | 0.33 | 0.022 U | 0.16 | 0.018 U | 0.76 J | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20c-12 | 0.024 U | 0.048 J | 0.04 U | 0.2 | 0.022 U | 0.16 | 0.018 U | 0.72 J | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20d-06 | 0.027 J | 0.084 J | 0.083 J | 0.26 | 0.022 U | 0.24 | 0.018 U | 1.4 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20d-12 | 0.024 U | 0.082 J | 0.049 J | 1.4 | 0.022 U | 0.24 | 0.018 U | 1.4 | 0.025 U | 4.6 | 0.03 U | 0.076 U | 0.024 U | 0.032 J | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-20e-06 | 0.024 U | 0.048 J | 0.04 U | 0.56 | 0.022 U | 0.16 | 0.018 U | 0.78 J | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20e-12 | 0.024 U | 0.043 J | 0.04 U | 0.2 | 0.022 U | 0.16 | 0.018 U | 0.87 J | 0.025 U | 0.91 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20f-06 | 0.024 U | 0.035 J | 0.04 U | 0.23 | 0.022 U | 0.15 | 0.018 U | 0.99 J | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20f-12 | 0.0047 U | 0.013 J | 0.023 | 0.033 | 0.0044 U | 0.058 | 0.0036 U | 0.48 | 0.0049 U | 0.34 | 0.0059 U | 0.015 U | 0.0049 U | 0.0068 J | 0.01 U | 0.004 U | 0.004 U | 0.061 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-20g-06 | 0.024 U | 0.048 J | 0.04 U | 0.33 | 0.022 U | 0.27 | 0.018 U | 1.5 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.031 J | 0.051 U | 0.02 U | 0.02 U | 0.25 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20g-12 | 0.0094 U | 0.0095 U | 0.016 U | 0.11 | 0.0088 U | 0.12 | 0.0073 U | 0.91 | 0.0098 U | 0.56 | 0.012 U | 0.031 U | 0.0098 U | 0.011 | 0.021 U | 0.008 U | 0.0079 U | 0.13 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-20h-06 | 0.0094 U | 0.02 J | 0.016 U | 0.18 | 0.0088 U | 0.23 | 0.0073 U | 1.6 | 0.0098 U | 0.74 | 0.012 U | 0.031 U | 0.0098 U | 0.019 J | 0.021 U | 0.008 U | 0.0079 U | 0.24 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-20h-12 | 0.0094 U | 0.027 J | 0.018 J | 0.16 | 0.0088 U | 0.17 | 0.0073 U | 1.1 | 0.0098 U | 0.56 | 0.012 U | 0.031 U | 0.0098 U | 0.02 J | 0.021 U | 0.008 U | 0.0079 U | 0.16 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-20i-06 | 0.0094 U | 0.055 | 0.054 | 0.2 | 0.0088 U | 0.13 | 0.0073 U | 0.77 | 0.0098 U | 0.93 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.13 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-20i-12 | 0.0094 U | 0.02 J | 0.025 J | 0.24 | 0.0088 U | 0.076 | 0.0073 U | 0.45 | 0.0098 U | 0.67 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.071 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-20j-06 | 0.0094 U | 0.037 J | 0.068 | 0.19 | 0.0088 U | 0.23 | 0.0073 U | 1.6 | 0.0098 U | 0.38 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.28 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-20j-12 | 0.0047 U | 0.033 | 0.048 | 0.14 | 0.0044 U | 0.13 | 0.0036 U | 0.86 | 0.0049 U | 0.48 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.12 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-20k-06 | 0.0094 U | 0.082 | 0.079 | 0.23 | 0.0088 U | 0.17 | 0.0073 U | 1.2 | 0.0098 U | 1.1 | 0.012 U | 0.031 U | 0.0098 U | 0.011 | 0.021 U | 0.008 U | 0.0079 U | 0.19 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-20k-12 | 0.024 U | 0.096 J | 0.066 J | 0.16 | 0.022 U | 0.27 | 0.018 U | 2 | 0.025 U | 0.78 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.31 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20L-06 | 0.024 U | 0.09 | 0.072 | 0.29 | 0.022 U | 0.19 | 0.018 U | 1.3 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-20L-12 | 0.024 U | 0.18 | 0.13 | 0.16 | 0.022 U | 0.22 | 0.018 U | 1.4 | 0.025 U | 0.65 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-21a-06-1 | 0.024 U | 0.024 U | 0.04 U | 0.57 | 0.022 U | 0.044 | 0.018 U | 0.5 U | 0.025 U | 3.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.038 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-21a-06-2 | 0.024 U | 0.024 U | 0.04 U | 0.54 | 0.022 U | 0.021 | 0.018 U | 0.5 U | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-21a-06-3 | 0.024 U | 0.024 U | 0.04 U | 1.3 | 0.022 U | 0.029 | 0.018 U | 0.5 U | 0.025 U | 3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.026 | 0.02 U | 0.027 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-21a-12 | 0.024 U | 0.024 U | 0.04 U | 0.68 | 0.022 U | 0.018 | 0.018 U | 0.5 U | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.024 | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-21b-06 | 0.024 U | 0.024 U | 0.04 U | 0.46 | 0.022 U | 0.045 | 0.018 U | 0.5 U | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.042 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-21b-12 | 0.0094 U | 0.017 | 0.016 U | 0.14 | 0.0088 U | 0.045 | 0.0073 U | 0.4 | 0.0098 U | 0.71 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.044 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-21c-06 | 0.024 U | 0.21 | 0.04 U | 0.6 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.041 | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-21c-12 | 0.024 U | 0.067 | 0.04 U | 0.49 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.031 | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-21d-06 | 0.024 U | 0.024 U | 0.04 U | 0.9 | 0.022 U | 0.018 | 0.018 U | 0.5 U | 0.025 U | 5.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.044 | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-21d-12 | 0.024 U | 0.024 U | 0.04 U | 0.92 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 3.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.044 | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-22a-06 | 0.094 U | 0.095 U | 0.16 U | 1.5 | 0.088 U | 0.082 | 0.073 U | 2 U | 0.098 U | 5.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-22a-12 | 0.094 U | 0.095 U | 0.16 U | 2.1 | 0.088 U | 0.075 | 0.073 U | 2 U | 0.098 U | 5.6 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.086 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-22b-06 | 0.094 U | 0.095 U | 0.16 U | 1.4 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 4.3 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-22b-12 | 0.094 U | 0.095 U | 0.16 U | 2.9 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 4.9 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-22c-06 | 0.094 U | 0.095 U | 0.16 U | 0.81 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 4 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-22c-12 | 0.047 U | 0.048 U | 0.081 U | 1 | 0.044 U | 0.059 | 0.036 U | 1 U | 0.049 U | 3.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.056 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-22d-06 | 0.047 U | 0.048 U | 0.081 U | 0.6 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 3.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-22d-12 | 0.024 U | 0.029 | 0.04 U | 0.39 | 0.022 U | 0.049 | 0.018 U | 0.5 U | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.048 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-23a-06-1 | 0.047 U | 0.048 U | 0.081 U | 0.81 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 1.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-23a-06-2 | 0.094 U | 0.095 U | 0.16 U | 4.1 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 7.1 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-23a-06-3 | 0.024 U | 0.048 | 0.04 U | 0.35 | 0.022 U | 0.019 | 0.018 U | 0.5 U | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-23a-12 | 0.094 U | 0.095 U | 0.16 U | 4.7 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 9.6 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.091 | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-23b-06 | 0.094 U | 0.29 | 0.16 U | 3.2 | 0.088 U | 0.11 | 0.073 U | 2 U | 0.098 U | 8.6 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-23b-12 | 0.047 U | 0.048 U | 0.081 U | 1.3 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-23c-06 | 0.047 U | 0.048 U | 0.12 | 0.79 | 0.044 U | 0.14 | 0.036 U | 1 U | 0.049 U | 2.8 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.13 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-23c-12 | 0.047 U | 0.048 U | 0.081 U | 0.61 | 0.044 U | 0.088 | 0.036 U | 1 U | 0.049 U | 2.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.079 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-23d-06 | 0.047 U | 0.065 | 0.081 U | 1.6 | 0.044 U | 0.3 | 0.036 U | 1.9 | 0.049 U | 3.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.28 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-23d-12 | 0.094 U | 0.095 U | 0.16 U | 6 | 0.088 U | 0.2 | 0.073 U | 2 U | 0.098 U | 5.6 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.2 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-24a-06 | 0.024 U | 0.06 | 0.072 | 0.41 | 0.022 U | 0.13 | 0.018 U | 0.81 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-24a-12 | 0.024 U | 0.098 | 0.067 | 0.42 | 0.022 U | 0.15 | 0.018 U | 0.99 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-24b-06 | 0.0047 U | 0.088 | 0.083 | 0.41 | 0.0044 U | 0.19 | 0.0036 U | 1.1 | 0.0049 U | 2.59 | 0.0059 U | 0.015 U | 0.0049 U | 0.025 | 0.01 U | 0.017 J | 0.004 U | 0.17 | 0.011 U | 0.0082 J | 0.0062 U | 0.1 U |
| EAR2-RA-24b-12 | 0.0047 U | 0.09 | 0.053 | 0.2 | 0.0044 U | 0.42 | 0.0036 U | 2.6 | 0.0049 U | 0.89 | 0.0059 U | 0.015 U | 0.0049 U | 0.035 | 0.01 U | 0.0083 J | 0.004 U | 0.43 | 0.038 | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-24c-06 | 0.05 | 0.058 | 0.062 | 1.1 | 0.0044 U | 0.15 | 0.0036 U | 0.92 | 0.0049 U | 3.2 | 0.0059 U | 0.015 U | 0.0049 U | 0.03 | 0.01 U | 0.04 | 0.004 U | 0.15 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-24c-12 | 0.0084 J | 0.04 | 0.034 | 1.2 | 0.0044 U | 0.11 | 0.0036 U | 0.72 | 0.0049 U | 2.9 | 0.0059 U | 0.015 U | 0.0049 U | 0.03 | 0.01 U | 0.03 | 0.004 U | 0.11 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-24d-06 | 0.0047 U | 0.047 | 0.066 | 0.46 | 0.0044 U | 0.11 | 0.0036 U | 0.72 | 0.0049 U | 1.8 | 0.0059 U | 0.015 U | 0.0049 U | 0.021 | 0.01 U | 0.016 J | 0.004 U | 0.1 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-24d-12 | 0.0047 U | 0.045 | 0.056 | 0.4 | 0.0044 U | 0.067 | 0.0036 U | 0.45 | 0.0049 U | 1.1 | 0.0059 U | 0.015 U | 0.0049 U | 0.019 J | 0.01 U | 0.012 J | 0.004 U | 0.059 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-25a-06-1 | 0.047 U | 0.07 | 0.081 U | 1.5 | 0.044 U | 1.1 | 0.036 U | 6.6 | 0.049 U | 3 | 0.059 U | 0.15 U | 0.049 U | 0.072 | 0.1 U | 0.04 U | 0.04 U | 0.88 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-25a-06-2 | 0.024 U | 0.064 | 0.04 U | 0.66 | 0.022 U | 0.96 | 0.018 U | 6.1 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.069 | 0.051 U | 0.02 | 0.02 U | 0.87 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-25a-06-3 | 0.024 U | 0.065 | 0.04 U | 0.65 | 0.022 U | 1 | 0.018 U | 6.4 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.072 | 0.051 U | 0.02 U | 0.02 U | 0.92 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-25a-12 | 0.047 U | 0.076 | 0.081 U | 1.1 | 0.044 U | 1 | 0.036 U | 6.3 | 0.049 U | 2.8 | 0.059 U | 0.15 U | 0.049 U | 0.063 | 0.1 U | 0.04 U | 0.04 U | 0.84 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-25b-06 | 0.024 U | 0.16 | 0.25 | 0.59 | 0.022 U | 0.53 | 0.018 U | 3.4 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.47 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-25b-12 | 0.032 | 0.16 | 0.42 | 0.13 | 0.022 U | 0.32 | 0.018 U | 2.1 | 0.025 U | 0.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.26 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-25c-06 | 0.024 U | 0.081 | 0.04 U | 0.24 | 0.022 U | 0.63 | 0.018 U | 3.8 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.04 | 0.051 U | 0.02 U | 0.02 U | 0.5 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-25c-12 | 0.024 U | 0.1 | 0.04 U | 0.47 | 0.022 U | 0.75 | 0.018 U | 4.5 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.05 | 0.051 U | 0.02 U | 0.02 U | 0.56 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-25d-06 | 0.024 U | 0.055 | 0.04 U | 1.5 | 0.022 U | 0.31 | 0.018 U | 2 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.033 | 0.051 U | 0.02 U | 0.02 U | 0.27 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-25d-12 | 0.047 U | 0.048 U | 0.081 U | 2.4 | 0.044 U | 0.23 | 0.036 U | 1.4 | 0.049 U | 1.6 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.19 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-26a-06-1 | 0.024 U | 0.024 J | 0.04 U | 0.45 | 0.022 U | 0.091 J | 0.018 U | 0.63 J | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.085 J | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-26a-06-2 | 0.024 U | 0.063 J | 0.067 J | 1 | 0.022 U | 0.28 | 0.018 U | 2.1 | 0.025 U | 3 | 0.03 U | 0.076 U | 0.024 U | 0.033 J | 0.051 U | 0.037 J | 0.02 U | 0.34 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-26a-06-3 | 0.024 U | 0.057 J | 0.04 U | 0.78 | 0.022 U | 0.18 | 0.018 U | 1.3 | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.044 J | 0.02 U | 0.19 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-26a-12 | 0.024 U | 0.049 J | 0.04 U | 1.1 | 0.022 U | 0.32 | 0.018 U | 2.2 | 0.025 U | 3.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.032 J | 0.02 U | 0.32 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-26b-06 | 0.024 U | 0.046 J | 0.04 U | 0.32 | 0.022 U | 0.29 | 0.018 U | 1.9 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.28 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-26b-12 | 0.024 U | 0.028 J | 0.04 U | 0.18 | 0.022 U | 0.18 | 0.018 U | 1.2 | 0.025 U | 0.76 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-26c-06 | 0.024 U | 0.11 | 0.14 | 0.47 | 0.022 U | 0.22 | 0.018 U | 1.5 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-26c-12 | 0.024 U | 0.03 J | 0.04 U | 0.74 | 0.022 U | 0.14 | 0.018 U | 1.2 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.022 J | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-26d-06 | 0.0094 U | 0.049 | 0.027 J | 0.68 | 0.0088 U | 0.17 | 0.0073 U | 1.1 | 0.0098 U | 2.7 | 0.012 U | 0.031 U | 0.0098 U | 0.034 J | 0.021 U | 0.023 J | 0.0079 U | 0.18 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-26d-12 | 0.0094 U | 0.037 J | 0.02 J | 0.77 | 0.0088 U | 0.11 | 0.0073 U | 0.69 | 0.0098 U | 2.3 | 0.012 U | 0.031 U | 0.0098 U | 0.029 J | 0.021 U | 0.022 J | 0.0079 U | 0.11 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-26e-06 | 0.0094 U | 0.056 | 0.043 | 2.7 | 0.0088 U | 0.36 | 0.0073 U | 2.5 | 0.0098 U | 6 | 0.012 U | 0.031 U | 0.0098 U | 0.05 | 0.021 U | 0.084 | 0.0079 U | 0.37 | 0.031 J | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-26e-12 | 0.0094 U | 0.05 | 0.042 | 2.8 | 0.0088 U | 0.23 | 0.0073 U | 1.6 | 0.0098 U | 4.5 | 0.012 U | 0.031 U | 0.0098 U | 0.041 | 0.021 U | 0.081 | 0.0079 U | 0.23 | 0.022 U | 0.0063 U | 0.012 | 0.2 U |
| EAR2-RA-26f-06 | 0.056 | 0.076 | 0.081 | 0.5 | 0.0044 U | 0.22 | 0.0036 U | 1.3 | 0.0049 U | 2.2 | 0.0059 U | 0.015 U | 0.0049 U | 0.026 | 0.01 U | 0.029 | 0.004 U | 0.22 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-26f-12 | 0.04 | 0.071 | 0.063 | 1.7 | 0.0044 U | 0.11 | 0.0036 U | 0.74 | 0.0049 U | 2.9 | 0.0059 U | 0.015 U | 0.0049 U | 0.028 | 0.01 U | 0.034 | 0.004 U | 0.13 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-26g-06 | 0.047 U | 0.059 | 0.084 | 1.3 | 0.044 U | 0.15 | 0.036 U | 1 | 0.049 U | 3.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.15 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-26g-12 | 0.047 U | 0.05 | 0.081 U | 1 | 0.044 U | 0.12 | 0.036 U | 1 U | 0.049 U | 3.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.11 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-27a-06 | 0.024 U | 0.024 U | 0.04 U | 2.1 | 0.022 U | 0.077 | 0.018 U | 0.61 | 0.025 U | 4.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.044 | 0.02 U | 0.08 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-27a-12 | 0.024 U | 0.024 U | 0.04 U | 2.3 | 0.022 U | 0.041 | 0.018 U | 0.5 U | 0.025 U | 3.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.055 | 0.02 U | 0.04 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-27b-06 | 0.024 U | 0.024 U | 0.04 U | 1.6 | 0.022 U | 0.029 | 0.018 U | 0.5 U | 0.025 U | 4.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.028 | 0.02 U | 0.043 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-27b-12 | 0.024 U | 0.024 U | 0.04 U | 1.3 | 0.022 U | 0.036 | 0.018 U | 0.5 U | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.075 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-27c-06 | 0.024 U | 0.024 U | 0.04 U | 3.7 | 0.022 U | 0.045 | 0.018 U | 0.5 U | 0.025 U | 5.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.053 | 0.02 U | 0.053 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-27c-12 | 0.024 U | 0.024 U | 0.04 U | 8.3 | 0.022 U | 0.072 | 0.018 U | 0.5 U | 0.025 U | 9.7 | 0.03 U | 0.076 U | 0.024 U | 0.061 | 0.051 U | 0.16 | 0.02 U | 0.068 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-27d-06 | 0.024 U | 0.024 U | 0.04 U | 8.5 | 0.022 U | 0.045 | 0.018 U | 0.5 U | 0.025 U | 7.5 | 0.03 U | 0.076 U | 0.024 U | 0.039 | 0.051 U | 0.15 | 0.02 U | 0.06 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-27d-12 | 0.024 | 0.024 U | 0.04 U | 13 | 0.022 U | 0.045 | 0.018 U | 0.5 U | 0.025 U | 11 | 0.03 U | 0.076 U | 0.024 U | 0.052 | 0.051 U | 0.33 | 0.02 U | 0.044 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-28a-06-1 | 0.024 U | 0.033 | 0.04 U | 0.82 | 0.022 U | 0.07 | 0.018 U | 0.57 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.081 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-28a-06-2 | 0.047 U | 0.048 U | 0.081 U | 1.2 | 0.044 U | 0.083 | 0.036 U | 1 U | 0.049 U | 3.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.085 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-28a-06-3 | 0.047 U | 0.048 U | 0.081 U | 0.9 | 0.044 U | 0.064 | 0.036 U | 1 U | 0.049 U | 3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.071 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-28a-12 | 0.024 U | 0.024 U | 0.04 U | 1.1 | 0.022 U | 0.072 | 0.018 U | 0.5 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.067 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-28b-06 | 0.047 U | 0.048 U | 0.081 U | 1.1 | 0.044 U | 0.23 | 0.036 U | 1.6 | 0.049 U | 2.8 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.3 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-28b-12 | 0.047 U | 0.048 U | 0.081 U | 2.1 | 0.044 U | 0.12 | 0.036 U | 1 U | 0.049 U | 3.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.13 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-28c-06 | 0.024 U | 0.058 | 0.04 U | 3.7 | 0.022 U | 0.073 | 0.018 U | 0.56 | 0.025 U | 6.7 | 0.03 U | 0.076 U | 0.024 U | 0.048 | 0.051 U | 0.02 U | 0.02 U | 0.08 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-28c-12 | 0.094 U | 0.095 U | 0.16 U | 5.6 | 0.088 U | 0.073 | 0.073 U | 2 U | 0.098 U | 4.4 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.094 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-28d-06 | 0.047 U | 0.048 U | 0.081 U | 2.4 | 0.044 U | 0.088 | 0.036 U | 1 U | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.083 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-28d-12 | 0.094 U | 0.095 U | 0.16 U | 11 | 0.088 U | 0.12 | 0.073 U | 2 U | 0.098 U | 5.7 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.11 | 0.079 U | 0.13 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-29a-06 | 0.047 U | 0.048 U | 0.081 U | 9 | 0.044 U | 0.11 | 0.036 U | 1 U | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.14 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-29a-12 | 0.047 U | 0.058 | 0.081 U | 3.3 | 0.044 U | 0.12 | 0.036 U | 1 U | 0.049 U | 2.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.09 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-29b-06 | 0.024 U | 0.056 | 0.059 | 0.7 | 0.022 U | 0.044 | 0.018 U | 0.5 U | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.044 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-29b-12 | 0.024 U | 0.024 U | 0.04 U | 1.1 | 0.022 U | 0.042 | 0.018 U | 0.5 U | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.044 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-29c-06 | 0.047 U | 0.048 U | 0.081 U | 1.7 | 0.044 U | 0.044 | 0.036 U | 1 U | 0.049 U | 3.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-29c-12 | 0.047 U | 0.048 U | 0.081 U | 3.4 | 0.044 U | 0.07 | 0.036 U | 1 U | 0.049 U | 3.8 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.072 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-30a-06 | 0.024 U | 0.037 | 0.04 U | 0.38 | 0.022 U | 0.072 | 0.018 U | 0.6 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.067 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30a-12 | 0.024 U | 0.063 | 0.064 | 0.33 | 0.022 U | 0.085 | 0.018 U | 0.65 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.069 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30b-06 | 0.058 J | 0.085 J | 0.081 J | 0.76 | 0.022 U | 0.27 | 0.018 U | 1.5 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.029 J | 0.051 U | 0.023 J | 0.02 U | 0.23 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30b-12 | 0.067 J | 0.13 | 0.088 J | 0.82 | 0.022 U | 0.23 | 0.018 U | 1.2 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30c-06 | 0.059 J | 0.14 | 0.083 J | 0.61 | 0.022 U | 0.23 | 0.018 U | 1.3 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30c-12 | 0.07 J | 0.13 | 0.074 J | 4.1 | 0.022 U | 0.2 | 0.018 U | 1.1 | 0.025 U | 2.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.033 J | 0.02 U | 0.16 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30d-06 | 0.024 U | 0.099 J | 0.058 J | 0.53 | 0.022 U | 0.34 | 0.018 U | 2 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.32 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30d-12 | 0.024 U | 0.098 J | 0.04 U | 0.57 | 0.022 U | 0.21 | 0.018 U | 1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30e-06 | 0.024 U | 0.061 J | 0.04 U | 0.99 | 0.022 U | 0.26 | 0.018 U | 1.4 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30e-12 | 0.024 U | 0.06 J | 0.04 U | 8 | 0.022 U | 0.17 | 0.018 U | 1 | 0.025 U | 5.8 | 0.03 U | 0.076 U | 0.024 U | 0.036 J | 0.051 U | 0.073 J | 0.02 U | 0.21 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-30f-06 | 0.047 U | 0.091 J | 0.081 U | 4 | 0.044 U | 0.12 J | 0.036 U | 1 U | 0.049 U | 3.6 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.12 J | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-30f-12 | 0.14 U | 0.14 U | 0.24 U | 17 | 0.13 U | 0.11 U | 0.11 U | 3 U | 0.15 U | 4.5 | 0.18 U | 0.46 U | 0.15 U | 0.17 U | 0.31 U | 0.12 U | 0.12 U | 0.13 U | 0.33 U | 0.095 U | 0.18 U | 3 U |
| EAR2-RA-31a-06-1 | 0.0047 U | 0.023 | 0.0083 J | 0.12 | 0.0044 U | 0.16 | 0.0036 U | 0.95 | 0.0049 U | 0.49 | 0.0059 U | 0.015 U | 0.0049 U | 0.011 J | 0.01 U | 0.004 U | 0.004 U | 0.15 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-31a-06-2 | 0.0047 U | 0.012 J | 0.0081 U | 0.033 | 0.0044 U | 0.09 | 0.0036 U | 0.78 | 0.0049 U | 0.2 | 0.0059 U | 0.015 U | 0.0049 U | 0.0081 J | 0.01 U | 0.004 U | 0.004 U | 0.096 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-31a-06-3 | 0.0047 U | 0.017 J | 0.0081 U | 0.064 | 0.0044 U | 0.13 | 0.0036 U | 0.94 | 0.0049 U | 0.3 | 0.0059 U | 0.015 U | 0.0049 U | 0.01 J | 0.01 U | 0.004 U | 0.004 U | 0.12 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-31a-12 | 0.024 U | 0.024 U | 0.04 U | 0.13 | 0.022 U | 0.29 | 0.018 U | 3.8 | 0.025 U | 0.53 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.41 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-31b-06 | 0.0047 U | 0.026 | 0.023 | 0.024 | 0.0044 U | 0.15 | 0.0036 U | 0.84 | 0.0049 U | 0.1 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.13 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-31b-12 | 0.0047 U | 0.017 J | 0.023 | 0.012 J | 0.0044 U | 0.12 | 0.0036 U | 0.85 | 0.0049 U | 0.085 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.13 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-31c-06 | 0.0047 U | 0.007 J | 0.01 J | 0.0075 J | 0.0044 U | 0.14 | 0.0036 U | 1.1 | 0.0049 U | 0.073 | 0.0059 U | 0.015 U | 0.0049 U | 0.014 J | 0.01 U | 0.004 U | 0.004 U | 0.17 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-31c-12 | 0.0047 U | 0.011 J | 0.011 J | 0.0087 J | 0.0044 U | 0.15 | 0.0036 U | 1.1 | 0.0049 U | 0.09 | 0.0059 U | 0.015 U | 0.0049 U | 0.012 J | 0.01 U | 0.004 U | 0.004 U | 0.18 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-31d-06 | 0.0094 U | 0.027 J | 0.016 U | 0.073 | 0.0088 U | 0.42 | 0.0073 U | 3 | 0.0098 U | 0.45 | 0.012 U | 0.031 U | 0.0098 U | 0.016 J | 0.021 U | 0.008 U | 0.0079 U | 0.43 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-31d-12 | 0.024 U | 0.026 J | 0.04 U | 0.25 | 0.022 U | 0.36 | 0.018 U | 2.5 | 0.025 U | 0.99 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.37 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-31e-06 | 0.0047 U | 0.0099 J | 0.016 J | 0.017 J | 0.0044 U | 0.14 | 0.0036 U | 0.91 | 0.0049 U | 0.11 | 0.0059 U | 0.015 U | 0.0049 U | 0.0081 J | 0.01 U | 0.004 U | 0.004 U | 0.15 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-31e-12 | 0.0047 U | 0.029 | 0.013 J | 0.012 J | 0.0044 U | 0.27 | 0.0036 U | 1.8 | 0.0049 U | 0.15 | 0.0059 U | 0.015 U | 0.0049 U | 0.0095 J | 0.01 U | 0.004 U | 0.004 U | 0.28 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-32a-06-1 | 0.0094 U | 0.014 J | 0.016 U | 0.16 | 0.0088 U | 0.19 | 0.0073 U | 1.6 | 0.0098 U | 0.63 | 0.012 U | 0.031 U | 0.0098 U | 0.014 J | 0.021 U | 0.008 U | 0.0079 U | 0.21 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-32a-06-2 | 0.0047 U | 0.015 J | 0.028 | 0.08 | 0.0044 U | 0.26 | 0.0036 U | 2 | 0.0049 U | 0.52 | 0.0059 U | 0.015 U | 0.0049 U | 0.015 J | 0.01 U | 0.004 U | 0.004 U | 0.3 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-32a-06-3 | 0.0094 U | 0.015 J | 0.016 U | 0.11 | 0.0088 U | 0.25 | 0.0073 U | 1.9 | 0.0098 U | 0.56 | 0.012 U | 0.031 U | 0.0098 U | 0.017 J | 0.021 U | 0.008 U | 0.0079 U | 0.28 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-32a-12 | 0.0094 U | 0.01 J | 0.016 U | 0.065 | 0.0088 U | 0.24 | 0.0073 U | 2 | 0.0098 U | 0.45 | 0.012 U | 0.031 U | 0.0098 U | 0.011 | 0.021 U | 0.008 U | 0.0079 U | 0.27 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-32b-06 | 0.0047 U | 0.02 | 0.0097 J | 0.025 | 0.0044 U | 0.2 | 0.0036 U | 1.5 | 0.0049 U | 0.12 | 0.0059 U | 0.015 U | 0.0049 U | 0.012 J | 0.01 U | 0.004 U | 0.004 U | 0.22 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-32b-12 | 0.0019 U | 0.013 | 0.0069 J | 0.025 | 0.0018 U | 0.18 | 0.0015 U | 1.4 | 0.002 U | 0.097 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0021 J | 0.0016 U | 0.2 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-32c-06 | 0.0047 U | 0.031 | 0.03 | 0.049 | 0.0044 U | 0.19 | 0.0036 U | 1.3 | 0.0049 U | 0.24 | 0.0059 U | 0.015 U | 0.0049 U | 0.014 J | 0.01 U | 0.004 U | 0.004 U | 0.22 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-32c-12 | 0.0047 U | 0.11 | 0.025 | 0.04 | 0.0044 U | 0.26 | 0.0036 U | 2 | 0.0049 U | 0.16 | 0.0059 U | 0.015 U | 0.0049 U | 0.012 J | 0.01 U | 0.004 U | 0.004 U | 0.32 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-32d-06 | 0.0047 U | 0.026 | 0.025 | 0.087 | 0.0044 U | 0.17 | 0.0036 U | 1.2 | 0.0049 U | 0.37 | 0.0059 U | 0.015 U | 0.0049 U | 0.017 J | 0.01 U | 0.004 U | 0.004 U | 0.21 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-32d-12 | 0.0047 U | 0.016 J | 0.013 J | 0.02 J | 0.0044 U | 0.11 | 0.0036 U | 0.72 | 0.0049 U | 0.1 | 0.0059 U | 0.015 U | 0.0049 U | 0.012 J | 0.01 U | 0.004 U | 0.004 U | 0.11 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-33a-06 | 0.047 U | 0.098 | 0.081 U | 3 | 0.044 U | 0.19 | 0.036 U | 1 U | 0.049 U | 4.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.15 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-33a-12 | 0.047 U | 0.079 | 0.081 U | 2.4 | 0.044 U | 0.043 | 0.036 U | 1 U | 0.049 U | 3.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.058 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-33b-6 | 0.047 U | 0.075 | 0.081 U | 1.4 | 0.044 U | 0.047 | 0.036 U | 1 U | 0.049 U | 3.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.089 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-33b-12 | 0.047 U | 0.064 | 0.081 U | 3.9 | 0.044 U | 0.081 | 0.036 U | 1 U | 0.049 U | 3.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.056 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-33c-6 | 0.047 U | 0.051 | 0.081 U | 1.8 | 0.044 U | 0.12 | 0.036 U | 1 U | 0.049 U | 2.6 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.095 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-33c-12 | 0.047 U | 0.055 | 0.081 U | 1.4 | 0.044 U | 0.086 | 0.036 U | 1 U | 0.049 U | 3.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.062 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-33d-6 | 0.024 U | 0.086 | 0.052 | 0.7 | 0.022 U | 0.068 | 0.018 U | 0.5 U | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.058 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-33d-12 | 0.024 U | 0.061 | 0.077 | 0.58 | 0.022 U | 0.036 | 0.018 U | 0.5 U | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.038 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-34a-06 | 0.094 U | 0.095 U | 0.16 U | 0.93 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 3.9 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-34a-12 | 0.047 U | 0.055 | 0.081 U | 1.3 | 0.044 U | 0.1 | 0.036 U | 1 U | 0.049 U | 2.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.095 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-34b-06 | 0.094 U | 0.11 | 0.77 | 2.2 | 0.088 U | 0.077 | 0.073 U | 2 U | 0.098 U | 3.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-34b-12 | 0.047 U | 0.11 | 0.18 | 2.3 | 0.044 U | 0.036 | 0.036 U | 1 U | 0.049 U | 2.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-34c-06 | 0.047 U | 0.059 | 0.081 U | 1.5 | 0.044 U | 0.067 | 0.036 U | 1 U | 0.049 U | 3.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.063 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-34c-12 | 0.094 U | 0.095 U | 0.16 U | 2.9 | 0.088 U | 0.082 | 0.073 U | 2 U | 0.098 U | 4.8 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-34d-06 | 0.15 | 0.095 U | 1.4 | 3 | 0.088 U | 0.073 | 0.073 U | 2 U | 0.098 U | 4.3 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-34d-12 | 0.094 U | 0.2 | 0.17 | 6.3 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 4.9 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-34e-06 | 0.047 U | 0.18 | 0.1 | 2.4 | 0.044 U | 0.057 | 0.036 U | 1 U | 0.049 U | 2.8 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.056 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-34e-12 | 0.094 U | 0.17 | 0.25 | 3.1 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 3 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-34f-06 | 0.0047 U | 0.0097 | 0.0081 U | 0.083 | 0.0044 U | 0.02 | 0.0036 U | 0.14 | 0.0049 U | 0.32 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.013 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-34f-12 | 0.0019 U | 0.012 | 0.014 | 0.011 | 0.0018 U | 0.022 | 0.0015 U | 0.12 | 0.002 U | 0.045 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.015 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-34g-06 | 0.047 U | 0.048 U | 0.081 U | 0.68 | 0.044 U | 0.064 | 0.036 U | 1 U | 0.049 U | 2.5 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.062 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-34g-12 | 0.024 U | 0.032 | 0.04 U | 0.73 | 0.022 U | 0.026 | 0.018 U | 0.5 U | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.024 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-34h-06 | 0.094 U | 0.095 U | 0.16 U | 1.5 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 3.9 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-34h-12 | 0.094 U | 0.095 U | 0.16 U | 3.3 | 0.088 U | 0.12 | 0.073 U | 2 U | 0.098 U | 5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.11 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-35a-06-1 | 0.094 U | 0.095 U | 0.16 U | 1.6 | 0.088 U | 0.12 | 0.073 U | 2 U | 0.098 U | 5.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.14 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-35a-06-2 | 0.094 U | 0.095 U | 0.16 U | 2 | 0.088 U | 0.11 | 0.073 U | 2 U | 0.098 U | 5.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.13 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-35a-06-3 | 0.094 U | 0.095 U | 0.16 U | 2.2 | 0.088 U | 0.12 | 0.073 U | 2 U | 0.098 U | 5.3 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.13 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-35a-12 | 0.094 U | 0.095 U | 0.16 U | 3 | 0.088 U | 0.14 | 0.073 U | 2 U | 0.098 U | 5.7 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.16 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-35b-06 | 0.094 U | 0.095 U | 0.16 U | 3.1 | 0.088 U | 0.074 | 0.073 U | 2 U | 0.098 U | 6.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-35b-12 | 0.094 U | 0.095 U | 0.16 U | 7.1 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 6.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-35c-06 | 0.024 U | 0.033 | 0.04 U | 0.93 | 0.022 U | 0.075 | 0.018 U | 0.61 | 0.025 U | 4.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.021 | 0.02 U | 0.073 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-35c-12 | 0.094 U | 0.095 U | 0.16 U | 5.4 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 3.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-35d-06 | 0.024 U | 0.038 | 0.04 U | 1.2 | 0.022 U | 0.11 | 0.018 U | 0.82 | 0.025 U | 4.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-35d-12 | 0.024 U | 0.034 | 0.04 U | 3.6 | 0.022 U | 0.091 | 0.018 U | 0.67 | 0.025 U | 4.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.097 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-36a-06 | 0.034 | 0.16 | 0.12 | 1.2 | 0.022 U | 0.12 | 0.018 U | 1 | 0.025 U | 4.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.026 | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-36a-12 | 0.024 U | 0.14 | 0.15 | 1.3 | 0.022 U | 0.14 | 0.018 U | 1.2 | 0.025 U | 4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.033 | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-36b-06 | 0.024 U | 0.04 | 0.04 U | 1.3 | 0.022 U | 0.11 | 0.018 U | 0.91 | 0.025 U | 3.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-36b-12 | 0.024 U | 0.038 | 0.041 | 2.6 | 0.022 U | 0.095 | 0.018 U | 0.82 | 0.025 U | 4.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-36c-06 | 0.047 U | 0.052 | 0.081 U | 4 | 0.044 U | 0.11 | 0.036 U | 1 U | 0.049 U | 4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.1 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-36c-12 | 0.047 U | 0.078 | 0.081 U | 2 | 0.044 U | 0.083 | 0.036 U | 1 U | 0.049 U | 2.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.076 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-36d-06 | 0.047 U | 0.048 U | 0.081 U | 3.3 | 0.044 U | 0.091 | 0.036 U | 1 U | 0.049 U | 4.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.081 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-36d-12 | 0.094 U | 0.095 U | 0.16 U | 5.2 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 3.8 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-37a-06-1 | 0.33 J | 0.26 J | 0.41 | 6.5 | 0.088 U | 0.46 | 0.073 U | 2.9 J | 0.098 U | 5.8 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.46 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-37a-06-2 | 0.17 J | 0.22 J | 0.34 J | 2.8 | 0.088 U | 0.45 | 0.073 U | 2.8 J | 0.098 U | 4.8 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.44 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-37a-06-3 | 0.23 | 0.29 | 0.43 | 2.6 | 0.044 U | 0.41 | 0.036 U | 2.7 | 0.049 U | 4.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.41 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-37a-12 | 0.35 J | 0.33 J | 1.6 | 26 | 0.22 U | 0.95 J | 0.18 U | 6.2 J | 0.25 U | 11 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.97 J | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-37b-06 | 0.13 | 0.24 | 0.51 | 0.22 | 0.022 U | 0.39 | 0.018 U | 2.3 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.37 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-37b-12 | 0.2 | 0.19 | 1.7 | 1.1 | 0.022 U | 0.83 | 0.018 U | 5.7 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.85 | 0.098 J | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-37c-06 | 0.097 J | 0.11 | 0.21 | 2 | 0.022 U | 0.26 | 0.018 U | 1.7 | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.32 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-37c-12 | 0.073 J | 0.068 J | 0.1 | 1.4 | 0.022 U | 0.27 | 0.018 U | 1.7 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.31 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-37d-06 | 0.047 U | 0.048 U | 0.081 U | 1.4 | 0.044 U | 0.37 | 0.036 U | 2.5 | 0.049 U | 2.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.46 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-37d-12 | 0.047 U | 0.048 U | 0.081 U | 3.7 | 0.044 U | 0.44 | 0.036 U | 3 | 0.049 U | 3.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.56 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-37e-06 | 0.024 U | 0.053 J | 0.099 J | 0.87 | 0.022 U | 0.44 | 0.018 U | 3.1 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.49 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-37e-12 | 0.0047 U | 0.022 | 0.027 | 0.16 | 0.0044 U | 0.14 | 0.0036 U | 0.93 | 0.0049 U | 0.28 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 J | 0.01 U | 0.004 U | 0.004 U | 0.17 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-37f-06 | 0.024 U | 0.098 J | 0.095 J | 0.48 | 0.022 U | 0.48 | 0.018 U | 3.1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 | 0.051 U | 0.02 U | 0.02 U | 0.52 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-37f-12 | 0.039 J | 0.098 | 0.083 | 0.28 | 0.0088 U | 0.3 | 0.0073 U | 2 | 0.0098 U | 0.69 | 0.012 U | 0.031 U | 0.0098 U | 0.024 J | 0.021 U | 0.008 U | 0.0079 U | 0.31 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-37g-06 | 0.024 U | 0.082 J | 0.068 J | 0.26 | 0.022 U | 0.62 | 0.018 U | 4.1 | 0.025 U | 0.89 | 0.03 U | 0.076 U | 0.024 U | 0.032 J | 0.051 U | 0.02 U | 0.02 U | 0.64 | 0.056 J | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-37g-12 | 0.0047 U | 0.038 | 0.063 | 0.026 | 0.0044 U | 0.42 | 0.0036 U | 2.8 | 0.0049 U | 0.16 | 0.0059 U | 0.015 U | 0.0049 U | 0.023 | 0.01 U | 0.004 U | 0.004 U | 0.42 | 0.047 | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-37h-06 | 0.024 U | 0.037 | 0.04 | 0.54 | 0.022 U | 0.24 | 0.018 U | 1.7 | 0.025 U | 0.83 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.26 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-37h-12 | 0.029 | 0.06 | 0.064 | 1 | 0.022 U | 0.25 | 0.018 U | 1.9 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.28 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-38a-06-1 | 0.024 U | 0.088 | 0.04 U | 0.29 | 0.022 U | 0.25 | 0.018 U | 1.5 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-38a-06-2 | 0.024 U | 0.043 | 0.04 U | 0.38 | 0.022 U | 0.13 | 0.018 U | 1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-38a-06-3 | 0.024 U | 0.044 | 0.043 | 0.41 | 0.022 U | 0.14 | 0.018 U | 1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-38a-12 | 0.0047 U | 0.036 | 0.015 | 0.087 | 0.0044 U | 0.26 | 0.0036 U | 1.8 | 0.0049 U | 0.35 | 0.0059 U | 0.015 U | 0.0049 U | 0.019 | 0.01 U | 0.004 U | 0.004 U | 0.38 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-38b-06 | 0.026 | 0.082 | 0.27 | 0.76 | 0.022 U | 0.14 | 0.018 U | 1.1 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-38b-12 | 0.024 U | 0.043 | 0.04 U | 0.69 | 0.022 U | 0.14 | 0.018 U | 1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-38c-06 | 0.047 U | 0.048 U | 0.081 U | 2 | 0.044 U | 0.07 | 0.036 U | 1 U | 0.049 U | 3.5 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.076 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-38c-12 | 0.094 U | 0.095 U | 0.16 U | 3.9 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 5.3 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.09 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-38d-06 | 0.024 U | 0.027 | 0.04 U | 8.9 | 0.022 U | 0.06 | 0.018 U | 0.5 U | 0.025 U | 6.1 | 0.03 U | 0.076 U | 0.024 U | 0.065 | 0.051 U | 0.071 | 0.02 U | 0.063 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-38d-12 | 0.024 U | 0.025 | 0.04 U | 5 | 0.022 U | 0.046 | 0.018 U | 0.5 U | 0.025 U | 4.7 | 0.03 U | 0.076 U | 0.024 U | 0.044 | 0.051 U | 0.025 | 0.02 U | 0.053 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-38e-06 | 0.024 U | 0.029 | 0.074 | 1.4 | 0.022 U | 0.052 | 0.018 U | 0.5 U | 0.025 U | 3.6 | 0.03 U | 0.076 U | 0.024 U | 0.033 | 0.051 U | 0.02 U | 0.02 U | 0.053 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-38e-12 | 0.028 | 0.047 | 0.063 | 2.2 | 0.022 U | 0.055 | 0.018 U | 0.5 U | 0.025 U | 3.7 | 0.03 U | 0.076 U | 0.024 U | 0.029 | 0.051 U | 0.02 U | 0.02 U | 0.06 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-39a-06 | 0.24 U | 0.24 U | 0.4 U | 7.1 | 0.22 U | 0.18 U | 0.18 U | 5 U | 0.25 U | 9.7 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-39a-12 | 0.24 U | 0.24 U | 0.4 U | 13 | 0.22 U | 0.18 U | 0.18 U | 5 U | 0.25 U | 15 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-39b-06 | 0.094 U | 0.095 U | 0.16 U | 1.6 | 0.088 U | 0.084 | 0.073 U | 2 U | 0.098 U | 4.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.11 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-39b-12 | 0.094 U | 0.095 U | 0.16 U | 5.3 | 0.088 U | 0.11 | 0.073 U | 2 U | 0.098 U | 5.8 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.14 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-39c-06 | 0.066 | 0.24 | 0.45 | 1.7 | 0.022 U | 0.38 | 0.018 U | 2.4 | 0.025 U | 3.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.025 | 0.02 U | 0.36 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-39c-12 | 0.12 | 0.25 | 0.75 | 2.8 | 0.022 U | 0.4 | 0.018 U | 2.6 | 0.025 U | 3.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.033 | 0.02 U | 0.38 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-39d-06 | 0.024 U | 0.05 | 0.04 U | 0.72 | 0.022 U | 0.1 | 0.018 U | 0.73 | 0.025 U | 3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-39d-12 | 0.024 U | 0.055 | 0.04 U | 0.57 | 0.022 U | 0.073 | 0.018 U | 0.55 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.068 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-39e-06 | 0.024 U | 0.03 | 0.04 U | 1.3 | 0.022 U | 0.12 | 0.018 U | 0.92 | 0.025 U | 4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-39e-12 | 0.024 U | 0.03 | 0.04 U | 2.6 | 0.022 U | 0.089 | 0.018 U | 0.72 | 0.025 U | 3.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.021 | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-40a-06-1 | 0.047 U | 0.05 | 0.081 U | 1.7 | 0.044 U | 0.098 | 0.036 U | 1 U | 0.049 U | 3.8 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.12 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-40a-06-2 | 0.047 U | 0.048 U | 0.081 U | 0.92 | 0.044 U | 0.1 | 0.036 U | 1 U | 0.049 U | 2.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.1 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-40a-06-3 | 0.024 U | 0.031 | 0.04 U | 0.76 | 0.022 U | 0.13 | 0.018 U | 1 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-40a-12 | 0.094 U | 0.095 U | 0.16 U | 3.9 | 0.088 U | 0.085 | 0.073 U | 2 U | 0.098 U | 5.6 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.092 | 0.079 U | 0.1 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-40b-06 | 0.047 U | 0.056 | 0.081 U | 1.2 | 0.044 U | 0.09 | 0.036 U | 1 U | 0.049 U | 3.6 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.11 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-40b-12 | 0.047 U | 0.059 | 0.081 U | 1.6 | 0.044 U | 0.053 | 0.036 U | 1 U | 0.049 U | 3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.065 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-40c-06 | 0.094 U | 0.095 U | 0.16 U | 4.2 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 5.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.086 | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-40c-12 | 0.094 U | 0.095 U | 0.16 U | 5.2 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 2.6 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.086 | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-40d-06 | 0.0047 U | 0.025 | 0.024 | 0.3 | 0.0044 U | 0.2 | 0.0036 U | 1.3 | 0.0049 U | 1 | 0.0059 U | 0.015 U | 0.0049 U | 0.03 | 0.01 U | 0.0094 J | 0.004 U | 0.2 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-40d-12 | 0.0047 U | 0.026 | 0.024 | 0.13 | 0.0044 U | 0.059 | 0.0036 U | 0.39 | 0.0049 U | 0.58 | 0.0059 U | 0.015 U | 0.0049 U | 0.019 J | 0.01 U | 0.004 U | 0.004 U | 0.055 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-41a-06 | 0.024 U | 0.093 | 0.1 | 0.95 | 0.022 U | 0.24 | 0.018 U | 1.4 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.021 | 0.02 U | 0.28 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-41a-12 | 0.024 U | 0.094 | 0.081 | 0.83 | 0.022 U | 0.25 | 0.018 U | 1.8 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.024 | 0.02 U | 0.23 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-41b-06 | 0.047 U | 0.097 | 0.081 U | 1.2 | 0.044 U | 0.42 | 0.036 U | 2.6 | 0.049 U | 2.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.041 | 0.04 U | 0.39 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-41b-12 | 0.047 U | 0.075 | 0.081 U | 2.8 | 0.044 U | 0.39 | 0.036 U | 2.6 | 0.049 U | 3.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.046 | 0.04 U | 0.39 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-41c-06 | 0.024 U | 0.096 | 0.042 | 0.96 | 0.022 U | 0.24 | 0.018 U | 1.8 | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.25 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-41c-12 | 0.094 U | 0.095 U | 0.16 U | 2.9 | 0.088 U | 0.18 | 0.073 U | 2 U | 0.098 U | 3.4 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.15 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-41d-06 | 0.036 | 0.15 | 0.14 | 0.24 | 0.0044 U | 0.19 | 0.0036 U | 1 | 0.0049 U | 1.1 | 0.0059 U | 0.015 U | 0.0049 U | 0.025 | 0.01 U | 0.0068 J | 0.004 U | 0.17 | 0.011 U | 0.0077 J | 0.0062 U | 0.1 U |
| EAR2-RA-41d-12 | 0.027 | 0.092 | 0.094 | 0.41 | 0.0044 U | 0.11 | 0.0036 U | 0.64 | 0.0049 U | 0.85 | 0.0059 U | 0.015 U | 0.0049 U | 0.02 J | 0.01 U | 0.0057 J | 0.004 U | 0.092 | 0.011 U | 0.0056 J | 0.0062 U | 0.1 U |
| EAR2-RA-41e-06 | 0.018 J | 0.054 | 0.05 | 1.4 | 0.0044 U | 0.076 | 0.0036 U | 0.48 | 0.0049 U | 3.5 | 0.0059 U | 0.015 U | 0.0049 U | 0.034 | 0.01 U | 0.03 | 0.004 U | 0.071 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endo-sulfan I | Endo-sulfan II | Endo-sulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Hepta-chlor | Hepta-chlor epoxide | Meth-oxychlor | Toxa-phene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-41e-12 | 0.017 J | 0.067 | 0.054 | 0.7 | 0.0044 U | 0.046 | 0.0036 U | 0.29 | 0.0049 U | 1.5 | 0.0059 U | 0.015 U | 0.0049 U | 0.016 J | 0.01 U | 0.018 J | 0.004 U | 0.044 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-42a-06 | 0.24 U | 0.24 U | 0.4 U | 4.5 | 0.22 U | 0.52 | 0.18 U | 5 U | 0.25 U | 5.7 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.46 | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-42a-12 | 0.024 U | 0.063 | 0.04 U | 15 | 0.022 U | 0.54 | 0.018 U | 4 | 0.025 U | 7.1 | 0.03 U | 0.076 U | 0.024 U | 0.039 | 0.051 U | 0.088 | 0.02 U | 0.5 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-42b-06 | 0.12 U | 0.12 U | 0.2 U | 8.7 | 0.11 U | 0.28 | 0.091 U | 2.5 U | 0.12 U | 5 | 0.15 U | 0.38 U | 0.12 U | 0.14 U | 0.26 U | 0.1 U | 0.099 U | 0.31 | 0.28 U | 0.079 U | 0.15 U | 2.5 U |
| EAR2-RA-42b-12 | 0.24 U | 0.24 U | 0.4 U | 20 | 0.22 U | 0.25 | 0.18 U | 5 U | 0.25 U | 7.7 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-42c-06 | 0.24 U | 0.24 U | 0.4 U | 27 | 0.22 U | 0.74 | 0.18 U | 5 U | 0.25 U | 7 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.65 | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-42c-12 | 0.24 U | 0.24 U | 0.4 U | 17 | 0.22 U | 0.47 | 0.18 U | 5 U | 0.25 U | 6.4 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.4 | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-42d-06 | 0.024 U | 0.027 | 0.04 U | 0.14 | 0.022 U | 0.36 | 0.018 U | 2.7 | 0.025 U | 0.84 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.41 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-42d-12 | 0.024 U | 0.035 | 0.04 U | 0.21 | 0.022 U | 0.16 | 0.018 U | 1 | 0.025 U | 0.68 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-42e-06 | 0.029 | 0.077 | 0.09 | 1.9 | 0.0044 U | 0.13 | 0.0036 U | 0.76 | 0.0049 U | 3 | 0.0059 U | 0.015 U | 0.0049 U | 0.023 | 0.01 U | 0.01 J | 0.004 U | 0.13 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-42e-12 | 0.034 | 0.11 | 0.14 | 0.56 | 0.0044 U | 0.12 | 0.0036 U | 0.7 | 0.0049 U | 1.7 | 0.0059 U | 0.015 U | 0.0049 U | 0.016 J | 0.01 U | 0.006 J | 0.004 U | 0.12 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-42f-06 | 0.0047 U | 0.035 | 0.038 | 0.32 | 0.0044 U | 0.11 | 0.0036 U | 0.62 | 0.0049 U | 1.4 | 0.0059 U | 0.015 U | 0.0049 U | 0.018 J | 0.01 U | 0.0068 J | 0.004 U | 0.1 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-42f-12 | 0.0047 U | 0.041 | 0.033 | 0.37 | 0.0044 U | 0.11 | 0.0036 U | 0.69 | 0.0049 U | 1.3 | 0.0059 U | 0.015 U | 0.0049 U | 0.019 J | 0.01 U | 0.011 J | 0.004 U | 0.11 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-43a-06-1 | 0.0094 U | 0.03 J | 0.027 J | 1.7 | 0.0088 U | 0.14 | 0.0073 U | 0.93 | 0.0098 U | 3.7 | 0.012 U | 0.031 U | 0.0098 U | 0.043 | 0.021 U | 0.039 J | 0.0079 U | 0.14 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-43a-06-2 | 0.0094 U | 0.016 J | 0.027 J | 1.5 | 0.0088 U | 0.093 | 0.0073 U | 0.6 | 0.0098 U | 3.9 | 0.012 U | 0.031 U | 0.0098 U | 0.027 J | 0.021 U | 0.021 J | 0.0079 U | 0.094 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-43a-06-3 | 0.0094 U | 0.031 J | 0.03 J | 2.4 | 0.0088 U | 0.14 | 0.0073 U | 0.92 | 0.0098 U | 3.6 | 0.012 U | 0.031 U | 0.0098 U | 0.039 J | 0.021 U | 0.046 | 0.0079 U | 0.14 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-43a-12 | 0.0094 U | 0.025 J | 0.024 J | 3 | 0.0088 U | 0.2 | 0.0073 U | 1.4 | 0.0098 U | 4.7 | 0.012 U | 0.031 U | 0.0098 U | 0.047 | 0.021 U | 0.058 | 0.0079 U | 0.21 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-43b-06 | 0.0094 U | 0.048 | 0.033 J | 0.7 | 0.0088 U | 0.29 | 0.0073 U | 1.7 | 0.0098 U | 2.3 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.023 J | 0.0079 U | 0.28 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-43b-12 | 0.0094 U | 0.064 | 0.026 J | 0.78 | 0.0088 U | 0.37 | 0.0073 U | 2.2 | 0.0098 U | 1.5 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.013 J | 0.0079 U | 0.37 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-43c-06 | 0.0094 U | 0.022 J | 0.035 J | 0.34 | 0.0088 U | 0.26 | 0.0073 U | 1.7 | 0.0098 U | 1 | 0.012 U | 0.031 U | 0.0098 U | 0.03 J | 0.021 U | 0.0088 J | 0.0079 U | 0.27 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-43c-12 | 0.015 J | 0.05 | 0.056 | 0.32 | 0.0044 U | 0.07 | 0.0036 U | 0.45 | 0.0049 U | 1.9 | 0.0059 U | 0.015 U | 0.0049 U | 0.027 | 0.01 U | 0.013 J | 0.004 U | 0.069 | 0.011 U | 0.0037 J | 0.0062 U | 0.1 U |
| EAR2-RA-44a-06 | 0.0094 U | 0.043 | 0.033 J | 0.3 | 0.0088 U | 0.28 | 0.0073 U | 1.8 | 0.0098 U | 1.2 | 0.012 U | 0.031 U | 0.0098 U | 0.031 J | 0.021 U | 0.008 U | 0.0079 U | 0.27 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-44a-12 | 0.0094 U | 0.033 J | 0.029 J | 0.27 | 0.0088 U | 0.28 | 0.0073 U | 1.9 | 0.0098 U | 0.81 | 0.012 U | 0.031 U | 0.0098 U | 0.03 J | 0.021 U | 0.008 U | 0.0079 U | 0.28 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-44b-06 | 0.0047 U | 0.062 | 0.04 | 1.4 | 0.0044 U | 0.35 | 0.0036 U | 2.2 | 0.0049 U | 3.5 | 0.0059 U | 0.015 U | 0.0049 U | 0.045 | 0.01 U | 0.038 | 0.004 U | 0.35 | 0.014 J | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-44b-12 | 0.0047 U | 0.063 | 0.045 | 3.3 | 0.0044 U | 0.62 | 0.0036 U | 4.1 | 0.0049 U | 6.1 | 0.0059 U | 0.015 U | 0.0049 U | 0.058 | 0.01 U | 0.12 | 0.004 U | 0.64 | 0.039 | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-44c-06 | 0.0047 U | 0.068 | 0.048 | 1.2 | 0.0044 U | 0.26 | 0.0036 U | 1.7 | 0.0049 U | 2.5 | 0.0059 U | 0.015 U | 0.0049 U | 0.032 | 0.01 U | 0.029 | 0.004 U | 0.26 | 0.018 J | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-44c-12 | 0.016 J | 0.19 | 0.13 | 1.9 | 0.0044 U | 0.17 | 0.0036 U | 1 | 0.0049 U | 2.8 | 0.0059 U | 0.015 U | 0.0049 U | 0.032 | 0.01 U | 0.03 | 0.004 U | 0.16 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-44d-06 | 0.01 J | 0.022 | 0.027 | 1.1 | 0.0044 U | 0.061 | 0.0036 U | 0.4 | 0.0049 U | 2.5 | 0.0059 U | 0.015 U | 0.0049 U | 0.027 | 0.01 U | 0.018 J | 0.004 U | 0.066 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-44d-12 | 0.012 J | 0.024 | 0.02 | 2.4 | 0.0044 U | 0.071 | 0.0036 U | 0.49 | 0.0049 U | 4.2 | 0.0059 U | 0.015 U | 0.0049 U | 0.046 | 0.01 U | 0.04 | 0.004 U | 0.079 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-45a-06-1 | 0.0094 U | 0.66 | 0.37 | 0.046 | 0.0088 U | 0.15 | 0.0073 U | 1.1 | 0.0098 U | 0.29 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.14 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-45a-06-2 | 0.0094 U | 0.36 | 0.31 | 0.081 | 0.0088 U | 0.13 | 0.0073 U | 1 | 0.0098 U | 0.24 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.12 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-45a-06-3 | 0.0094 U | 0.44 | 0.67 | 0.056 | 0.0088 U | 0.14 | 0.0073 U | 1 | 0.0098 U | 0.25 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.12 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-45a-12 | 0.024 U | 1.2 | 0.56 | 0.022 U | 0.022 U | 0.22 | 0.018 U | 1.6 | 0.025 U | 0.14 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-45b-06 | 0.0047 U | 0.11 | 0.097 | 0.028 | 0.0044 U | 0.081 | 0.0036 U | 0.61 | 0.0049 U | 0.18 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.074 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-45b-12 | 0.0094 U | 0.62 | 0.4 | 0.0089 | 0.0088 U | 0.24 | 0.0073 U | 1.6 | 0.0098 U | 0.063 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.21 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-45c-06 | 0.0094 U | 0.57 | 0.24 | 0.057 | 0.0088 U | 0.24 | 0.0073 U | 1.6 | 0.0098 U | 0.22 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.2 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-45c-12 | 0.0094 U | 0.62 | 0.28 | 0.14 | 0.0088 U | 0.29 | 0.0073 U | 1.9 | 0.0098 U | 0.2 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.23 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-45d-06 | 0.01 | 0.59 | 0.36 | 0.15 | 0.0088 U | 0.47 | 0.0073 U | 3.3 | 0.0098 U | 0.41 | 0.012 U | 0.031 U | 0.0098 U | 0.015 | 0.021 U | 0.008 U | 0.0079 U | 0.44 | 0.026 | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-45d-12 | 0.024 U | 0.77 | 0.28 | 0.13 | 0.022 U | 0.42 | 0.018 U | 2.7 | 0.025 U | 0.25 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.33 | 0.055 U | 0.016 | 0.031 U | 0.5 U |
| EAR2-RA-45e-06 | 0.0094 U | 0.64 | 0.22 | 0.0088 U | 0.0088 U | 0.25 | 0.0073 U | 1.5 | 0.0098 U | 0.06 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.19 | 0.022 U | 0.013 | 0.012 U | 0.2 U |
| EAR2-RA-45e-12 | 0.0047 U | 0.3 | 0.12 | 0.0044 U | 0.0044 U | 0.3 | 0.0036 U | 1.8 | 0.0049 U | 0.017 | 0.0059 U | 0.015 U | 0.0049 U | 0.011 | 0.01 U | 0.004 U | 0.004 U | 0.23 | 0.011 U | 0.016 | 0.0062 U | 0.1 U |
| EAR2-RA-45f-06 | 0.0047 U | 0.31 | 0.19 | 0.074 | 0.0044 U | 0.23 | 0.0036 U | 1.5 | 0.0049 U | 0.31 | 0.0059 U | 0.015 U | 0.0049 U | 0.006 | 0.01 U | 0.004 U | 0.004 U | 0.21 | 0.015 | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-45f-12 | 0.0094 U | 0.5 | 0.33 | 0.036 | 0.0088 U | 0.54 | 0.0073 U | 3.5 | 0.0098 U | 0.18 | 0.012 U | 0.031 U | 0.0098 U | 0.013 | 0.021 U | 0.008 U | 0.0079 U | 0.48 | 0.033 | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-46a-06 | 0.0047 U | 0.04 | 0.04 | 0.079 | 0.0044 U | 0.11 | 0.0036 U | 0.72 | 0.0049 U | 0.28 | 0.0059 U | 0.015 U | 0.0049 U | 0.012 | 0.01 U | 0.004 U | 0.004 U | 0.074 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-46a-12 | 0.0047 U | 0.05 | 0.047 | 0.033 | 0.0044 U | 0.23 | 0.0036 U | 1.3 | 0.0049 U | 0.13 | 0.0059 U | 0.015 U | 0.0049 U | 0.014 | 0.01 U | 0.004 U | 0.004 U | 0.17 | 0.011 U | 0.01 | 0.0062 U | 0.1 U |
| EAR2-RA-46b-06 | 0.0052 | 0.051 | 0.11 | 0.0028 | 0.0018 U | 0.021 | 0.0015 U | 0.2 | 0.002 U | 0.025 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.022 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-46b-12 | 0.0051 | 0.17 | 0.15 | 0.0028 | 0.0022 U | 0.038 | 0.0018 U | 0.27 | 0.0025 U | 0.015 | 0.003 U | 0.0076 U | 0.0024 U | 0.0028 U | 0.0051 U | 0.002 U | 0.002 U | 0.037 | 0.0055 U | 0.0016 U | 0.0031 U | 0.05 U |
| EAR2-RA-46c-06 | 0.0022 | 0.09 | 0.07 | 0.0055 | 0.0018 U | 0.036 | 0.0015 U | 0.28 | 0.002 U | 0.034 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.034 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-46c-12 | 0.0047 U | 0.18 | 0.075 | 0.0044 U | 0.0044 U | 0.064 | 0.0036 U | 0.44 | 0.0049 U | 0.017 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.056 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-46d-06 | 0.024 U | 0.04 | 0.04 U | 0.3 | 0.022 U | 0.05 | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.042 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-46d-12 | 0.024 U | 0.044 | 0.04 U | 0.35 | 0.022 U | 0.056 | 0.018 U | 0.5 U | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.048 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-46e-06 | 0.024 U | 0.053 | 0.04 U | 0.25 | 0.022 U | 0.14 | 0.018 U | 1.2 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-46e-12 | 0.024 U | 0.052 | 0.04 U | 0.3 | 0.022 U | 0.15 | 0.018 U | 1.2 | 0.025 U | 0.92 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-47a-06-1 | 0.0058 | 0.19 | 0.12 | 0.0044 U | 0.0044 U | 0.059 | 0.0036 U | 0.47 | 0.0049 U | 0.018 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.059 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-47a-06-2 | 0.01 | 0.22 | 0.13 | 0.0044 U | 0.0044 U | 0.047 | 0.0036 U | 0.46 | 0.0049 U | 0.02 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.054 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-47a-06-3 | 0.013 | 0.21 | 0.14 | 0.0044 U | 0.0044 U | 0.048 | 0.0036 U | 0.42 | 0.0049 U | 0.025 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.05 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-47a-12 | 0.035 | 0.92 | 0.55 | 0.022 U | 0.022 U | 0.17 | 0.018 U | 1.1 | 0.025 U | 0.022 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-47b-06 | 0.028 | 0.2 | 0.33 | 0.0088 U | 0.0088 U | 0.043 | 0.0073 U | 0.35 | 0.0098 U | 0.021 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.046 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-47b-12 | 0.23 | 1.9 | 2.9 | 0.044 U | 0.044 U | 0.29 | 0.036 U | 2 | 0.049 U | 0.046 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.26 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-47c-06 | 0.0024 U | 0.14 | 0.11 | 0.0022 | 0.0022 U | 0.064 | 0.0018 U | 0.55 | 0.0025 U | 0.028 | 0.003 U | 0.0076 U | 0.0024 U | 0.0028 U | 0.0051 U | 0.002 U | 0.002 U | 0.062 | 0.0055 U | 0.0016 U | 0.0031 U | 0.05 U |
| EAR2-RA-47c-12 | 0.0047 U | 0.31 | 0.11 | 0.0044 U | 0.0044 U | 0.1 | 0.0036 U | 0.69 | 0.0049 U | 0.02 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.093 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-47d-06 | 0.0024 U | 0.045 | 0.042 | 0.039 | 0.0022 U | 0.029 | 0.0018 U | 0.23 | 0.0025 U | 0.15 | 0.003 U | 0.0076 U | 0.0024 U | 0.0028 U | 0.0051 U | 0.002 U | 0.002 U | 0.03 | 0.0055 U | 0.0016 U | 0.0031 U | 0.05 U |
| EAR2-RA-47d-12 | 0.0024 U | 0.12 | 0.065 | 0.012 | 0.0022 U | 0.12 | 0.0018 U | 0.84 | 0.0025 U | 0.07 | 0.003 U | 0.0076 U | 0.0024 U | 0.0034 | 0.0051 U | 0.002 U | 0.002 U | 0.12 | 0.0058 | 0.0016 U | 0.0031 U | 0.05 U |
| EAR2-RA-47e-06 | 0.024 U | 0.049 | 0.04 U | 0.39 | 0.022 U | 0.095 | 0.018 U | 0.75 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.089 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-47e-12 | 0.024 U | 0.071 | 0.059 | 0.37 | 0.022 U | 0.16 | 0.018 U | 1 | 0.025 U | 0.99 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-47f-06 | 0.024 U | 0.046 | 0.04 U | 0.25 | 0.022 U | 0.12 | 0.018 U | 0.95 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-47f-12 | 0.024 U | 0.054 | 0.1 | 0.24 | 0.022 U | 0.16 | 0.018 U | 1.1 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-47g-06 | 0.0094 U | 0.04 | 0.022 | 0.12 | 0.0088 U | 0.03 | 0.0073 U | 0.26 | 0.0098 U | 0.62 | 0.012 U | 0.031 U | 0.0098 U | 0.015 | 0.021 U | 0.008 U | 0.0079 U | 0.027 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-47g-12 | 0.0094 U | 0.12 | 0.042 | 0.14 | 0.0088 U | 0.065 | 0.0073 U | 0.47 | 0.0098 U | 0.54 | 0.012 U | 0.031 U | 0.0098 U | 0.013 | 0.021 U | 0.008 U | 0.0079 U | 0.06 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-47h-06 | 0.0094 U | 0.074 | 0.023 | 0.21 | 0.0088 U | 0.046 | 0.0073 U | 0.43 | 0.0098 U | 0.56 | 0.012 U | 0.031 U | 0.0098 U | 0.017 | 0.021 U | 0.008 U | 0.0079 U | 0.042 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-47h-12 | 0.0094 U | 0.3 | 0.047 | 0.15 | 0.0088 U | 0.066 | 0.0073 U | 0.56 | 0.0098 U | 0.64 | 0.012 U | 0.031 U | 0.0098 U | 0.013 | 0.021 U | 0.008 U | 0.0079 U | 0.06 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-47i-06 | 0.024 U | 0.069 | 0.049 | 0.27 | 0.022 U | 0.098 | 0.018 U | 0.69 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.078 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-47i-12 | 0.024 U | 0.063 | 0.053 | 0.29 | 0.022 U | 0.091 | 0.018 U | 0.73 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.085 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48a-06 | 0.024 U | 0.05 | 0.04 U | 0.7 | 0.022 U | 0.1 | 0.018 U | 0.65 | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.094 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48a-12 | 0.024 U | 0.046 | 0.04 U | 0.66 | 0.022 U | 0.088 | 0.018 U | 0.65 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.082 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48b-06-1 | 0.024 U | 0.058 | 0.04 U | 0.43 | 0.022 U | 0.15 | 0.018 U | 1.1 | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48b-06-2 | 0.024 U | 0.051 | 0.04 U | 0.77 | 0.022 U | 0.11 | 0.018 U | 0.78 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48b-06-3 | 0.024 U | 0.043 | 0.04 U | 0.6 | 0.022 U | 0.14 | 0.018 U | 1 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48b-12 | 0.024 U | 0.045 | 0.04 U | 0.62 | 0.022 U | 0.096 | 0.018 U | 0.68 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.096 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-48c-06 | 0.024 U | 0.065 | 0.04 U | 0.94 | 0.022 U | 0.12 | 0.018 U | 0.76 | 0.025 U | 2.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48c-12 | 0.024 U | 0.067 | 0.04 U | 1 | 0.022 U | 0.11 | 0.018 U | 0.67 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48d-06 | 0.024 U | 0.045 | 0.04 U | 0.86 | 0.022 U | 0.1 | 0.018 U | 0.69 | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.086 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48d-12 | 0.024 U | 0.048 | 0.04 U | 0.75 | 0.022 U | 0.11 | 0.018 U | 0.7 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.09 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-48e-06 | 0.0094 U | 0.083 | 0.058 | 0.12 | 0.0088 U | 0.069 | 0.0073 U | 0.51 | 0.0098 U | 0.33 | 0.012 U | 0.031 U | 0.0098 U | 0.011 | 0.021 U | 0.008 U | 0.0079 U | 0.053 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-48e-12 | 0.0094 U | 0.27 | 0.17 | 0.049 | 0.0088 U | 0.39 | 0.0073 U | 2.3 | 0.0098 U | 0.17 | 0.012 U | 0.031 U | 0.0098 U | 0.018 | 0.021 U | 0.008 U | 0.0079 U | 0.3 | 0.022 U | 0.0067 | 0.012 U | 0.2 U |
| EAR2-RA-49a-06 | 0.024 U | 0.13 | 0.047 | 0.17 | 0.022 U | 0.097 | 0.018 U | 0.82 | 0.025 U | 0.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49a-12 | 0.05 | 0.18 | 0.91 | 0.23 | 0.022 U | 0.14 | 0.018 U | 1.2 | 0.025 U | 0.65 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49b-06 | 0.024 U | 0.13 | 0.069 | 0.13 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.56 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49b-12 | 0.044 | 0.57 | 0.16 | 0.037 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.23 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.027 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49c-06 | 0.024 U | 0.06 | 0.082 | 0.37 | 0.022 U | 0.051 | 0.018 U | 0.5 U | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.043 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49c-12 | 0.024 U | 0.048 | 0.04 U | 0.17 | 0.022 U | 0.019 | 0.018 U | 0.5 U | 0.025 U | 0.63 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49d-06 | 0.045 | 0.23 | 0.49 | 0.53 | 0.022 U | 0.049 | 0.018 U | 0.5 U | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.025 | 0.02 U | 0.036 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49d-12 | 0.022 | 0.21 | 0.44 | 0.11 | 0.0044 U | 0.018 | 0.0036 U | 0.11 | 0.0049 U | 0.55 | 0.0059 U | 0.015 U | 0.0049 U | 0.0064 | 0.01 U | 0.004 U | 0.004 U | 0.015 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-49e-06 | 0.024 U | 0.099 | 0.077 | 0.49 | 0.022 U | 0.053 | 0.018 U | 0.5 U | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.049 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49e-12 | 0.024 U | 0.08 | 0.04 U | 0.17 | 0.022 U | 0.025 | 0.018 U | 0.5 U | 0.025 U | 0.67 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49f-06 | 0.024 U | 0.12 | 0.044 | 0.31 | 0.022 U | 0.038 | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.029 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-49f-12 | 0.024 U | 0.28 | 0.084 | 0.87 | 0.022 U | 0.07 | 0.018 U | 0.5 U | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.053 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50a-06-1 | 0.024 U | 0.059 | 0.04 U | 0.42 | 0.022 U | 0.086 | 0.018 U | 0.52 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.075 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50a-06-2 | 0.024 U | 0.085 | 0.087 | 0.52 | 0.022 U | 0.089 | 0.018 U | 0.5 U | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.071 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50a-06-3 | 0.024 U | 0.063 | 0.044 | 0.47 | 0.022 U | 0.07 | 0.018 U | 0.5 U | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.061 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50a-12 | 0.024 U | 0.058 | 0.04 U | 0.44 | 0.022 U | 0.074 | 0.018 U | 0.5 U | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.06 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50b-06 | 0.024 U | 0.083 | 0.049 | 0.41 | 0.022 U | 0.066 | 0.018 U | 0.5 U | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.058 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50b-12 | 0.024 U | 0.08 | 0.04 U | 0.27 | 0.022 U | 0.061 | 0.018 U | 0.5 U | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.053 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50c-06 | 0.024 U | 0.069 | 0.068 | 0.25 | 0.022 U | 0.055 | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.047 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50c-12 | 0.024 U | 0.18 | 0.062 | 0.19 | 0.022 U | 0.05 | 0.018 U | 0.5 U | 0.025 U | 0.83 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.044 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50d-06 | 0.024 U | 0.082 | 0.04 U | 0.33 | 0.022 U | 0.066 | 0.018 U | 0.5 U | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.054 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50d-12 | 0.024 U | 0.12 | 0.1 | 0.51 | 0.022 U | 0.1 | 0.018 U | 0.59 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.085 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50e-06 | 0.047 U | 0.062 | 0.081 U | 0.79 | 0.044 U | 0.084 | 0.036 U | 1 U | 0.049 U | 2.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.069 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-50e-12 | 0.047 U | 0.24 | 0.094 | 0.85 | 0.044 U | 0.068 | 0.036 U | 1 U | 0.049 U | 2.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.061 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-50f-06 | 0.047 U | 0.09 | 0.081 U | 0.7 | 0.044 U | 0.13 | 0.036 U | 1 U | 0.049 U | 3.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.11 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-50f-12 | 0.047 U | 0.048 U | 0.081 U | 0.45 | 0.044 U | 0.077 | 0.036 U | 1 U | 0.049 U | 2.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.067 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-50g-06 | 0.024 U | 0.042 | 0.04 U | 0.64 | 0.022 U | 0.07 | 0.018 U | 0.5 U | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.055 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50g-12 | 0.024 U | 0.046 | 0.04 U | 0.67 | 0.022 U | 0.075 | 0.018 U | 0.52 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.063 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50h-06 | 0.047 U | 0.048 U | 0.081 U | 0.49 | 0.044 U | 0.058 | 0.036 U | 1 U | 0.049 U | 2.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.053 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-50h-12 | 0.047 U | 0.048 U | 0.081 U | 0.68 | 0.044 U | 0.15 | 0.036 U | 1.1 | 0.049 U | 3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.16 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-50i-06 | 0.024 U | 0.036 | 0.04 U | 0.095 | 0.022 U | 0.073 | 0.018 U | 0.5 U | 0.025 U | 0.82 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.062 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50i-12 | 0.012 U | 0.11 | 0.041 | 0.033 | 0.011 U | 0.054 | 0.0091 U | 0.36 | 0.012 U | 0.44 | 0.015 U | 0.038 U | 0.012 U | 0.014 U | 0.026 U | 0.01 U | 0.0099 U | 0.048 | 0.028 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR2-RA-50j-06 | 0.024 U | 0.08 | 0.056 | 0.43 | 0.022 U | 0.18 | 0.018 U | 1.2 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50j-12 | 0.024 U | 0.096 | 0.04 | 0.17 | 0.022 U | 0.067 | 0.018 U | 0.5 U | 0.025 U | 0.96 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.055 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50k-06 | 0.024 U | 0.075 | 0.068 | 0.4 | 0.022 U | 0.29 | 0.018 U | 2 | 0.025 U | 2.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.26 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-50k-12 | 0.024 U | 0.13 | 0.14 | 0.12 | 0.022 U | 0.27 | 0.018 U | 1.9 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.25 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51a-06-1 | 0.024 | 1 | 0.4 | 0.36 | 0.022 U | 0.085 | 0.018 U | 0.7 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.087 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51a-06-2 | 0.058 | 0.89 | 0.83 | 0.21 | 0.022 U | 0.051 | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.067 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51a-06-3 | 0.024 U | 0.46 | 0.3 | 0.25 | 0.022 U | 0.05 | 0.018 U | 0.5 U | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.044 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51a-12 | 0.13 | 1.1 | 1.7 | 0.53 | 0.022 U | 0.053 | 0.018 U | 0.5 U | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.068 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51b-06 | 0.024 U | 0.094 | 0.04 U | 0.49 | 0.022 U | 0.072 | 0.018 U | 0.51 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.063 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51b-12 | 0.024 U | 0.13 | 0.057 | 0.63 | 0.022 U | 0.086 | 0.018 U | 0.5 U | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.07 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51c-06 | 0.024 U | 0.044 | 0.04 U | 0.42 | 0.022 U | 0.066 | 0.018 U | 0.5 U | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.054 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51c-12 | 0.024 U | 0.044 | 0.04 U | 0.6 | 0.022 U | 0.071 | 0.018 U | 0.5 U | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.063 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51d-06 | 0.024 U | 0.04 | 0.04 U | 1.2 | 0.022 U | 0.073 | 0.018 U | 0.55 | 0.025 U | 3.3 | 0.03 U | 0.076 U | 0.024 U | 0.03 | 0.051 U | 0.02 U | 0.02 U | 0.066 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51d-12 | 0.024 U | 0.051 | 0.2 | 1.5 | 0.022 U | 0.065 | 0.018 U | 0.5 U | 0.025 U | 3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.021 | 0.02 U | 0.062 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51e-06 | 0.024 U | 0.025 | 0.04 U | 0.49 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51e-12 | 0.024 U | 0.033 | 0.04 U | 0.23 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51f-06 | 0.024 U | 0.031 | 0.04 U | 0.32 | 0.022 U | 0.034 | 0.018 U | 0.5 U | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.034 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-51f-12 | 0.024 U | 0.024 U | 0.04 U | 0.59 | 0.022 U | 0.021 | 0.018 U | 0.5 U | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.054 | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-52A-06 | 0.24 U | 0.24 U | 0.4 U | 25 | 0.22 U | 0.18 U | 0.18 U | 5 U | 0.25 U | 8.5 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-52A-12 | 0.12 U | 0.13 J | 0.2 U | 10 | 0.11 U | 0.16 J | 0.091 U | 2.5 U | 0.12 U | 4 | 0.15 U | 0.38 U | 0.12 U | 0.14 U | 0.26 U | 0.1 U | 0.099 U | 0.15 J | 0.28 U | 0.079 U | 0.15 U | 2.5 U |
| EAR2-RA-52B-06 | 0.11 J | 0.14 J | 0.2 J | 6.4 | 0.088 U | 0.2 J | 0.073 U | 2 U | 0.098 U | 7.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.12 J | 0.079 U | 0.19 J | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-52B-12 | 0.094 U | 0.18 J | 0.25 J | 7 | 0.088 U | 0.19 J | 0.073 U | 2 U | 0.098 U | 5.4 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.19 J | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-52c-06 | 0.024 U | 0.025 J | 0.04 U | 0.27 | 0.022 U | 0.17 | 0.018 U | 1.2 | 0.025 U | 0.88 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-52c-12 | 0.024 U | 0.024 U | 0.04 U | 0.25 | 0.022 U | 0.17 | 0.018 U | 1.1 | 0.025 U | 0.52 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-52d-06 | 0.0094 U | 0.024 J | 0.035 J | 0.064 | 0.0088 U | 0.36 | 0.0073 U | 2.8 | 0.0098 U | 0.4 | 0.012 U | 0.031 U | 0.0098 U | 0.02 J | 0.021 U | 0.008 U | 0.0079 U | 0.42 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-52d-12 | 0.0047 U | 0.018 J | 0.017 J | 0.027 | 0.0044 U | 0.24 | 0.0036 U | 1.7 | 0.0049 U | 0.17 | 0.0059 U | 0.015 U | 0.0049 U | 0.015 J | 0.01 U | 0.004 U | 0.004 U | 0.25 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-52e-06 | 0.024 U | 0.03 J | 0.075 J | 0.12 | 0.022 U | 0.18 | 0.018 U | 1.2 | 0.025 U | 0.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.031 J | 0.02 U | 0.18 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-52e-12 | 0.024 U | 0.038 J | 0.04 U | 0.16 | 0.022 U | 0.2 | 0.018 U | 1.4 | 0.025 U | 0.87 | 0.03 U | 0.076 U | 0.024 U | 0.037 J | 0.051 U | 0.16 | 0.02 U | 0.22 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53a-06-1 | 0.0023 | 0.13 | 0.032 | 0.0069 | 0.0018 U | 0.003 | 0.0015 U | 0.04 U | 0.002 U | 0.046 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.0028 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-53a-06-2 | 0.0047 U | 0.23 | 0.044 | 0.016 | 0.0044 U | 0.0042 | 0.0036 U | 0.1 U | 0.0049 U | 0.088 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-53a-06-3 | 0.0051 | 0.22 | 0.073 | 0.014 | 0.0044 U | 0.0037 | 0.0036 U | 0.1 U | 0.0049 U | 0.087 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-53a-12 | 0.0019 U | 0.099 | 0.027 | 0.014 | 0.0018 U | 0.0022 | 0.0015 U | 0.04 U | 0.002 U | 0.035 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.0023 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-53b-06 | 0.0094 U | 0.04 | 0.032 | 0.11 | 0.0088 U | 0.021 | 0.0073 U | 0.2 U | 0.0098 U | 0.59 | 0.012 U | 0.031 U | 0.0098 U | 0.013 | 0.021 U | 0.011 | 0.0079 U | 0.016 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53b-12 | 0.0094 U | 0.078 | 0.03 | 0.14 | 0.0088 U | 0.01 | 0.0073 U | 0.2 U | 0.0098 U | 0.42 | 0.012 U | 0.031 U | 0.0098 U | 0.017 | 0.021 U | 0.008 U | 0.0079 U | 0.01 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53c-06 | 0.0094 U | 0.017 | 0.028 | 0.059 | 0.0088 U | 0.013 | 0.0073 U | 0.2 U | 0.0098 U | 0.48 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.017 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53c-12 | 0.0094 U | 0.045 | 0.031 | 0.063 | 0.0088 U | 0.0077 | 0.0073 U | 0.2 U | 0.0098 U | 0.46 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.0095 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53d-06 | 0.024 U | 0.041 | 0.042 | 0.43 | 0.022 U | 0.046 | 0.018 U | 0.5 U | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.046 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53d-12 | 0.024 U | 0.039 | 0.04 U | 0.2 | 0.022 U | 0.031 | 0.018 U | 0.5 U | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.031 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53e-06 | 0.0094 U | 0.023 | 0.027 | 0.1 | 0.0088 U | 0.044 | 0.0073 U | 0.31 | 0.0098 U | 0.59 | 0.012 U | 0.031 U | 0.0098 U | 0.011 | 0.021 U | 0.008 U | 0.0079 U | 0.027 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53e-12 | 0.0047 U | 0.035 | 0.054 | 0.055 | 0.0044 U | 0.052 | 0.0036 U | 0.42 | 0.0049 U | 0.27 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.046 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-53f-06 | 0.024 U | 0.043 | 0.042 | 1.3 | 0.022 U | 0.078 | 0.018 U | 0.6 | 0.025 U | 4.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.082 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-53f-12 | 0.061 | 0.32 | 0.33 | 0.65 | 0.022 U | 0.064 | 0.018 U | 0.5 U | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.067 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53g-06 | 0.024 U | 0.024 U | 0.04 U | 1.9 | 0.022 U | 0.018 | 0.018 U | 0.5 U | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.022 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53g-12 | 0.024 U | 0.029 | 0.04 U | 6.2 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53h-06 | 0.024 U | 0.028 | 0.04 U | 0.62 | 0.022 U | 0.045 | 0.018 U | 0.5 U | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.054 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53h-12 | 0.024 U | 0.027 | 0.04 U | 0.73 | 0.022 U | 0.046 | 0.018 U | 0.5 U | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.051 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53i-06 | 0.0094 U | 0.019 | 0.021 | 0.053 | 0.0088 U | 0.037 | 0.0073 U | 0.23 | 0.0098 U | 0.43 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.035 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53i-12 | 0.0094 U | 0.026 | 0.025 | 0.078 | 0.0088 U | 0.062 | 0.0073 U | 0.38 | 0.0098 U | 0.51 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.059 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53j-06-1 | 0.0094 U | 0.024 | 0.017 | 0.071 | 0.0088 U | 0.0093 | 0.0073 U | 0.2 U | 0.0098 U | 0.45 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.0084 U | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53j-06-2 | 0.0094 U | 0.018 | 0.016 U | 0.11 | 0.0088 U | 0.011 | 0.0073 U | 0.2 U | 0.0098 U | 0.55 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.0086 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53j-06-3 | 0.0094 U | 0.016 | 0.016 U | 0.088 | 0.0088 U | 0.0074 | 0.0073 U | 0.2 U | 0.0098 U | 0.4 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.0084 U | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53j-12 | 0.0047 U | 0.046 | 0.027 | 0.043 | 0.0044 U | 0.0067 | 0.0036 U | 0.1 U | 0.0049 U | 0.25 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0053 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-53k-06 | 0.024 U | 0.024 U | 0.04 U | 0.15 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.99 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53k-12 | 0.0094 U | 0.027 | 0.016 U | 0.063 | 0.0088 U | 0.0072 U | 0.0073 U | 0.2 U | 0.0098 U | 0.48 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.0084 U | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53l-06 | 0.024 U | 0.024 U | 0.04 U | 0.45 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53l-12 | 0.024 U | 0.024 U | 0.04 U | 0.14 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-53m-06 | 0.0094 U | 0.016 | 0.016 U | 0.19 | 0.0088 U | 0.0072 U | 0.0073 U | 0.2 U | 0.0098 U | 0.34 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.0084 U | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-53m-12 | 0.0047 U | 0.0098 | 0.0099 | 0.044 | 0.0044 U | 0.007 | 0.0036 U | 0.1 U | 0.0049 U | 0.23 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0043 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-54a-06 | 0.024 U | 0.024 U | 0.04 U | 1.5 | 0.022 U | 0.041 | 0.018 U | 0.5 U | 0.025 U | 3.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.044 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-54a-12 | 0.024 U | 0.024 U | 0.057 | 3.9 | 0.022 U | 0.035 | 0.018 U | 0.5 U | 0.025 U | 3.7 | 0.03 U | 0.076 U | 0.024 U | 0.037 | 0.051 U | 0.033 | 0.02 U | 0.041 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-54b-06 | 0.024 U | 0.024 U | 0.04 U | 1.6 | 0.022 U | 0.032 | 0.018 U | 0.5 U | 0.025 U | 3.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 | 0.02 U | 0.04 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-54b-12 | 0.024 U | 0.024 U | 0.04 U | 1.5 | 0.022 U | 0.035 | 0.018 U | 0.5 U | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.022 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-54c-06 | 0.047 U | 0.081 | 0.081 U | 1.2 | 0.044 U | 0.049 | 0.036 U | 1 U | 0.049 U | 3.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.053 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-54c-12 | 0.13 | 0.23 | 0.27 | 1.2 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 2.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-54d-06 | 0.094 U | 0.095 U | 0.16 U | 1.2 | 0.088 U | 0.14 | 0.073 U | 2 U | 0.098 U | 4.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.14 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-54d-12 | 0.047 U | 0.048 U | 0.081 U | 1.6 | 0.044 U | 0.059 | 0.036 U | 1 U | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.067 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-54e-06 | 0.047 U | 0.048 U | 0.081 U | 0.73 | 0.044 U | 0.048 | 0.036 U | 1 U | 0.049 U | 2.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.043 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-54e-12 | 0.047 U | 0.048 U | 0.081 U | 1.4 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 2.6 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-54f-06 | 0.11 | 0.22 | 0.081 U | 0.62 | 0.044 U | 0.27 | 0.036 U | 1 U | 0.049 U | 3.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.14 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-54f-12 | 0.034 | 0.05 | 0.042 | 0.25 | 0.018 U | 0.031 | 0.015 U | 0.4 U | 0.02 U | 1.4 | 0.024 U | 0.061 U | 0.02 U | 0.023 U | 0.041 U | 0.016 U | 0.016 U | 0.035 | 0.044 U | 0.013 U | 0.025 U | 0.4 U |
| EAR2-RA-54g-06 | 0.027 | 0.028 | 0.016 U | 0.42 | 0.0088 U | 0.011 | 0.0073 U | 0.2 U | 0.0098 U | 0.73 | 0.012 U | 0.031 U | 0.0098 U | 0.012 | 0.021 U | 0.008 U | 0.0079 U | 0.012 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-54g-12 | 0.012 U | 0.087 | 0.046 | 0.33 | 0.011 U | 0.023 | 0.0091 U | 0.25 U | 0.012 U | 1.2 | 0.015 U | 0.038 U | 0.012 U | 0.021 | 0.026 U | 0.01 U | 0.0099 U | 0.019 | 0.028 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR2-RA-54h-06 | 0.14 | 0.095 U | 0.16 U | 1.3 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 4.1 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR2-RA-54h-12 | 0.024 U | 0.024 U | 0.04 U | 0.45 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-55a-06-1 | 0.0047 U | 0.013 | 0.0087 | 0.0044 U | 0.0044 U | 0.0036 U | 0.0036 U | 0.1 U | 0.0049 U | 0.014 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55a-06-2 | 0.0047 U | 0.016 | 0.014 | 0.0044 U | 0.0044 U | 0.0036 U | 0.0036 U | 0.1 U | 0.0049 U | 0.02 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55a-06-3 | 0.0047 U | 0.0082 | 0.0081 U | 0.0044 U | 0.0044 U | 0.0036 U | 0.0036 U | 0.1 U | 0.0049 U | 0.025 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55a-12 | 0.0047 U | 0.0087 | 0.0081 U | 0.0044 U | 0.0044 U | 0.0036 U | 0.0036 U | 0.1 U | 0.0049 U | 0.015 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55b-06 | 0.0047 U | 0.02 | 0.011 | 0.0044 U | 0.0044 U | 0.0042 | 0.0036 U | 0.1 U | 0.0049 U | 0.034 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55b-12 | 0.0047 U | 0.025 | 0.0081 U | 0.0044 U | 0.0044 U | 0.0036 U | 0.0036 U | 0.1 U | 0.0049 U | 0.012 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55c-06 | 0.0047 U | 0.036 | 0.018 | 0.0044 U | 0.0044 U | 0.0042 | 0.0036 U | 0.1 U | 0.0049 U | 0.018 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55c-12 | 0.0047 U | 0.082 | 0.067 | 0.0044 U | 0.0044 U | 0.018 | 0.0036 U | 0.12 | 0.0049 U | 0.014 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.013 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55d-06 | 0.0047 U | 0.039 | 0.016 | 0.0071 | 0.0044 U | 0.0036 U | 0.0036 U | 0.1 U | 0.0049 U | 0.022 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55d-12 | 0.0047 U | 0.051 | 0.022 | 0.0044 U | 0.0044 U | 0.0053 | 0.0036 U | 0.1 U | 0.0049 U | 0.023 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0057 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55e-06 | 0.0047 U | 0.021 | 0.0081 U | 0.0044 U | 0.0044 U | 0.0036 U | 0.0036 U | 0.1 U | 0.0049 U | 0.02 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55e-12 | 0.0047 U | 0.03 | 0.024 | 0.016 | 0.0044 U | 0.0039 | 0.0036 U | 0.1 U | 0.0049 U | 0.02 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0042 U | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-55f-06 | 0.024 U | 0.028 | 0.04 U | 0.32 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-55f-12 | 0.024 U | 0.052 | 0.04 U | 0.74 | 0.022 U | 0.041 | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.035 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-55g-06 | 0.024 U | 0.034 | 0.04 U | 0.19 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.94 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-55g-12 | 0.0094 U | 0.027 | 0.016 U | 0.18 | 0.0088 U | 0.0072 U | 0.0073 U | 0.2 U | 0.0098 U | 0.48 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.0084 U | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-55h-06 | 0.024 U | 0.024 U | 0.04 U | 0.57 | 0.022 U | 0.038 | 0.018 U | 0.5 U | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.027 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-55h-12 | 0.024 U | 0.024 U | 0.04 U | 0.4 | 0.022 U | 0.027 | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.023 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56a-06-1 | 0.024 U | 0.039 | 0.04 U | 0.58 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.78 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56a-06-2 | 0.0094 U | 0.015 | 0.016 U | 0.14 | 0.0088 U | 0.011 | 0.0073 U | 0.2 U | 0.0098 U | 0.38 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.012 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-56a-06-3 | 0.0094 U | 0.021 | 0.016 U | 0.08 | 0.0088 U | 0.01 | 0.0073 U | 0.2 U | 0.0098 U | 0.42 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.0099 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-56a-12 | 0.0048 | 0.031 | 0.021 | 0.029 | 0.0044 U | 0.0075 | 0.0036 U | 0.1 U | 0.0049 U | 0.16 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0067 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-56b-06 | 0.024 U | 0.045 | 0.04 U | 0.14 | 0.022 U | 0.071 | 0.018 U | 0.5 U | 0.025 U | 0.86 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.065 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56b-12 | 0.012 | 0.07 | 0.17 | 0.015 | 0.0022 U | 0.024 | 0.0018 U | 0.17 | 0.0025 U | 0.1 | 0.003 U | 0.0076 U | 0.0024 U | 0.0028 U | 0.0051 U | 0.002 U | 0.002 U | 0.023 | 0.0055 U | 0.0016 U | 0.0031 U | 0.05 U |
| EAR2-RA-56c-06 | 0.024 U | 0.12 | 0.074 | 0.27 | 0.022 U | 0.18 | 0.018 U | 0.99 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56c-12 | 0.039 | 0.15 | 0.18 | 0.12 | 0.022 U | 0.092 | 0.018 U | 0.63 | 0.025 U | 0.53 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.084 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56d-06 | 0.024 U | 0.024 | 0.04 U | 0.39 | 0.022 U | 0.039 | 0.018 U | 0.5 U | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.037 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56d-12 | 0.0075 | 0.066 | 0.053 | 0.057 | 0.0044 U | 0.01 | 0.0036 U | 0.1 U | 0.0049 U | 0.35 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0094 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-56e-06 | 0.0024 | 0.024 | 0.013 | 0.025 | 0.0022 U | 0.013 | 0.0018 U | 0.086 | 0.0025 U | 0.1 | 0.003 U | 0.0076 U | 0.0024 U | 0.0028 U | 0.0051 U | 0.002 U | 0.002 U | 0.011 | 0.0055 U | 0.0016 U | 0.0031 U | 0.05 U |
| EAR2-RA-56e-12 | 0.0043 | 0.048 | 0.042 | 0.0037 | 0.0018 U | 0.005 | 0.0015 U | 0.04 U | 0.002 U | 0.023 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0016 U | 0.0016 U | 0.0041 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-56f-06 | 0.024 U | 0.059 | 0.04 U | 0.11 | 0.022 U | 0.1 | 0.018 U | 0.51 | 0.025 U | 0.65 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.069 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56f-12 | 0.0019 U | 0.048 | 0.021 | 0.028 | 0.0018 U | 0.031 | 0.0015 U | 0.21 | 0.002 U | 0.12 | 0.0024 U | 0.0061 U | 0.002 U | 0.0059 | 0.0041 U | 0.0016 U | 0.0016 U | 0.025 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-56g-06 | 0.024 U | 0.19 | 0.054 | 0.28 | 0.022 U | 0.2 | 0.018 U | 1 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56g-12 | 0.0094 U | 0.38 | 0.08 | 0.084 | 0.0088 U | 0.32 | 0.0073 U | 1.8 | 0.0098 U | 0.37 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.2 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-56h-06 | 0.0039 | 0.067 | 0.036 | 0.026 | 0.0022 U | 0.011 | 0.0018 U | 0.075 | 0.0025 U | 0.15 | 0.003 U | 0.0076 U | 0.0024 U | 0.0028 U | 0.0051 U | 0.002 U | 0.002 U | 0.0083 | 0.0055 U | 0.0016 U | 0.0031 U | 0.05 U |
| EAR2-RA-56h-12 | 0.31 | 0.43 | 2.7 | 0.022 U | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.14 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.022 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56i-06 | 0.047 U | 0.048 U | 0.081 U | 1.2 | 0.044 U | 0.04 | 0.036 U | 1 U | 0.049 U | 3.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-56i-12 | 0.024 U | 0.04 | 0.04 U | 0.12 | 0.022 U | 0.027 | 0.018 U | 0.5 U | 0.025 U | 0.51 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.023 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56j-06-1 | 0.047 U | 0.048 U | 0.081 U | 1.4 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 3.9 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-56j-06-2 | 0.047 U | 0.048 U | 0.081 U | 1.2 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 3.6 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-56j-06-3 | 0.024 | 0.087 | 0.04 U | 0.33 | 0.022 U | 0.062 | 0.018 U | 0.5 U | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.058 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56j-12 | 0.024 U | 0.028 | 0.04 U | 0.22 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 0.53 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56k-06 | 0.047 U | 0.048 U | 0.081 U | 0.9 | 0.044 U | 0.036 U | 0.036 U | 1 U | 0.049 U | 2.7 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.042 U | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-56k-12 | 0.24 U | 0.24 U | 0.4 U | 1.8 | 0.22 U | 0.18 U | 0.18 U | 5 U | 0.25 U | 7.6 | 0.3 U | 0.76 U | 0.24 U | 0.28 U | 0.51 U | 0.2 U | 0.2 U | 0.21 U | 0.55 U | 0.16 U | 0.31 U | 5 U |
| EAR2-RA-56l-06 | 0.024 U | 0.026 | 0.04 U | 0.39 | 0.022 U | 0.018 U | 0.018 U | 0.5 U | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.021 U | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56l-12 | 0.094 U | 0.095 U | 0.16 U | 2.6 | 0.088 U | 0.072 U | 0.073 U | 2 U | 0.098 U | 7.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.084 U | 0.22 U | 0.063 U | 0.12 U | 2 U |

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endo-sulfan I | Endo-sulfan II | Endo-sulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Hepta-chlor | Hepta-chlor epoxide | Meth-oxychlor | Toxa-phene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-56m-06 | 0.024 U | 0.079 | 0.04 U | 0.44 | 0.022 U | 0.15 | 0.018 U | 0.63 | 0.037 | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.071 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56m-12 | 0.0047 U | 0.027 | 0.018 | 0.083 | 0.0044 U | 0.0099 | 0.0036 U | 0.1 U | 0.0049 U | 0.34 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.0066 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-56n-06 | 0.024 U | 0.027 | 0.04 U | 0.72 | 0.022 U | 0.068 | 0.018 U | 0.63 | 0.025 U | 3.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.076 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-56n-12 | 0.024 U | 0.042 | 0.04 U | 0.86 | 0.022 U | 0.053 | 0.018 U | 0.51 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.071 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57a-06 | 0.024 U | 0.037 J | 0.04 U | 0.81 | 0.022 U | 0.18 | 0.018 U | 1.3 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.025 J | 0.02 U | 0.19 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57a-12 | 0.024 U | 0.044 J | 0.04 U | 0.97 | 0.022 U | 0.084 J | 0.018 U | 0.66 J | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.035 J | 0.02 U | 0.078 J | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57b-06 | 0.024 U | 0.053 | 0.04 U | 0.59 | 0.022 U | 0.11 | 0.018 U | 0.81 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.021 | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57b-12 | 0.024 U | 0.06 | 0.04 U | 0.42 | 0.022 U | 0.091 | 0.018 U | 0.76 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57c-06 | 0.024 U | 0.043 | 0.04 U | 0.37 | 0.022 U | 0.14 | 0.018 U | 0.95 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57c-12 | 0.024 U | 0.037 | 0.04 U | 0.43 | 0.022 U | 0.15 | 0.018 U | 1.1 | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57d-06 | 0.024 U | 0.027 | 0.072 | 0.31 | 0.022 U | 0.16 | 0.018 U | 1.3 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57d-12 | 0.024 U | 0.025 | 0.04 U | 0.28 | 0.022 U | 0.19 | 0.018 U | 1.4 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57e-06 | 0.024 U | 0.024 U | 0.04 U | 0.18 | 0.022 U | 0.055 | 0.018 U | 0.5 U | 0.025 U | 0.91 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.052 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57e-12 | 0.024 U | 0.024 U | 0.04 U | 0.14 | 0.022 U | 0.035 | 0.018 U | 0.5 U | 0.025 U | 0.62 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.037 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57f-06 | 0.0094 U | 0.03 | 0.018 | 0.088 | 0.0088 U | 0.043 | 0.0073 U | 0.28 | 0.0098 U | 0.55 | 0.012 U | 0.031 U | 0.0098 U | 0.013 | 0.021 U | 0.008 U | 0.0079 U | 0.039 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-57f-12 | 0.0094 U | 0.02 | 0.018 | 0.091 | 0.0088 U | 0.036 | 0.0073 U | 0.24 | 0.0098 U | 0.45 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.034 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-57g-06 | 0.024 U | 0.05 | 0.04 U | 0.23 | 0.022 U | 0.091 | 0.018 U | 0.5 U | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.081 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57g-12 | 0.047 U | 0.06 | 0.081 U | 0.86 | 0.044 U | 0.14 | 0.036 U | 1 U | 0.049 U | 2.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.13 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-57h-06 | 0.024 U | 0.039 | 0.04 U | 0.16 | 0.022 U | 0.064 | 0.018 U | 0.5 U | 0.025 U | 0.67 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.053 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-57h-12 | 0.024 U | 0.045 | 0.041 | 0.25 | 0.022 U | 0.086 | 0.018 U | 0.56 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.074 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58a-06-1 | 0.024 U | 0.075 | 0.048 | 1.1 | 0.022 U | 0.15 | 0.018 U | 1.1 | 0.025 U | 4.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.031 | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58a-06-2 | 0.024 U | 0.075 | 0.056 | 0.48 | 0.022 U | 0.19 | 0.018 U | 1.3 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.18 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58a-06-3 | 0.024 U | 0.077 | 0.062 | 0.63 | 0.022 U | 0.26 | 0.018 U | 1.7 | 0.025 U | 3.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 | 0.051 U | 0.025 | 0.02 U | 0.25 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58a-12 | 0.024 U | 0.09 | 0.073 | 0.83 | 0.022 U | 0.16 | 0.018 U | 1.1 | 0.025 U | 3.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.029 | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58b-06 | 0.047 U | 0.067 | 0.081 U | 1.2 | 0.044 U | 0.23 | 0.036 U | 1.6 | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.044 | 0.04 U | 0.22 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-58b-12 | 0.047 U | 0.063 | 0.081 U | 0.82 | 0.044 U | 0.22 | 0.036 U | 1.5 | 0.049 U | 3.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 | 0.04 U | 0.22 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-58c-06 | 0.024 U | 0.12 | 0.26 | 0.59 | 0.022 U | 0.29 | 0.018 U | 2 | 0.025 U | 2.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.022 | 0.02 U | 0.29 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58c-12 | 0.024 U | 0.11 | 0.074 | 0.42 | 0.022 U | 0.3 | 0.018 U | 1.9 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.29 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58d-06 | 0.024 U | 0.083 J | 0.046 J | 0.47 | 0.022 U | 0.2 | 0.018 U | 1.4 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58d-12 | 0.024 U | 0.087 J | 0.056 J | 0.49 | 0.022 U | 0.21 | 0.018 U | 1.5 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58e-06 | 0.024 U | 0.1 | 0.11 | 0.61 | 0.022 U | 0.19 | 0.018 U | 1.3 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 J | 0.02 U | 0.18 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58e-12 | 0.024 U | 0.12 | 0.084 J | 0.52 | 0.022 U | 0.31 | 0.018 U | 2.1 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.021 J | 0.02 U | 0.31 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58f-06 | 0.024 U | 0.12 | 0.068 | 0.85 | 0.022 U | 0.25 | 0.018 U | 1.7 | 0.025 U | 2.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.026 | 0.02 U | 0.25 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-58f-12 | 0.024 U | 0.094 | 0.06 | 0.77 | 0.022 U | 0.21 | 0.018 U | 1.4 | 0.025 U | 3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.028 | 0.02 U | 0.2 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-59a-06 | 0.024 U | 0.058 J | 0.042 J | 0.58 | 0.022 U | 0.16 | 0.018 U | 1.1 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-59a-12 | 0.024 U | 0.05 J | 0.04 U | 1.4 | 0.022 U | 0.12 | 0.018 U | 0.85 J | 0.025 U | 2.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.026 J | 0.02 U | 0.11 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-59b-06 | 0.0094 U | 0.059 | 0.073 | 0.37 | 0.0088 U | 0.21 | 0.0073 U | 1.3 | 0.0098 U | 2.5 | 0.012 U | 0.031 U | 0.0098 U | 0.033 J | 0.021 U | 0.011 J | 0.0079 U | 0.21 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-59b-12 | 0.024 U | 0.066 J | 0.04 J | 0.46 | 0.022 U | 0.23 | 0.018 U | 1.5 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.036 J | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-59c-06 | 0.0094 U | 0.06 | 0.061 | 0.98 | 0.0088 U | 0.17 | 0.0073 U | 1.1 | 0.0098 U | 3.9 | 0.012 U | 0.031 U | 0.0098 U | 0.04 | 0.021 U | 0.04 J | 0.0079 U | 0.17 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-59c-12 | 0.0094 U | 0.055 | 0.051 | 1.3 | 0.0088 U | 0.19 | 0.0073 U | 1.3 | 0.0098 U | 4.1 | 0.012 U | 0.031 U | 0.0098 U | 0.047 | 0.021 U | 0.043 | 0.0079 U | 0.19 | 0.026 J | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-60a-06-1 | 0.024 U | 0.035 J | 0.064 J | 2.6 | 0.022 U | 0.19 | 0.018 U | 1.3 | 0.025 U | 5.4 | 0.03 U | 0.076 U | 0.024 U | 0.059 J | 0.051 U | 0.049 J | 0.02 U | 0.19 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-60a-06-2 | 0.024 U | 0.04 J | 0.044 J | 3.4 | 0.022 U | 0.29 | 0.018 U | 2 | 0.025 U | 6.4 | 0.03 U | 0.076 U | 0.024 U | 0.064 J | 0.051 U | 0.048 J | 0.02 U | 0.31 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-60a-06-3 | 0.047 U | 0.048 U | 0.081 U | 1.1 | 0.044 U | 0.22 | 0.036 U | 1.4 J | 0.049 U | 2.8 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.23 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR2-RA-60a-12 | 0.024 U | 0.069 J | 0.11 | 2 | 0.022 U | 0.33 | 0.018 U | 2.1 | 0.025 U | 3 | 0.03 U | 0.076 U | 0.024 U | 0.078 J | 0.051 U | 0.047 J | 0.02 U | 0.33 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-60b-06 | 0.024 U | 0.048 J | 0.044 J | 0.43 | 0.022 U | 0.16 | 0.018 U | 1 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.031 J | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-60b-12 | 0.024 U | 0.063 J | 0.067 J | 0.56 | 0.022 U | 0.1 | 0.018 U | 0.69 J | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.035 J | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-60c-06 | 0.024 U | 0.041 J | 0.054 J | 0.37 | 0.022 U | 0.1 | 0.018 U | 0.66 J | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.029 J | 0.051 U | 0.02 U | 0.02 U | 0.098 J | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-60c-12 | 0.024 U | 0.055 J | 0.053 J | 0.33 | 0.022 U | 0.058 J | 0.018 U | 0.5 U | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.06 J | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-60d-06 | 0.026 J | 0.12 | 0.16 | 0.29 | 0.022 U | 0.1 | 0.018 U | 0.66 J | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 | 0.051 U | 0.02 U | 0.02 U | 0.097 J | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-60d-12 | 0.025 J | 0.081 J | 0.095 J | 0.52 | 0.022 U | 0.082 J | 0.018 U | 0.54 J | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.078 J | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61a-06-1 | 0.024 U | 0.09 | 0.14 | 0.53 | 0.022 U | 0.31 | 0.018 U | 2 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.27 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61a-06-2 | 0.024 U | 0.081 | 0.064 | 0.38 | 0.022 U | 0.41 | 0.018 U | 2.6 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.39 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61a-06-3 | 0.024 U | 0.073 | 0.055 | 0.36 | 0.022 U | 0.23 | 0.018 U | 1.6 | 0.025 U | 0.98 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61a-12 | 0.024 U | 0.14 | 0.14 | 0.63 | 0.022 U | 0.32 | 0.018 U | 2.1 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.3 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61b-06 | 0.024 U | 0.056 | 0.041 | 0.1 | 0.022 U | 0.16 | 0.018 U | 1.3 | 0.025 U | 0.45 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61b-12 | 0.0047 U | 0.044 | 0.051 | 0.087 | 0.0044 U | 0.16 | 0.0036 U | 1.4 | 0.0049 U | 0.38 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.23 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-61c-06 | 0.032 | 0.15 | 0.48 | 0.25 | 0.0088 U | 0.34 | 0.0073 U | 2.2 | 0.0098 U | 0.48 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.36 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-61c-12 | 0.017 | 0.31 | 0.29 | 0.082 | 0.0044 U | 0.34 | 0.0036 U | 2.2 | 0.0049 U | 0.38 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.33 | 0.011 U | 0.013 | 0.0062 U | 0.1 U |
| EAR2-RA-61d-06 | 0.024 U | 0.034 J | 0.077 J | 1.7 | 0.022 U | 0.095 J | 0.018 U | 0.8 J | 0.025 U | 2.9 | 0.03 U | 0.076 U | 0.024 U | 0.051 J | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61d-12 | 1.1 | 6.6 | 10 | 2.5 | 0.022 U | 0.08 J | 0.018 U | 0.88 J | 0.025 U | 3 | 0.03 U | 0.076 U | 0.024 U | 0.047 J | 0.051 U | 0.096 J | 0.02 U | 0.11 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61e-06 | 0.024 U | 0.056 J | 0.04 U | 0.57 | 0.022 U | 0.076 J | 0.018 U | 0.55 J | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.03 J | 0.051 U | 0.02 U | 0.02 U | 0.083 J | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61e-12 | 0.024 U | 0.047 J | 0.04 U | 0.92 | 0.022 U | 0.099 J | 0.018 U | 0.76 J | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.044 J | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61f-06 | 0.024 U | 0.052 J | 0.04 U | 0.35 | 0.022 U | 0.08 J | 0.018 U | 0.56 J | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.036 J | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61f-12 | 0.024 U | 0.049 J | 0.04 U | 0.96 | 0.022 U | 0.045 J | 0.018 U | 0.5 U | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.031 J | 0.051 U | 0.02 U | 0.02 U | 0.061 J | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-61g-06 | 0.065 | 0.16 | 0.14 | 0.28 | 0.0088 U | 0.086 | 0.0073 U | 0.65 | 0.0098 U | 0.64 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.084 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-61g-12 | 0.0047 U | 0.16 | 0.093 | 0.15 | 0.0044 U | 0.11 | 0.0036 U | 0.7 | 0.0049 U | 0.29 | 0.0059 U | 0.015 U | 0.0049 U | 0.0076 J | 0.01 U | 0.004 U | 0.004 U | 0.1 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-62a-06-1 | 0.024 U | 0.41 | 0.23 | 0.5 | 0.022 U | 0.2 | 0.018 U | 1.3 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-62a-06-2 | 0.035 J | 0.43 | 0.5 | 0.29 | 0.0088 U | 0.16 | 0.0073 U | 1.1 | 0.0098 U | 0.72 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.0094 J | 0.0079 U | 0.19 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-62a-06-3 | 0.012 J | 0.22 | 0.12 | 0.24 | 0.0088 U | 0.11 | 0.0073 U | 0.79 | 0.0098 U | 0.63 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.11 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-62a-12 | 0.014 J | 0.25 | 0.12 | 0.27 | 0.0088 U | 0.14 | 0.0073 U | 0.93 | 0.0098 U | 0.47 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.15 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-62b-06 | 0.0047 U | 0.032 | 0.04 | 0.068 | 0.0044 U | 0.038 | 0.0036 U | 0.45 | 0.0049 U | 0.21 | 0.0059 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.044 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR2-RA-62b-12 | 0.0019 U | 0.04 | 0.011 | 0.024 | 0.0018 U | 0.012 | 0.0015 U | 0.11 | 0.002 U | 0.092 | 0.0024 U | 0.0061 U | 0.002 U | 0.0023 U | 0.0041 U | 0.0021 J | 0.0016 U | 0.014 | 0.0044 U | 0.0013 U | 0.0025 U | 0.04 U |
| EAR2-RA-62c-06 | 0.0094 U | 0.11 | 0.029 J | 0.26 | 0.0088 U | 0.27 | 0.0073 U | 1.8 | 0.0098 U | 0.81 | 0.012 U | 0.031 U | 0.0098 U | 0.017 J | 0.021 U | 0.008 U | 0.0079 U | 0.31 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-62c-12 | 0.0094 U | 0.15 | 0.055 | 0.26 | 0.0088 U | 0.11 | 0.0073 U | 0.84 | 0.0098 U | 0.55 | 0.012 U | 0.031 U | 0.0098 U | 0.011 | 0.021 U | 0.008 U | 0.0079 U | 0.11 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |

**Table A-1**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-2**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endo-sulfan I | Endo-sulfan II | Endo-sulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Hepta-chlor | Hepta-chlor epoxide | Meth-oxychlor | Toxa-phene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR2-RA-62d-06 | 0.033 J | 0.14 | 0.048 J | 0.55 | 0.022 U | 0.24 | 0.018 U | 1.8 | 0.025 U | 0.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.32 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-62d-12 | 0.0094 U | 0.26 | 0.038 J | 0.49 | 0.0088 U | 0.21 | 0.0073 U | 1.6 | 0.0098 U | 0.57 | 0.012 U | 0.031 U | 0.0098 U | 0.013 J | 0.021 U | 0.008 U | 0.0079 U | 0.29 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-62e-06 | 0.052 | 0.26 | 0.038 J | 0.66 | 0.0088 U | 0.16 | 0.0073 U | 1.2 | 0.0098 U | 0.88 | 0.012 U | 0.031 U | 0.0098 U | 0.027 J | 0.021 U | 0.011 J | 0.0079 U | 0.19 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-62e-12 | 0.024 U | 0.13 | 0.04 U | 1.8 | 0.022 U | 0.11 | 0.018 U | 0.96 J | 0.025 U | 0.63 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| EAR2-RA-62f-06 | 0.032 J | 0.098 | 0.055 | 0.087 | 0.0088 U | 0.073 | 0.0073 U | 0.56 | 0.0098 U | 0.38 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.068 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR2-RA-62f-12 | 0.0094 U | 0.19 | 0.11 | 0.16 | 0.0088 U | 0.092 | 0.0073 U | 0.72 | 0.0098 U | 0.4 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.13 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| Total | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 | 712 |
| Above PQL | 77 | 491 | 304 | 681 | 0 | 623 | 0 | 374 | 1 | 710 | 0 | 0 | 0 | 107 | 0 | 88 | 0 | 599 | 7 | 6 | 1 | 0 |
| "J" qualifier | 31 | 88 | 64 | 6 | 0 | 15 | 0 | 25 | 0 | 0 | 0 | 0 | 0 | 68 | 0 | 45 | 0 | 13 | 6 | 5 | 0 | 0 |
| Non-Detects | 604 | 133 | 344 | 25 | 712 | 74 | 712 | 313 | 711 | 2 | 712 | 712 | 712 | 537 | 712 | 579 | 712 | 100 | 699 | 701 | 711 | 712 |

**Notes:**
"U" = not detected at concentration shown
"J" = detected between practical quantitation limit and method detection limit

**Table A-2**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-3**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR3-RA-01a-06 | 0.024 U | 0.16 | 0.24 | 0.69 | 0.022 U | 0.47 | 0.018 U | 3.9 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.49 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-01a-12 | 0.024 U | 0.12 | 0.15 | 1.1 | 0.022 U | 0.42 | 0.018 U | 3.5 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.037 | 0.02 U | 0.44 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-01b-06 | 0.024 U | 0.083 U | 0.12 | 0.32 | 0.022 U | 0.23 | 0.018 U | 2 | 0.025 U | 0.85 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-01b-12 | 0.0094 U | 0.078 | 0.082 | 0.22 | 0.0088 U | 0.098 | 0.0073 U | 0.81 | 0.0098 U | 0.34 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.096 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-01c-06 | 0.024 U | 0.14 | 0.22 | 0.82 | 0.022 U | 0.42 | 0.018 U | 3.5 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.025 | 0.02 U | 0.45 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-01c-12 | 0.024 U | 0.11 U | 1 | 0.022 U | 0.31 | 0.018 U | 2.5 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.026 | 0.02 U | 0.31 | 0.06 U | 0.016 U | 0.031 U | 0.5 U | |
| EAR3-RA-02a-06 | 0.47 U | 0.48 U | 0.81 U | 17 | 0.44 U | 0.76 | 0.36 U | 10 U | 0.49 U | 3.9 | 0.59 U | 1.5 U | 0.49 U | 0.57 U | 1 U | 0.4 U | 0.4 U | 0.77 | 1.1 U | 0.32 U | 0.62 U | 10 U |
| EAR3-RA-02a-12 | 0.024 U | 0.23 | 0.17 | 2.1 | 0.022 U | 0.35 | 0.018 U | 2.8 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.1 | 0.02 U | 0.32 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-02b-06 | 0.024 U | 0.22 | 0.23 | 0.98 | 0.022 U | 0.75 | 0.018 U | 7.1 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.033 | 0.02 U | 0.78 | 0.06 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-02b-12 | 0.047 U | 0.32 | 0.17 | 2.7 | 0.044 U | 0.89 | 0.036 U | 8.3 | 0.049 U | 3.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.069 | 0.04 U | 0.91 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-03a-06 | 0.024 U | 0.13 | 0.11 | 0.33 | 0.022 U | 0.78 | 0.018 U | 6.1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.73 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-03a-12 | 0.024 U | 0.24 | 0.13 | 0.26 | 0.022 U | 0.8 | 0.018 U | 6.1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.68 | 0.06 U | 0.026 | 0.031 U | 0.5 U |
| EAR3-RA-03b-06 | 0.024 U | 0.091 | 0.087 | 0.27 | 0.022 U | 0.17 | 0.018 U | 1.3 | 0.025 U | 0.67 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-03b-12 | 0.032 | 0.18 | 0.28 | 0.37 | 0.022 U | 0.24 | 0.018 U | 1.8 | 0.025 U | 0.81 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-04a-06 | 0.024 U | 0.1 | 0.14 | 0.42 | 0.022 U | 0.44 | 0.018 U | 3.6 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.4 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-04a-12 | 0.024 U | 0.18 | 0.16 | 0.38 | 0.022 U | 0.99 | 0.018 U | 7.4 | 0.025 U | 0.88 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.85 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-04b-06 | 0.047 U | 0.18 | 0.39 | 1.5 | 0.044 U | 0.91 | 0.036 U | 7.9 | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.042 | 0.04 U | 0.87 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-04b-12 | 0.19 U | 0.19 U | 0.32 U | 9.1 | 0.18 U | 1.9 | 0.15 U | 20 | 0.2 U | 3.4 | 0.24 U | 0.61 U | 0.2 U | 0.23 U | 0.41 U | 0.16 U | 0.16 U | 2.1 | 0.52 | 0.13 U | 0.25 U | 4 U |
| EAR3-RA-05a-06-1 | 0.024 U | 0.19 | 0.14 | 1 | 0.022 U | 0.36 | 0.018 U | 3 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.034 | 0.02 U | 0.34 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-05a-06-2 | 0.094 U | 0.16 | 0.16 U | 3.8 | 0.088 U | 0.86 | 0.073 U | 8.2 | 0.098 U | 4.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.91 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-05a-06-3 | 0.024 U | 0.15 | 0.14 | 1.2 | 0.022 U | 0.37 | 0.018 U | 3.2 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.034 | 0.02 U | 0.36 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-05a-12 | 0.029 | 0.24 | 0.33 | 1.1 | 0.022 U | 0.39 | 0.018 U | 3.3 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.04 | 0.02 U | 0.37 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-05b-06 | 0.024 U | 0.14 | 0.12 | 0.37 | 0.022 U | 0.23 | 0.018 U | 2.2 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-05b-12 | 0.024 U | 0.086 | 0.087 | 0.35 | 0.022 U | 0.26 | 0.018 U | 2.2 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.26 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-06a-06 | 0.047 U | 0.1 | 0.55 | 1.6 | 0.044 U | 0.62 | 0.036 U | 5.9 | 0.049 U | 4.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.085 | 0.04 U | 0.67 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-06a-12 | 0.094 U | 0.097 | 0.16 U | 2.3 | 0.088 U | 0.76 | 0.073 U | 7.5 | 0.098 U | 5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.11 | 0.079 U | 0.84 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-06b-06 | 0.024 U | 0.13 | 0.21 | 0.68 | 0.022 U | 0.27 | 0.018 U | 2.4 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-06b-12 | 0.024 U | 0.17 | 0.23 | 0.79 | 0.022 U | 0.33 | 0.018 U | 2.9 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.035 | 0.02 U | 0.33 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-07a-06 | 0.027 | 0.34 | 1.5 | 0.21 | 0.022 U | 0.69 | 0.018 U | 6 | 0.025 U | 0.87 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.68 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-07a-12 | 0.024 U | 0.62 | 0.52 | 0.14 | 0.022 U | 0.59 | 0.018 U | 4.7 | 0.025 U | 0.61 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.54 | 0.06 U | 0.023 | 0.031 U | 0.5 U |
| EAR3-RA-07b-06 | 0.061 | 0.29 | 1 | 0.11 | 0.022 U | 0.36 | 0.018 U | 2.8 | 0.025 U | 0.55 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.34 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-07b-12 | 0.024 U | 0.58 | 0.56 | 0.081 | 0.022 U | 0.5 | 0.018 U | 3.6 | 0.025 U | 0.31 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.44 | 0.06 U | 0.017 | 0.031 U | 0.5 U |
| EAR3-RA-07c-06 | 0.024 U | 0.12 | 0.14 | 0.2 | 0.022 U | 0.27 | 0.018 U | 2.4 | 0.025 U | 0.89 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-07c-12 | 0.024 U | 0.079 | 0.055 | 0.12 | 0.022 U | 0.19 | 0.018 U | 1.7 | 0.025 U | 0.58 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-07d-06 | 0.024 U | 0.1 | 0.58 | 0.15 | 0.022 U | 0.17 | 0.018 U | 1.5 | 0.025 U | 0.67 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-07d-12 | 0.0094 U | 0.027 U | 0.031 | 0.044 | 0.0088 U | 0.049 | 0.0073 U | 0.42 | 0.0098 U | 0.19 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.05 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-08a-06-1 | 0.024 U | 0.13 | 0.25 | 0.22 | 0.022 U | 0.2 | 0.018 U | 1.6 | 0.025 U | 0.71 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-08a-06-2 | 0.024 U | 0.13 | 0.22 | 0.26 | 0.022 U | 0.25 | 0.018 U | 2.1 | 0.025 U | 0.77 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-08a-06-3 | 0.032 | 0.14 | 0.2 | 0.19 | 0.022 U | 0.2 | 0.018 U | 1.6 | 0.025 U | 0.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-08a-12 | 0.025 | 0.15 | 0.21 | 0.59 | 0.022 U | 0.16 | 0.018 U | 1.3 | 0.025 U | 0.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-08b-06 | 0.0094 U | 0.15 | 0.14 | 0.089 | 0.0088 U | 0.12 | 0.0073 U | 0.87 | 0.0098 U | 0.26 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.11 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-08b-12 | 0.0066 | 0.17 | 0.12 | 0.088 | 0.0044 U | 0.089 | 0.0036 U | 0.65 | 0.0049 U | 0.15 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.076 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-08c-06 | 0.024 U | 0.11 | 0.18 | 0.17 | 0.022 U | 0.21 | 0.018 U | 1.5 | 0.025 U | 0.49 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-08c-12 | 0.024 U | 0.12 | 0.13 | 0.25 | 0.022 U | 0.22 | 0.018 U | 1.6 | 0.025 U | 0.39 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09a-06 | 0.024 U | 0.12 | 0.24 | 0.31 | 0.022 U | 0.29 | 0.018 U | 2.3 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.28 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09a-12 | 0.024 U | 0.09 | 0.18 | 0.22 | 0.022 U | 0.19 | 0.018 U | 1.6 | 0.025 U | 0.69 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09b-06 | 0.024 U | 0.14 | 0.27 | 0.32 | 0.022 U | 0.33 | 0.018 U | 2.6 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.32 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09b-12 | 0.024 U | 0.17 | 0.23 | 0.24 | 0.022 U | 0.3 | 0.018 U | 2.3 | 0.025 U | 0.82 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.28 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09c-06 | 0.029 | 0.29 | 0.34 | 0.47 | 0.022 U | 0.36 | 0.018 U | 2.8 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.36 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09c-12 | 0.076 | 0.58 | 0.72 | 0.35 | 0.022 U | 0.28 | 0.018 U | 2.1 | 0.025 U | 0.85 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09d-06 | 0.024 U | 0.1 | 0.12 | 0.21 | 0.022 U | 0.21 | 0.018 U | 1.7 | 0.025 U | 0.85 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09d-12 | 0.03 | 0.17 | 0.24 | 0.19 | 0.022 U | 0.16 | 0.018 U | 1.3 | 0.025 U | 0.52 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09e-06 | 0.024 U | 0.26 | 0.28 | 0.63 | 0.022 U | 0.35 | 0.018 U | 2.8 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.029 | 0.02 U | 0.35 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-09e-12 | 0.048 | 0.52 | 0.43 | 0.16 | 0.022 U | 0.22 | 0.018 U | 1.7 | 0.025 U | 0.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-10a-06-1 | 0.039 | 0.17 | 0.55 | 0.13 | 0.022 U | 0.24 | 0.018 U | 2.1 | 0.025 U | 0.44 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-10a-06-2 | 0.087 | 0.14 | 0.58 | 0.12 | 0.022 U | 0.18 | 0.018 U | 1.5 | 0.025 U | 0.41 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-10a-06-3 | 0.028 | 0.15 | 0.16 | 0.32 | 0.022 U | 0.21 | 0.018 U | 1.8 | 0.025 U | 0.56 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-10a-12 | 0.01 | 0.08 | 0.1 | 0.15 | 0.0088 U | 0.14 | 0.0073 U | 1.2 | 0.0098 U | 0.34 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.14 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-10b-06 | 0.024 U | 0.14 | 0.3 | 1.3 | 0.022 U | 0.34 | 0.018 U | 2.8 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.032 | 0.02 U | 0.34 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-10b-12 | 0.024 U | 0.19 | 0.36 | 1.6 | 0.022 U | 0.23 | 0.018 U | 1.8 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.049 | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-10c-06 | 0.024 U | 0.2 | 0.21 | 0.7 | 0.022 U | 0.37 | 0.018 U | 3.1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.38 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-10c-12 | 0.024 U | 0.22 | 0.26 | 0.98 | 0.022 U | 0.49 | 0.018 U | 4.2 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.51 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-10d-06 | 0.024 U | 0.29 | 0.29 | 0.39 | 0.022 U | 0.51 | 0.018 U | 3.9 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.5 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-10d-12 | 0.028 | 0.42 | 0.31 | 0.28 | 0.022 U | 0.38 | 0.018 U | 3 | 0.025 U | 0.81 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.37 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-11a-12 | 0.16 | 0.25 | 2.5 | 0.085 | 0.022 U | 0.25 | 0.018 U | 1.8 | 0.025 U | 0.26 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-11a-6 | 0.049 | 0.11 | 0.59 | 0.22 | 0.022 U | 0.2 | 0.018 U | 1.6 | 0.025 U | 0.64 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-11b-06 | 0.17 | 0.32 | 2 | 0.5 | 0.022 U | 0.52 | 0.018 U | 4 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.5 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-11b-12 | 0.052 | 0.25 | 0.49 | 0.4 | 0.022 U | 0.39 | 0.018 U | 3.2 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.39 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-11c-12 | 0.024 | 0.19 | 0.45 | 0.046 | 0.022 U | 0.14 | 0.018 U | 1 | 0.025 U | 0.21 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-11c-6 | 0.024 U | 0.16 | 0.3 | 0.22 | 0.022 U | 0.22 | 0.018 U | 1.6 | 0.025 U | 0.74 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-12a-12 | 0.024 U | 0.11 | 0.15 | 0.72 | 0.022 U | 0.22 | 0.018 U | 1.8 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-12a-6 | 0.024 U | 0.14 | 0.13 | 0.21 | 0.022 U | 0.21 | 0.018 U | 1.6 | 0.025 U | 0.77 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-12b-06-1 | 0.094 U | 0.18 | 0.37 | 7.6 | 0.088 U | 1.1 | 0.073 U | 9.3 | 0.098 U | 6.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.14 | 0.079 U | 1 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-12b-06-2 | 0.047 U | 0.18 | 0.31 | 3.4 | 0.044 U | 0.52 | 0.036 U | 4.5 | 0.049 U | 4.2 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.066 | 0.04 U | 0.5 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-12b-06-3 | 0.16 | 0.29 | 1.9 | 2.3 | 0.044 U | 0.56 | 0.036 U | 4.8 | 0.049 U | 4.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.063 | 0.04 U | 0.53 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-12b-12 | 0.19 U | 0.19 U | 0.32 U | 16 | 0.18 U | 1.9 | 0.15 U | 18 | 0.2 U | 11 | 0.24 U | 0.61 U | 0.2 U | 0.23 U | 0.41 U | 0.3 | 0.16 U | 1.8 | 0.44 U | 0.13 U | 0.25 U | 4 U |
| EAR3-RA-12c-12 | 0.024 U | 0.13 | 0.16 | 0.37 | 0.022 U | 0.35 | 0.018 U | 2.5 | 0.025 U | 0.54 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.31 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-12c-6 | 0.024 U | 0.12 | 0.14 | 0.29 | 0.022 U | 0.28 | 0.018 U | 2.2 | 0.025 U | 0.77 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-12d-06 | 0.024 U | 0.1 | 0.15 | 0.33 | 0.022 U | 0.29 | 0.018 U | 2.6 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.3 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |

**Table A-2**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-3**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR3-RA-12d-12 | 0.024 U | 0.16 | 0.23 | 0.67 | 0.022 U | 3 | 0.018 U | 32 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 | 0.028 U | 0.051 U | 0.034 | 0.02 U | 3 | 0.69 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-12e-06 | 0.024 U | 0.12 | 0.14 | 0.22 | 0.022 U | 0.23 | 0.018 U | 1.9 | 0.025 U | 0.86 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-12e-12 | 0.013 | 0.12 | 0.14 | 0.046 | 0.0044 U | 0.13 | 0.0036 U | 1 | 0.0049 U | 0.17 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.11 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-13a-06 | 0.024 U | 0.21 | 0.14 | 0.99 | 0.022 U | 0.45 | 0.018 U | 3.8 | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.029 | 0.02 U | 0.47 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-13a-12 | 0.0094 U | 0.36 | 0.24 | 0.45 | 0.0088 U | 0.3 | 0.0073 U | 2.3 | 0.0098 U | 0.75 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.28 | 0.02 U | 0.0093 | 0.012 U | 0.2 U |
| EAR3-RA-13b-06 | 0.065 | 0.58 | 0.92 | 0.46 | 0.022 U | 0.33 | 0.018 U | 2.8 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 | 0.02 U | 0.36 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-13b-12 | 0.048 | 0.32 | 0.55 | 0.46 | 0.022 U | 0.2 | 0.018 U | 1.7 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-13c-06 | 0.032 | 0.25 | 0.41 | 0.39 | 0.022 U | 0.21 | 0.018 U | 1.8 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-13c-12 | 0.024 U | 0.12 | 0.24 | 0.22 | 0.022 U | 0.13 | 0.018 U | 1.1 | 0.025 U | 0.57 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-13d-06 | 0.025 | 0.37 | 0.56 | 0.16 | 0.022 U | 0.2 | 0.018 U | 1.6 | 0.025 U | 0.74 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-13d-12 | 0.024 U | 0.13 | 0.14 | 0.1 | 0.022 U | 0.14 | 0.018 U | 1.1 | 0.025 U | 0.37 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-14a-06 | 0.024 U | 0.086 | 0.083 | 0.19 | 0.022 U | 0.17 | 0.018 U | 1.4 | 0.025 U | 0.79 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-14a-12 | 0.024 U | 0.16 | 0.16 | 0.86 | 0.022 U | 0.36 | 0.018 U | 2.9 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.36 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-14b-06 | 0.024 U | 0.15 | 0.18 | 0.44 | 0.022 U | 0.35 | 0.018 U | 3 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.37 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-14b-12 | 0.094 U | 0.58 | 0.56 | 2.1 | 0.088 U | 1.4 | 0.073 U | 12 | 0.098 U | 6.1 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.081 | 0.079 U | 1.4 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-14c-06 | 0.031 | 0.44 | 0.51 | 0.16 | 0.022 U | 0.32 | 0.018 U | 2.5 | 0.025 U | 0.74 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.32 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-14c-12 | 0.024 U | 0.28 | 0.21 | 0.12 | 0.022 U | 0.28 | 0.018 U | 2.1 | 0.025 U | 0.45 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15a-06-1 | 0.024 U | 0.024 U | 0.04 U | 0.075 | 0.022 U | 0.13 | 0.018 U | 0.94 | 0.025 U | 0.43 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15a-06-2 | 0.024 U | 0.034 | 0.044 | 0.1 | 0.022 U | 0.2 | 0.018 U | 1.6 | 0.025 U | 0.48 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15a-06-3 | 0.19 | 0.095 U | 4.2 | 0.088 U | 0.088 U | 0.18 | 0.073 U | 2 U | 0.098 U | 0.46 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.18 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-15a-12 | 0.0094 U | 0.01 | 0.016 U | 0.04 | 0.0088 U | 0.11 | 0.0073 U | 0.85 | 0.0098 U | 0.22 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.11 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-15b-06 | 0.024 U | 0.024 U | 0.04 U | 0.17 | 0.022 U | 0.12 | 0.018 U | 0.87 | 0.025 U | 0.62 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15b-12 | 0.024 U | 0.024 U | 0.04 U | 0.3 | 0.022 U | 0.13 | 0.018 U | 0.94 | 0.025 U | 0.86 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15c-06 | 0.024 U | 0.024 U | 0.04 U | 0.25 | 0.022 U | 0.085 | 0.018 U | 0.66 | 0.025 U | 0.96 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.086 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15c-12 | 0.024 U | 0.033 | 0.04 U | 0.36 | 0.022 U | 0.1 | 0.018 U | 0.84 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15d-06 | 0.024 U | 0.052 | 0.074 | 0.49 | 0.022 U | 0.18 | 0.018 U | 1.3 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15d-12 | 0.024 U | 0.07 | 0.083 | 0.62 | 0.022 U | 0.19 | 0.018 U | 1.5 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15e-06 | 0.024 U | 0.061 | 0.059 | 0.43 | 0.022 U | 0.22 | 0.018 U | 1.7 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15e-12 | 0.024 U | 0.024 U | 0.04 U | 0.37 | 0.022 U | 0.16 | 0.018 U | 1.2 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15f-06 | 0.024 U | 0.088 | 0.067 | 0.17 | 0.022 U | 0.19 | 0.018 U | 1.5 | 0.025 U | 0.96 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-15f-12 | 0.024 U | 0.041 | 0.041 | 0.59 | 0.022 U | 0.16 | 0.018 U | 1.2 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-16a-06 | 0.024 U | 0.21 | 0.14 | 0.44 | 0.022 U | 0.41 | 0.018 U | 3.2 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.4 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-16a-12 | 0.026 | 0.21 | 0.36 | 0.28 | 0.011 U | 0.23 | 0.0091 U | 1.8 | 0.012 U | 0.53 | 0.015 U | 0.038 U | 0.012 U | 0.014 U | 0.026 U | 0.01 U | 0.0099 U | 0.23 | 0.03 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR3-RA-16b-06 | 0.05 | 0.08 | 0.072 | 0.26 | 0.022 U | 0.12 | 0.018 U | 0.99 | 0.025 U | 0.69 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-16b-12 | 0.036 | 0.11 | 0.097 | 0.2 | 0.0088 U | 0.098 | 0.0073 U | 0.85 | 0.0098 U | 0.39 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.1 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-16c-06 | 0.0094 U | 0.03 | 0.037 | 0.11 | 0.0088 U | 0.084 | 0.0073 U | 0.8 | 0.0098 U | 0.4 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.084 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-16c-12 | 0.0094 U | 0.069 | 0.093 | 0.27 | 0.0088 U | 0.15 | 0.0073 U | 1.4 | 0.0098 U | 0.62 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.14 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-16d-06 | 0.048 | 0.12 | 0.13 | 0.72 | 0.022 U | 0.27 | 0.018 U | 2.4 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.036 | 0.02 U | 0.29 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-16d-12 | 0.048 | 0.12 | 0.14 | 0.54 | 0.022 U | 0.15 | 0.018 U | 1.4 | 0.025 U | 0.87 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-16e-06 | 0.057 | 0.1 | 0.14 | 0.48 | 0.022 U | 0.24 | 0.018 U | 2 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.026 | 0.02 U | 0.25 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-16e-12 | 0.038 | 0.1 | 0.12 | 0.26 | 0.022 U | 0.14 | 0.018 U | 1.3 | 0.025 U | 0.82 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-17a-06 | 0.024 U | 0.079 | 0.062 | 0.74 | 0.022 U | 0.22 | 0.018 U | 1.7 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-17a-12 | 0.024 U | 0.092 | 0.071 | 0.76 | 0.022 U | 0.31 | 0.018 U | 2.4 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.29 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-17b-06 | 0.024 U | 0.083 | 0.08 | 0.42 | 0.022 U | 0.21 | 0.018 U | 1.8 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-17b-12 | 0.024 U | 0.078 | 0.15 | 0.71 | 0.022 U | 0.22 | 0.018 U | 1.8 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-17c-06 | 0.024 U | 0.22 | 0.29 | 0.41 | 0.022 U | 0.27 | 0.018 U | 2 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.25 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-17c-12 | 0.024 U | 0.36 | 0.35 | 0.21 | 0.022 U | 0.38 | 0.018 U | 2.4 | 0.025 U | 0.62 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.29 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-18a-06-1 | 0.024 U | 0.079 | 0.092 | 1.4 | 0.022 U | 0.25 | 0.018 U | 2.1 | 0.025 U | 2.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.041 | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-18a-06-2 | 0.024 U | 0.07 | 0.091 | 1.4 | 0.022 U | 0.26 | 0.018 U | 2.3 | 0.025 U | 2.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.043 | 0.02 U | 0.31 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-18a-06-3 | 0.047 U | 0.11 | 0.13 | 1.6 | 0.044 U | 0.34 | 0.036 U | 2.8 | 0.049 U | 3.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.051 | 0.04 U | 0.35 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-18a-12 | 0.024 U | 0.11 | 0.11 | 1.8 | 0.022 U | 0.28 | 0.018 U | 2.4 | 0.025 U | 2.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.037 | 0.02 U | 0.29 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-18b-06 | 0.024 U | 0.1 | 0.12 | 0.65 | 0.022 U | 0.25 | 0.018 U | 2.2 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.027 | 0.02 U | 0.28 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-18b-12 | 0.024 U | 0.081 | 0.1 | 0.39 | 0.022 U | 0.19 | 0.018 U | 1.7 | 0.025 U | 0.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-18c-06 | 0.024 U | 0.15 | 0.13 | 0.65 | 0.022 U | 0.22 | 0.018 U | 1.8 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.029 | 0.02 U | 0.24 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-18c-12 | 0.018 | 0.18 | 0.22 | 0.17 | 0.0088 U | 0.13 | 0.0073 U | 1 | 0.0098 U | 0.51 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.12 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-19a-06 | 0.024 U | 0.16 | 0.19 | 0.69 | 0.022 U | 0.46 | 0.018 U | 3.5 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.024 | 0.02 U | 0.46 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-19a-12 | 0.024 U | 0.17 | 0.25 | 0.77 | 0.022 U | 0.39 | 0.018 U | 2.9 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.38 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-19b-06 | 0.024 U | 0.23 | 0.23 | 0.63 | 0.022 U | 0.67 | 0.018 U | 4.9 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.65 | 0.06 U | 0.028 | 0.031 U | 0.5 U |
| EAR3-RA-19b-12 | 0.024 U | 0.24 | 0.25 | 0.67 | 0.022 U | 1.2 | 0.018 U | 8.6 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 1.1 | 0.13 | 0.051 | 0.031 U | 0.5 U |
| EAR3-RA-19c-06 | 0.024 U | 0.16 | 0.19 | 0.4 | 0.022 U | 0.3 | 0.018 U | 2.3 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.28 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-19c-12 | 0.024 U | 0.12 | 0.087 | 0.24 | 0.022 U | 0.12 | 0.018 U | 0.91 | 0.025 U | 0.68 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-19d-06 | 0.047 U | 0.23 | 0.21 | 1.2 | 0.044 U | 0.5 | 0.036 U | 3.9 | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.48 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-19d-12 | 0.094 U | 0.23 | 0.2 | 1.5 | 0.088 U | 0.55 | 0.073 U | 4.3 | 0.098 U | 4.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.53 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-20a-06-1 | 0.094 U | 0.27 | 0.27 | 5.8 | 0.088 U | 0.35 | 0.073 U | 3.2 | 0.098 U | 6.3 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.097 | 0.079 U | 0.41 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-20a-06-2 | 0.094 U | 0.25 | 0.24 | 3.6 | 0.088 U | 0.33 | 0.073 U | 3 | 0.098 U | 4.4 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.4 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-20a-06-3 | 0.094 U | 0.2 | 0.16 U | 3.9 | 0.088 U | 0.28 | 0.073 U | 2.6 | 0.098 U | 4.7 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.34 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-20a-12 | 0.19 U | 0.41 | 0.37 | 11 | 0.18 U | 0.56 | 0.15 U | 5.5 | 0.2 U | 8.3 | 0.24 U | 0.61 U | 0.2 U | 0.23 U | 0.41 U | 0.16 U | 0.16 U | 0.7 | 0.44 U | 0.13 U | 0.25 U | 4 U |
| EAR3-RA-20b-06 | 0.047 U | 0.31 | 0.25 | 2 | 0.044 U | 0.34 | 0.036 U | 3.1 | 0.049 U | 3.3 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.045 | 0.04 U | 0.4 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-20b-12 | 0.047 U | 0.41 | 0.29 | 1.5 | 0.044 U | 0.28 | 0.036 U | 2.6 | 0.049 U | 2.5 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.33 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-21a-06 | 0.024 U | 0.15 | 0.055 | 0.23 | 0.022 U | 0.18 | 0.018 U | 1.4 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-21a-12 | 0.024 U | 0.033 | 0.04 U | 0.22 | 0.022 U | 0.14 | 0.018 U | 1.1 | 0.025 U | 0.74 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-21b-06 | 0.026 | 0.26 | 0.43 | 0.078 | 0.011 U | 0.099 | 0.0091 U | 0.82 | 0.012 U | 0.48 | 0.015 U | 0.038 U | 0.012 U | 0.014 U | 0.026 U | 0.01 U | 0.0099 U | 0.1 | 0.03 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR3-RA-21b-12 | 0.0067 | 0.13 | 0.14 | 0.0082 | 0.0044 U | 0.065 | 0.0036 U | 0.54 | 0.0049 U | 0.096 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.06 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-21c-06 | 0.012 U | 0.083 | 0.037 | 0.041 | 0.011 U | 0.12 | 0.0091 U | 1.1 | 0.012 U | 0.38 | 0.015 U | 0.038 U | 0.012 U | 0.014 U | 0.026 U | 0.01 U | 0.0099 U | 0.14 | 0.03 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR3-RA-21c-12 | 0.0094 U | 0.11 | 0.028 | 0.027 | 0.0088 U | 0.14 | 0.0073 U | 1.1 | 0.0098 U | 0.28 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.15 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-21d-06 | 0.024 U | 0.034 | 0.04 U | 0.092 | 0.022 U | 0.086 | 0.018 U | 0.64 | 0.025 U | 0.78 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.078 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-21d-12 | 0.024 U | 0.025 | 0.04 U | 0.16 | 0.022 U | 0.048 | 0.018 U | 0.5 U | 0.025 U | 0.84 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.038 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-22a-06 | 0.047 U | 0.052 | 0.081 U | 0.62 | 0.044 U | 0.19 | 0.036 U | 1.6 | 0.049 U | 1.8 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.21 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-22a-12 | 0.047 U | 0.064 | 0.082 | 0.84 | 0.044 U | 0.34 | 0.036 U | 2.9 | 0.049 U | 2.1 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.37 | 0.11 U | 0.032 U | 0.062 U | 1 U |

**Table A-2**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-3**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR3-RA-22b-06 | 0.024 U | 0.055 | 0.094 | 0.25 | 0.022 U | 0.19 | 0.018 U | 1.4 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-22b-12 | 0.024 U | 0.053 | 0.082 | 0.26 | 0.022 U | 0.28 | 0.018 U | 1.9 | 0.025 U | 0.86 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.25 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-22c-06 | 0.024 U | 0.054 | 0.06 | 0.67 | 0.022 U | 0.26 | 0.018 U | 2.1 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.26 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-22c-12 | 0.024 U | 0.044 | 0.052 | 0.59 | 0.022 U | 0.24 | 0.018 U | 1.9 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.24 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-22d-06 | 0.024 U | 0.044 | 0.04 U | 0.37 | 0.022 U | 0.21 | 0.018 U | 1.6 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-22d-12 | 0.0094 U | 0.044 | 0.16 | 0.17 | 0.0088 U | 0.3 | 0.0073 U | 1.8 | 0.0098 U | 0.45 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.25 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-23a-06-1 | 0.024 U | 0.095 | 0.19 | 0.16 | 0.022 U | 0.18 | 0.018 U | 1.5 | 0.025 U | 0.52 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-23a-06-2 | 0.024 U | 0.087 | 0.23 | 0.12 | 0.022 U | 0.16 | 0.018 U | 1.3 | 0.025 U | 0.55 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-23a-06-3 | 0.024 U | 0.11 | 0.17 | 0.095 | 0.022 U | 0.17 | 0.018 U | 1.3 | 0.025 U | 0.53 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-23a-12 | 0.0094 U | 0.056 | 0.098 | 0.064 | 0.0088 U | 0.099 | 0.0073 U | 0.78 | 0.0098 U | 0.23 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.095 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-23b-06 | 0.14 | 0.6 | 1.7 | 0.64 | 0.022 U | 0.32 | 0.018 U | 2.5 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.32 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-23b-12 | 0.058 | 0.32 | 0.68 | 0.089 | 0.022 U | 0.18 | 0.018 U | 1.3 | 0.025 U | 0.27 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-23c-06 | 0.081 | 0.39 | 0.93 | 1.3 | 0.022 U | 0.42 | 0.018 U | 3.2 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.044 | 0.02 U | 0.4 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-23c-12 | 0.047 | 0.28 | 0.43 | 1.8 | 0.022 U | 0.33 | 0.018 U | 2.5 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.033 | 0.02 U | 0.3 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-23d-06 | 0.0094 U | 0.081 | 0.093 | 0.16 | 0.0088 U | 0.11 | 0.0073 U | 0.97 | 0.0098 U | 0.43 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.12 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-23d-12 | 0.017 | 0.19 | 0.2 | 0.26 | 0.0088 U | 0.12 | 0.0073 U | 1.1 | 0.0098 U | 0.5 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.14 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-23e-06 | 0.0094 U | 0.13 | 0.19 | 0.2 | 0.0088 U | 0.3 | 0.0073 U | 2.4 | 0.0098 U | 0.5 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.32 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-23e-12 | 0.0047 U | 0.099 | 0.3 | 0.098 | 0.0044 U | 0.19 | 0.0036 U | 1.4 | 0.0049 U | 0.25 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.16 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-24a-12 | 0.032 | 0.35 | 0.24 | 0.92 | 0.022 U | 0.25 | 0.018 U | 1.9 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-24a-6 | 0.024 U | 0.23 | 0.13 | 0.38 | 0.022 U | 0.24 | 0.018 U | 2 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-24b-06 | 0.024 U | 0.11 | 0.1 | 0.32 | 0.022 U | 0.36 | 0.018 U | 3.1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.37 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-24b-12 | 0.024 U | 0.13 | 0.12 | 0.36 | 0.022 U | 0.36 | 0.018 U | 3.1 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.35 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-24c-06 | 0.024 U | 0.15 | 0.12 | 1.6 | 0.022 U | 0.32 | 0.018 U | 2.5 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.32 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-24c-12 | 0.026 | 0.19 | 0.29 | 1.3 | 0.022 U | 0.45 | 0.018 U | 3.6 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.025 | 0.02 U | 0.44 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-24d-06 | 0.024 U | 0.19 | 0.24 | 0.76 | 0.022 U | 0.45 | 0.018 U | 3.9 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.021 | 0.02 U | 0.44 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-24d-12 | 0.024 U | 0.26 | 0.3 | 0.94 | 0.022 U | 0.72 | 0.018 U | 6.5 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.028 | 0.02 U | 0.76 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-24e-06 | 0.024 U | 0.14 | 0.14 | 1.3 | 0.022 U | 0.45 | 0.018 U | 4 | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.029 | 0.02 U | 0.46 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-24e-12 | 0.024 U | 0.14 | 0.14 | 1.2 | 0.022 U | 0.4 | 0.018 U | 3.5 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.025 | 0.02 U | 0.41 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25a-06-1 | 0.024 U | 0.17 | 0.2 | 0.15 | 0.022 U | 0.24 | 0.018 U | 2 | 0.025 U | 0.63 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25a-06-2 | 0.024 U | 0.16 | 0.17 | 0.11 | 0.022 U | 0.18 | 0.018 U | 1.4 | 0.025 U | 0.46 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25a-06-3 | 0.026 | 0.21 | 0.37 | 0.14 | 0.022 U | 0.26 | 0.018 U | 2 | 0.025 U | 0.56 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25a-12 | 0.024 U | 0.22 | 0.2 | 0.12 | 0.022 U | 0.22 | 0.018 U | 1.7 | 0.025 U | 0.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25b-06 | 0.024 U | 0.099 | 0.12 | 0.16 | 0.022 U | 0.24 | 0.018 U | 1.9 | 0.025 U | 0.59 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25b-12 | 0.024 U | 0.14 | 0.12 | 0.25 | 0.022 U | 0.36 | 0.018 U | 2.7 | 0.025 U | 0.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.31 | 0.06 U | 0.022 | 0.031 U | 0.5 U |
| EAR3-RA-25c-06 | 0.024 U | 0.096 | 0.08 | 0.33 | 0.022 U | 0.18 | 0.018 U | 1.3 | 0.025 U | 0.78 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25c-12 | 0.024 U | 0.081 | 0.052 | 0.27 | 0.022 U | 0.12 | 0.018 U | 0.87 | 0.025 U | 0.49 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25d-06 | 0.024 U | 0.2 | 0.14 | 1 | 0.022 U | 0.23 | 0.018 U | 1.7 | 0.025 U | 0.86 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25d-12 | 0.024 U | 0.28 | 0.18 | 0.87 | 0.022 U | 0.35 | 0.018 U | 2.9 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.36 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25e-06 | 0.024 U | 0.15 | 0.17 | 0.42 | 0.022 U | 0.41 | 0.018 U | 3.4 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.45 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-25e-12 | 0.024 U | 0.15 | 0.14 | 0.63 | 0.022 U | 0.86 | 0.018 U | 7.6 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.92 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26a-06 | 0.024 U | 0.053 | 0.047 | 0.15 | 0.022 U | 0.12 | 0.018 U | 0.9 | 0.025 U | 0.44 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26a-12 | 0.0047 U | 0.0062 | 0.0087 | 0.058 | 0.0044 U | 0.11 | 0.0036 U | 0.95 | 0.0049 U | 0.16 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.11 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-26b-06 | 0.024 U | 0.031 | 0.04 U | 0.25 | 0.022 U | 0.14 | 0.018 U | 0.97 | 0.025 U | 0.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26b-12 | 0.024 U | 0.024 U | 0.04 U | 0.23 | 0.022 U | 0.086 | 0.018 U | 0.59 | 0.025 U | 0.61 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.078 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26c-06 | 0.024 U | 0.027 | 0.044 | 0.45 | 0.022 U | 0.16 | 0.018 U | 1.2 | 0.025 U | 0.87 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26c-12 | 0.024 U | 0.057 | 0.041 | 0.22 | 0.022 U | 0.084 | 0.018 U | 0.63 | 0.025 U | 0.56 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.081 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26d-06 | 0.024 U | 0.034 | 0.04 U | 0.59 | 0.022 U | 0.11 | 0.018 U | 0.78 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26d-12 | 0.024 U | 0.071 | 0.04 | 0.73 | 0.022 U | 0.14 | 0.018 U | 0.97 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26e-06 | 0.024 U | 0.054 | 0.045 | 0.4 | 0.022 U | 0.19 | 0.018 U | 1.4 | 0.025 U | 0.93 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26e-12 | 0.024 U | 0.037 | 0.04 U | 0.45 | 0.022 U | 0.19 | 0.018 U | 1.5 | 0.025 U | 0.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26f-06 | 0.024 U | 0.046 | 0.04 U | 0.1 | 0.022 U | 0.14 | 0.018 U | 1.1 | 0.025 U | 0.42 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-26f-12 | 0.024 U | 0.024 U | 0.04 U | 0.13 | 0.022 U | 0.13 | 0.018 U | 1.1 | 0.025 U | 0.38 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-27a-06-1 | 0.024 U | 0.059 | 0.053 | 0.13 | 0.022 U | 0.17 | 0.018 U | 1.5 | 0.025 U | 0.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-27a-06-2 | 0.024 U | 0.052 | 0.063 | 0.17 | 0.022 U | 0.23 | 0.018 U | 2 | 0.025 U | 0.48 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.25 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-27a-06-3 | 0.024 U | 0.035 | 0.053 | 0.14 | 0.022 U | 0.17 | 0.018 U | 1.5 | 0.025 U | 0.43 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-27a-12 | 0.024 U | 0.083 | 0.16 | 0.35 | 0.022 U | 0.24 | 0.018 U | 2 | 0.025 U | 0.57 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.26 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-27b-06 | 0.026 | 0.096 | 0.19 | 0.7 | 0.022 U | 0.38 | 0.018 U | 3 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.022 | 0.02 U | 0.4 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-27b-12 | 0.032 | 0.15 | 0.51 | 2.7 | 0.022 U | 0.82 | 0.018 U | 7.3 | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.034 | 0.02 U | 0.91 | 0.1 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-27c-06 | 0.024 U | 0.051 | 0.093 | 0.49 | 0.022 U | 0.14 | 0.018 U | 1.1 | 0.025 U | 0.58 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-27c-12 | 0.024 U | 0.047 | 0.084 | 0.48 | 0.022 U | 0.14 | 0.018 U | 1.1 | 0.025 U | 0.55 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-28a-06 | 0.024 U | 0.057 | 0.12 | 0.97 | 0.022 U | 0.42 | 0.018 U | 3.5 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.025 | 0.02 U | 0.42 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-28a-12 | 0.024 U | 0.048 | 0.12 | 1.7 | 0.022 U | 0.48 | 0.018 U | 4.2 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.053 | 0.02 U | 0.51 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-28b-06 | 0.024 U | 0.1 | 0.17 | 2.6 | 0.022 U | 0.56 | 0.018 U | 4.7 | 0.025 U | 3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.049 | 0.02 U | 0.58 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-28b-12 | 0.024 U | 0.14 | 0.13 | 1.2 | 0.022 U | 0.4 | 0.018 U | 3.3 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.026 | 0.02 U | 0.4 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-28c-06 | 0.024 U | 0.063 | 0.098 | 0.48 | 0.022 U | 0.3 | 0.018 U | 2.5 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.022 | 0.02 U | 0.31 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-28c-12 | 0.024 U | 0.061 | 0.073 | 0.3 | 0.022 U | 0.2 | 0.018 U | 1.5 | 0.025 U | 0.77 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-28d-06 | 0.024 U | 0.064 | 0.092 | 0.35 | 0.022 U | 0.2 | 0.018 U | 1.7 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-28d-12 | 0.024 U | 0.048 | 0.082 | 0.44 | 0.022 U | 0.17 | 0.018 U | 1.5 | 0.025 U | 0.88 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.027 | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-29a-06 | 0.044 | 0.62 | 0.36 | 0.19 | 0.022 U | 0.28 | 0.018 U | 2.2 | 0.025 U | 0.62 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.28 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-29a-12 | 0.056 | 0.5 | 1 | 0.15 | 0.022 U | 0.59 | 0.018 U | 4.6 | 0.025 U | 0.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.55 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-29b-06 | 0.024 U | 0.054 | 0.094 | 0.79 | 0.022 U | 0.32 | 0.018 U | 2.7 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.027 | 0.02 U | 0.32 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-29b-12 | 0.063 | 0.065 | 1.3 | 1.2 | 0.022 U | 0.36 | 0.018 U | 3 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.045 | 0.02 U | 0.38 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-29c-06 | 0.024 U | 0.034 | 0.059 | 1.7 | 0.022 U | 0.32 | 0.018 U | 2.7 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.042 | 0.02 U | 0.33 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-29c-12 | 0.024 U | 0.024 U | 0.04 U | 1.4 | 0.022 U | 0.24 | 0.018 U | 2.1 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.021 | 0.02 U | 0.25 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-29d-06 | 0.024 U | 0.075 | 0.15 | 0.84 | 0.022 U | 0.39 | 0.018 U | 3.4 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.029 | 0.02 U | 0.39 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-29d-12 | 0.024 U | 0.22 | 0.26 | 1.5 | 0.022 U | 0.5 | 0.018 U | 4.3 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.048 | 0.02 U | 0.49 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-30a-06-1 | 0.024 U | 0.078 | 0.11 | 0.33 | 0.022 U | 0.23 | 0.018 U | 1.9 | 0.025 U | 0.74 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-30a-06-2 | 0.024 U | 0.064 | 0.14 | 0.34 | 0.022 U | 0.25 | 0.018 U | 2.1 | 0.025 U | 0.77 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.25 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-30a-06-3 | 0.024 U | 0.061 | 0.12 | 0.72 | 0.022 U | 0.27 | 0.018 U | 2.3 | 0.025 U | 0.95 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.28 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |

**Table A-2**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-3**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR3-RA-30a-12 | 0.024 U | 0.061 | 0.083 | 0.55 | 0.022 U | 0.15 | 0.018 U | 1.3 | 0.025 U | 0.58 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-30b-06 | 0.024 U | 0.052 | 0.11 | 0.86 | 0.022 U | 0.31 | 0.018 U | 2.7 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 | 0.02 U | 0.35 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-30b-12 | 0.024 U | 0.13 | 0.22 | 1.5 | 0.022 U | 0.27 | 0.018 U | 2.3 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.029 | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-30c-06 | 0.024 U | 0.097 | 0.28 | 1.6 | 0.022 U | 0.35 | 0.018 U | 2.9 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.047 | 0.02 U | 0.36 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-30c-12 | 0.024 U | 0.076 | 0.1 | 2.2 | 0.022 U | 0.38 | 0.018 U | 3.2 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.069 | 0.02 U | 0.39 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-31a-06 | 0.024 U | 0.18 | 0.14 | 0.45 | 0.022 U | 0.28 | 0.018 U | 2.4 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.3 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-31a-12 | 0.024 U | 0.12 | 0.055 | 0.33 | 0.022 U | 0.19 | 0.018 U | 1.6 | 0.025 U | 0.53 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-31b-06 | 0.024 U | 0.14 | 0.2 | 0.2 | 0.022 U | 0.38 | 0.018 U | 3.6 | 0.025 U | 0.61 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.42 | 0.1 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-31b-12 | 0.024 U | 0.22 | 0.11 | 0.18 | 0.022 U | 0.19 | 0.018 U | 1.6 | 0.025 U | 0.37 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-31c-06 | 0.024 U | 0.11 | 0.11 | 0.25 | 0.022 U | 0.22 | 0.018 U | 1.7 | 0.025 U | 0.67 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-31c-12 | 0.024 U | 0.14 | 0.22 | 1.5 | 0.022 U | 0.32 | 0.018 U | 2.6 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.31 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-31d-06 | 0.024 U | 0.095 | 0.24 | 1.6 | 0.022 U | 0.36 | 0.018 U | 3.1 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.024 | 0.02 U | 0.39 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-31d-12 | 0.047 U | 0.13 | 0.13 | 3.1 | 0.044 U | 0.53 | 0.036 U | 4.6 | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.04 U | 0.04 U | 0.57 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-31e-06 | 0.024 U | 0.067 | 0.074 | 0.54 | 0.022 U | 0.25 | 0.018 U | 2.2 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.28 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-31e-12 | 0.024 U | 0.095 | 0.097 | 1.1 | 0.022 U | 0.24 | 0.018 U | 2.1 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32a-06-1 | 0.024 U | 0.066 | 0.05 | 0.43 | 0.022 U | 0.21 | 0.018 U | 1.6 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32a-06-2 | 0.024 U | 0.048 | 0.11 | 0.28 | 0.022 U | 0.15 | 0.018 U | 1.5 | 0.025 U | 0.95 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32a-06-3 | 0.024 U | 0.04 | 0.04 U | 0.19 | 0.022 U | 0.12 | 0.018 U | 1.2 | 0.025 U | 0.68 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32a-12 | 0.025 | 0.095 | 0.1 | 0.48 | 0.022 U | 0.22 | 0.018 U | 1.7 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.024 | 0.02 U | 0.23 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32b-06 | 0.024 U | 0.11 | 0.21 | 2.5 | 0.022 U | 1 | 0.018 U | 9 | 0.025 U | 2.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 1 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32b-12 | 0.024 U | 0.11 | 0.067 | 3.7 | 0.022 U | 1 | 0.018 U | 9 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.94 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32c-06 | 0.15 | 0.087 | 0.049 | 0.87 | 0.022 U | 0.27 | 0.018 U | 2.5 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.33 | 0.07 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32c-12 | 0.15 | 0.13 | 0.053 | 2.2 | 0.022 U | 0.47 | 0.018 U | 4.4 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.052 | 0.02 U | 0.56 | 0.09 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32d-06 | 0.096 | 0.089 | 0.04 U | 0.53 | 0.022 U | 0.24 | 0.018 U | 2.2 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.31 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32d-12 | 0.11 | 0.091 | 0.042 | 0.85 | 0.022 U | 0.29 | 0.018 U | 2.9 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.025 | 0.02 U | 0.39 | 0.13 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32e-06 | 0.024 U | 0.063 | 0.04 U | 1.8 | 0.022 U | 0.31 | 0.018 U | 2.9 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.037 | 0.02 U | 0.39 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-32e-12 | 0.094 U | 0.095 U | 0.16 U | 4.8 | 0.088 U | 0.48 | 0.073 U | 4.1 | 0.098 U | 4 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.15 | 0.079 U | 0.51 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-32F-06 | 0.0094 U | 0.061 | 0.056 | 0.74 | 0.0088 U | 0.15 | 0.0073 U | 1.2 | 0.0098 U | 1.1 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.023 | 0.0079 U | 0.15 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-32F-12 | 0.024 U | 0.062 | 0.055 | 1.2 | 0.022 U | 0.18 | 0.018 U | 1.6 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.058 | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33a-06 | 0.12 | 0.2 | 0.43 | 6.7 | 0.022 U | 0.31 | 0.018 U | 3.5 | 0.025 U | 3.9 | 0.03 U | 0.076 U | 0.024 U | 0.035 | 0.051 U | 0.089 | 0.02 U | 0.42 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33a-12 | 0.035 | 0.065 | 0.1 | 3 | 0.022 U | 0.11 | 0.018 U | 1.2 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.055 | 0.02 U | 0.14 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33b-06 | 0.067 | 0.22 | 0.14 | 0.54 | 0.022 U | 0.22 | 0.018 U | 1.9 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.039 | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33b-12 | 0.089 | 0.063 | 0.1 | 10 | 0.022 U | 0.26 | 0.018 U | 2.9 | 0.025 U | 4.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.36 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33c-06-1 | 0.12 U | 0.12 U | 0.2 U | 5.2 | 0.11 U | 0.52 | 0.091 U | 4.5 | 0.12 U | 6.3 | 0.15 U | 0.38 U | 0.12 U | 0.14 U | 0.26 U | 0.12 | 0.099 U | 0.55 | 0.28 U | 0.079 U | 0.15 U | 2.5 U |
| EAR3-RA-33c-06-2 | 0.12 U | 0.12 U | 0.2 U | 3.9 | 0.11 U | 0.47 | 0.091 U | 4 | 0.12 U | 5.9 | 0.15 U | 0.38 U | 0.12 U | 0.14 U | 0.26 U | 0.1 | 0.099 U | 0.5 | 0.28 U | 0.079 U | 0.15 U | 2.5 U |
| EAR3-RA-33c-06-3 | 0.024 U | 0.033 | 0.062 | 1.6 | 0.022 U | 0.24 | 0.018 U | 2.1 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.061 | 0.02 U | 0.26 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33c-12 | 0.094 U | 0.095 U | 0.16 U | 4.9 | 0.088 U | 0.4 | 0.073 U | 3.5 | 0.098 U | 4.5 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.12 | 0.079 U | 0.43 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-33d-06 | 0.024 U | 0.049 | 0.075 | 1 | 0.022 U | 0.24 | 0.018 U | 2 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.25 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33d-12 | 0.024 U | 0.028 | 0.04 U | 0.87 | 0.022 U | 0.17 | 0.018 U | 1.4 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.027 | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33e-06 | 0.024 U | 0.071 | 0.12 | 1.2 | 0.022 U | 0.31 | 0.018 U | 2.6 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.032 | 0.02 U | 0.32 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33e-12 | 0.024 U | 0.061 | 0.16 | 1.6 | 0.022 U | 0.34 | 0.018 U | 3 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.046 | 0.02 U | 0.36 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33f-06 | 0.024 U | 0.052 | 0.05 | 0.73 | 0.022 U | 0.2 | 0.018 U | 2 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.19 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33f-12 | 0.024 U | 0.031 | 0.04 U | 1.4 | 0.022 U | 0.17 | 0.018 U | 1.5 | 0.025 U | 1.8 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33g-06 | 0.024 U | 0.046 | 0.04 U | 0.25 | 0.022 U | 0.098 | 0.018 U | 0.83 | 0.025 U | 0.95 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-33g-12 | 0.0094 U | 0.036 | 0.031 | 0.12 | 0.0088 U | 0.045 | 0.0073 U | 0.37 | 0.0098 U | 0.48 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.042 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-34a-06 | 0.024 U | 0.034 | 0.04 U | 0.98 | 0.022 U | 0.078 | 0.018 U | 0.67 | 0.025 U | 0.67 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.078 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-34a-12 | 0.0094 U | 0.038 | 0.018 | 0.39 | 0.0088 U | 0.066 | 0.0073 U | 0.57 | 0.0098 U | 0.43 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.066 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-34b-06 | 0.024 U | 0.17 | 0.12 | 0.36 | 0.022 U | 0.15 | 0.018 U | 1.3 | 0.025 U | 0.95 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-34b-12 | 0.042 | 0.16 | 0.12 | 0.31 | 0.022 U | 0.13 | 0.018 U | 1.3 | 0.025 U | 0.81 | 0.03 U | 0.076 U | 0.024 U | 0.028 | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-34c-06 | 0.094 U | 0.18 | 0.41 | 7.3 | 0.088 U | 1.3 | 0.073 U | 11 | 0.098 U | 5.9 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.14 | 0.079 U | 1.3 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-34c-12 | 0.024 U | 0.13 | 0.11 | 1.1 | 0.022 U | 0.31 | 0.018 U | 2.5 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.031 | 0.02 U | 0.31 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-34d-06 | 0.024 U | 0.087 | 0.078 | 1.5 | 0.022 U | 0.46 | 0.018 U | 4.1 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.48 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-34d-12 | 0.024 U | 0.061 | 0.062 | 1.9 | 0.022 U | 0.3 | 0.018 U | 2.5 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.3 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-35a-06-1 | 0.047 U | 0.12 | 0.16 | 2.1 | 0.044 U | 0.69 | 0.036 U | 5.4 | 0.049 U | 3.6 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.053 | 0.04 U | 0.7 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-35a-06-2 | 0.024 U | 0.11 | 0.13 | 1.3 | 0.022 U | 0.42 | 0.018 U | 3.4 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.038 | 0.02 U | 0.43 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-35a-06-3 | 0.047 U | 0.082 | 0.14 | 1.4 | 0.044 U | 0.41 | 0.036 U | 3.3 | 0.049 U | 2.6 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.041 | 0.04 U | 0.42 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-35a-12 | 0.094 U | 0.13 | 0.22 | 3 | 0.088 U | 0.87 | 0.073 U | 6.5 | 0.098 U | 4.6 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.88 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-35b-06 | 0.024 U | 0.12 | 0.14 | 0.87 | 0.022 U | 0.41 | 0.018 U | 3.3 | 0.025 U | 2.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 | 0.02 U | 0.42 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-35b-12 | 0.024 U | 0.13 | 0.18 | 2.5 | 0.022 U | 0.44 | 0.018 U | 3.6 | 0.025 U | 2.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.035 | 0.02 U | 0.45 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-35c-06 | 0.024 U | 0.25 | 0.24 | 0.64 | 0.022 U | 0.44 | 0.018 U | 3.2 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.4 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-35c-12 | 0.025 | 0.24 | 0.56 | 0.91 | 0.022 U | 0.52 | 0.018 U | 4.2 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.53 | 0.06 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-35d-06 | 0.024 U | 0.32 | 0.32 | 0.87 | 0.022 U | 0.4 | 0.018 U | 3.3 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.032 | 0.02 U | 0.41 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-35d-12 | 0.024 U | 0.23 | 0.21 | 1.1 | 0.022 U | 0.35 | 0.018 U | 2.8 | 0.025 U | 2.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.034 | 0.02 U | 0.34 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-36a-06 | 0.024 U | 0.22 | 0.28 | 1.4 | 0.022 U | 0.59 | 0.018 U | 4.6 | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.036 | 0.02 U | 0.58 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-36a-12 | 0.024 | 0.2 | 0.34 | 1.4 | 0.022 U | 0.55 | 0.018 U | 4.3 | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.04 | 0.02 U | 0.54 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-36b-06 | 0.024 U | 0.18 | 0.23 | 1.3 | 0.022 U | 0.5 | 0.018 U | 3.9 | 0.025 U | 2.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.039 | 0.02 U | 0.45 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-36b-12 | 0.094 U | 0.24 | 0.22 | 4.1 | 0.088 U | 0.89 | 0.073 U | 6.8 | 0.098 U | 4.7 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.81 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-36c-06 | 0.018 | 0.27 | 0.14 | 0.15 | 0.0044 U | 0.14 | 0.0036 U | 1.2 | 0.0049 U | 0.55 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.15 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-36c-12 | 0.024 U | 0.28 | 0.14 | 0.14 | 0.022 U | 0.14 | 0.018 U | 1.2 | 0.025 U | 0.55 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-36d-06 | 0.026 | 0.2 | 0.31 | 0.29 | 0.022 U | 0.2 | 0.018 U | 1.6 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-36d-12 | 0.018 | 0.28 | 0.14 | 0.083 | 0.0088 U | 0.16 | 0.0073 U | 1.4 | 0.0098 U | 0.41 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.17 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-36e-06 | 0.012 | 0.11 | 0.21 | 0.062 | 0.0044 U | 0.23 | 0.0036 U | 1.9 | 0.0049 U | 0.19 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.26 | 0.02 | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-36e-12 | 0.086 | 0.19 | 1.3 | 0.048 | 0.022 U | 0.48 | 0.018 U | 3.5 | 0.025 U | 0.18 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.46 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-36f-06 | 0.0061 | 0.15 | 0.14 | 0.044 | 0.0044 U | 0.16 | 0.0036 U | 1.3 | 0.0049 U | 0.17 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.18 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-36f-12 | 0.0051 | 0.088 | 0.087 | 0.011 | 0.0044 U | 0.076 | 0.0036 U | 0.7 | 0.0049 U | 0.057 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.086 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-37a-06-1 | 0.0094 U | 0.064 | 0.033 | 0.095 | 0.0088 U | 0.12 | 0.0073 U | 1.2 | 0.0098 U | 0.3 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.14 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-37a-06-2 | 0.0047 U | 0.067 | 0.048 | 0.033 | 0.0044 U | 0.37 | 0.0036 U | 3.1 | 0.0049 U | 0.24 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.41 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-37a-06-3 | 0.0047 U | 0.051 | 0.05 | 0.049 | 0.0044 U | 0.31 | 0.0036 U | 2.6 | 0.0049 U | 0.3 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.33 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-37a-12 | 0.0047 U | 0.053 | 0.082 | 0.16 | 0.0044 U | 0.2 | 0.0036 U | 1.9 | 0.0049 U | 0.42 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.24 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |

**Table A-2**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-3**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR3-RA-37b-06 | 0.0047 U | 0.099 | 0.053 | 0.061 | 0.0044 U | 0.14 | 0.0036 U | 1.3 | 0.0049 U | 0.31 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.13 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-37b-12 | 0.0094 U | 0.091 | 0.076 | 0.021 | 0.0088 U | 0.28 | 0.0073 U | 2.7 | 0.0098 U | 0.16 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.35 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-37c-06 | 0.0047 U | 0.06 | 0.088 | 0.04 | 0.0044 U | 0.15 | 0.0036 U | 1.8 | 0.0049 U | 0.27 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.19 | 0.01 U | 0.035 | 0.0062 U | 0.1 U |
| EAR3-RA-37c-12 | 0.012 U | 0.031 | 0.02 U | 0.1 | 0.011 U | 0.25 | 0.0091 U | 2.3 | 0.012 U | 0.18 | 0.015 U | 0.038 U | 0.012 U | 0.014 U | 0.026 U | 0.01 U | 0.0099 U | 0.32 | 0.03 U | 0.0079 U | 0.015 U | 0.25 U |
| EAR3-RA-37d-06 | 0.0094 U | 0.016 | 0.016 U | 0.12 | 0.0088 U | 0.094 | 0.0073 U | 0.86 | 0.0098 U | 0.47 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.11 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-37d-12 | 0.0047 U | 0.017 | 0.011 | 0.066 | 0.0044 U | 0.13 | 0.0036 U | 1.2 | 0.0049 U | 0.35 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.16 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-38a-06 | 0.024 U | 0.064 | 0.11 | 0.58 | 0.022 U | 0.18 | 0.018 U | 1.5 | 0.025 U | 1.4 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-38a-12 | 0.024 U | 0.079 | 0.14 | 0.72 | 0.022 U | 0.2 | 0.018 U | 1.7 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-38b-06 | 0.024 U | 0.081 | 0.64 | 0.37 | 0.022 U | 0.19 | 0.018 U | 1.5 | 0.025 U | 0.85 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-38b-12 | 0.024 U | 0.12 | 0.31 | 0.2 | 0.022 U | 0.2 | 0.018 U | 1.7 | 0.025 U | 0.59 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-38c-06 | 0.024 U | 0.2 | 0.2 | 1 | 0.022 U | 0.38 | 0.018 U | 2.8 | 0.025 U | 1.5 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.35 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-38c-12 | 0.027 | 0.17 | 0.17 | 0.49 | 0.022 U | 0.22 | 0.018 U | 1.6 | 0.025 U | 0.88 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.21 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-38d-06 | 0.024 U | 0.11 | 0.13 | 1 | 0.022 U | 0.32 | 0.018 U | 2.8 | 0.025 U | 1.9 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.41 | 0.08 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-38d-12 | 0.00047 U | 0.0024 | 0.0029 | 0.012 | 0.00044 U | 0.0055 | 0.0004 U | 0.04 | 0.00049 U | 0.02 | 6E-04 U | 0.0015 U | 0.0005 U | 6E-04 U | 0.001 U | 4E-04 U | 0.0004 U | 0.0055 | 0 U | 0.00032 U | 0.00062 U | 0.01 U |
| EAR3-RA-39a-06 | 0.024 U | 0.1 | 0.14 | 0.2 | 0.022 U | 0.25 | 0.018 U | 2.1 | 0.025 U | 0.69 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-39a-12 | 0.024 U | 0.076 | 0.1 | 0.096 | 0.022 U | 0.14 | 0.018 U | 1.1 | 0.025 U | 0.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-39b-06 | 0.13 | 0.14 | 2.9 | 0.23 | 0.022 U | 0.42 | 0.018 U | 3.8 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.43 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-39b-12 | 0.024 U | 0.16 | 0.17 | 0.65 | 0.022 U | 0.35 | 0.018 U | 3.3 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.37 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-39c-06 | 0.024 U | 0.092 | 0.1 | 0.2 | 0.022 U | 0.17 | 0.018 U | 1.5 | 0.025 U | 0.72 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-39c-12 | 0.024 U | 0.17 | 0.18 | 0.16 | 0.022 U | 0.16 | 0.018 U | 1.4 | 0.025 U | 0.55 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40a-06-1 | 0.024 U | 0.12 | 0.12 | 0.54 | 0.022 U | 0.54 | 0.018 U | 4.5 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.59 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40a-06-2 | 0.024 U | 0.13 | 0.16 | 0.65 | 0.022 U | 0.57 | 0.018 U | 5 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.6 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40a-06-3 | 0.024 U | 0.14 | 0.14 | 0.67 | 0.022 U | 0.65 | 0.018 U | 5.5 | 0.025 U | 2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.69 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40a-12 | 0.024 U | 0.049 | 0.048 | 0.33 | 0.022 U | 0.38 | 0.018 U | 3.4 | 0.025 U | 0.84 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.41 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40b-06 | 0.024 U | 0.16 | 0.15 | 0.66 | 0.022 U | 0.9 | 0.018 U | 7.7 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.94 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40b-12 | 0.024 U | 0.095 | 0.09 | 0.66 | 0.022 U | 0.83 | 0.018 U | 7.5 | 0.025 U | 1.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.86 | 0.08 | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40c-06 | 0.024 U | 0.058 | 0.06 | 0.42 | 0.022 U | 0.13 | 0.018 U | 1.1 | 0.025 U | 0.71 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40c-12 | 0.024 U | 0.077 | 0.057 | 0.34 | 0.022 U | 0.1 | 0.018 U | 0.85 | 0.025 U | 0.53 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40d-06 | 0.024 U | 0.1 | 0.16 | 1.7 | 0.022 U | 0.39 | 0.018 U | 3.1 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.028 | 0.02 U | 0.38 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40d-12 | 0.094 U | 0.095 U | 0.16 U | 4.5 | 0.088 U | 0.47 | 0.073 U | 4 | 0.098 U | 3.2 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.48 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-40e-06 | 0.094 U | 0.095 U | 0.16 U | 3.2 | 0.088 U | 0.45 | 0.073 U | 3.7 | 0.098 U | 4.4 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.49 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-40e-12 | 0.094 U | 0.1 | 0.16 U | 3.8 | 0.088 U | 0.34 | 0.073 U | 3 | 0.098 U | 4.4 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.38 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-40f-06 | 0.024 U | 0.089 | 0.15 | 0.29 | 0.022 U | 0.29 | 0.018 U | 2.2 | 0.025 U | 0.59 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.29 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40f-12 | 0.024 U | 0.076 | 0.08 | 0.36 | 0.022 U | 0.31 | 0.018 U | 2.2 | 0.025 U | 0.61 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.28 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40g-06 | 0.024 U | 0.066 | 0.062 | 1.4 | 0.022 U | 0.3 | 0.018 U | 2.4 | 0.025 U | 2.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.031 | 0.02 U | 0.29 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40g-12 | 0.094 U | 0.14 | 0.16 U | 6.7 | 0.088 U | 0.43 | 0.073 U | 3.1 | 0.098 U | 2.9 | 0.12 U | 0.31 U | 0.098 U | 0.11 U | 0.21 U | 0.08 U | 0.079 U | 0.42 | 0.22 U | 0.063 U | 0.12 U | 2 U |
| EAR3-RA-40h-06 | 0.024 U | 0.024 U | 0.04 U | 0.12 | 0.022 U | 0.049 | 0.018 U | 0.5 U | 0.025 U | 0.54 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.05 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40h-12 | 0.024 U | 0.024 U | 0.04 U | 0.23 | 0.022 U | 0.1 | 0.018 U | 0.88 | 0.025 U | 0.96 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40i-06 | 0.024 U | 0.024 U | 0.04 U | 0.055 | 0.022 U | 0.11 | 0.018 U | 0.99 | 0.025 U | 0.27 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-40i-12 | 0.0094 U | 0.0095 U | 0.016 U | 0.062 | 0.0088 U | 0.083 | 0.0073 U | 0.74 | 0.0098 U | 0.23 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.077 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-40j-06 | 0.014 | 0.093 | 0.26 | 0.091 | 0.0088 U | 0.1 | 0.0073 U | 0.82 | 0.0098 U | 0.33 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.091 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-40j-12 | 0.0047 U | 0.047 | 0.038 | 0.0099 | 0.0044 U | 0.047 | 0.0036 U | 0.35 | 0.0049 U | 0.067 | 0.006 U | 0.015 U | 0.0049 U | 0.006 U | 0.01 U | 0.004 U | 0.004 U | 0.038 | 0.01 U | 0.0032 U | 0.0062 U | 0.1 U |
| EAR3-RA-41a-06-1 | 0.026 | 0.15 | 0.34 | 0.1 | 0.022 U | 0.13 | 0.018 U | 0.98 | 0.025 U | 0.37 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41a-06-2 | 0.032 | 0.17 | 0.31 | 0.15 | 0.022 U | 0.15 | 0.018 U | 1.2 | 0.025 U | 0.48 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.14 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41a-06-3 | 0.032 | 0.15 | 0.22 | 0.13 | 0.022 U | 0.14 | 0.018 U | 1.1 | 0.025 U | 0.43 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41a-12 | 0.05 | 0.27 | 0.41 | 0.045 | 0.022 U | 0.087 | 0.018 U | 0.72 | 0.025 U | 0.13 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.078 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41b-06 | 0.024 U | 0.17 | 0.14 | 0.082 | 0.022 U | 0.11 | 0.018 U | 0.89 | 0.025 U | 0.38 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41b-12 | 0.011 | 0.31 | 0.22 | 0.026 | 0.0088 U | 0.072 | 0.0073 U | 0.59 | 0.0098 U | 0.12 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.066 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-41c-06 | 0.024 U | 0.14 | 0.07 | 0.13 | 0.022 U | 0.13 | 0.018 U | 1 | 0.025 U | 0.47 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41c-12 | 0.024 U | 0.2 | 0.12 | 0.08 | 0.022 U | 0.17 | 0.018 U | 1.3 | 0.025 U | 0.31 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.15 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41d-06 | 0.033 | 0.12 | 0.18 | 0.18 | 0.022 U | 0.18 | 0.018 U | 1.5 | 0.025 U | 0.57 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.17 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41d-12 | 0.038 | 0.21 | 0.25 | 0.21 | 0.022 U | 0.25 | 0.018 U | 1.8 | 0.025 U | 0.67 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41e-06 | 0.024 U | 0.063 | 0.069 | 0.15 | 0.022 U | 0.12 | 0.018 U | 0.94 | 0.025 U | 0.46 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41e-12 | 0.024 U | 0.12 | 0.18 | 0.48 | 0.022 U | 0.17 | 0.018 U | 1.2 | 0.025 U | 0.54 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41f-06 | 0.024 U | 0.075 | 0.077 | 0.21 | 0.022 U | 0.16 | 0.018 U | 1.2 | 0.025 U | 0.61 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.16 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-41f-12 | 0.024 U | 0.1 | 0.077 | 0.12 | 0.022 U | 0.13 | 0.018 U | 0.99 | 0.025 U | 0.37 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42a-06-1 | 0.0094 U | 0.41 | 0.11 | 0.083 | 0.0088 U | 0.3 | 0.0073 U | 2.3 | 0.0098 U | 0.35 | 0.012 U | 0.031 U | 0.0098 U | 0.011 | 0.021 U | 0.008 U | 0.0079 U | 0.23 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-42a-06-2 | 0.0094 U | 0.52 | 0.22 | 0.12 | 0.0088 U | 0.69 | 0.0073 U | 4.9 | 0.0098 U | 0.29 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.55 | 0.02 | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-42a-06-3 | 0.024 U | 0.68 | 0.2 | 0.048 | 0.022 U | 0.42 | 0.018 U | 3.1 | 0.025 U | 0.22 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.3 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42a-12 | 0.0094 U | 0.58 | 0.14 | 0.037 | 0.0088 U | 0.93 | 0.0073 U | 6.2 | 0.0098 U | 0.089 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.63 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-42b-06 | 0.035 | 0.56 | 0.37 | 0.075 | 0.0088 U | 0.58 | 0.0073 U | 4 | 0.0098 U | 0.26 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.42 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-42b-12 | 0.11 | 0.83 | 0.98 | 0.029 | 0.022 U | 0.58 | 0.018 U | 3.7 | 0.025 U | 0.11 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.35 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42c-06 | 0.06 | 0.3 | 0.27 | 0.18 | 0.0088 U | 0.2 | 0.0073 U | 1.6 | 0.0098 U | 0.57 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.19 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-42c-12 | 0.062 | 0.33 | 0.34 | 0.12 | 0.0088 U | 0.27 | 0.0073 U | 1.9 | 0.0098 U | 0.33 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.21 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-42d-06 | 0.033 | 0.23 | 0.15 | 0.17 | 0.022 U | 0.12 | 0.018 U | 1 | 0.025 U | 0.65 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.12 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42d-12 | 0.024 | 0.13 | 0.074 | 0.09 | 0.0088 U | 0.058 | 0.0073 U | 0.62 | 0.0098 U | 0.33 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.062 | 0.02 U | 0.011 | 0.012 U | 0.2 U |
| EAR3-RA-42e-06 | 0.0094 U | 0.082 | 0.084 | 0.063 | 0.0088 U | 0.089 | 0.0073 U | 0.7 | 0.0098 U | 0.32 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.081 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-42e-12 | 0.0094 U | 0.33 | 0.17 | 0.029 | 0.0088 U | 0.14 | 0.0073 U | 1 | 0.0098 U | 0.13 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.12 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-42f-06 | 0.046 | 0.083 | 0.065 | 0.27 | 0.022 U | 0.12 | 0.018 U | 0.97 | 0.025 U | 0.71 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.11 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42f-12 | 0.0094 U | 0.033 | 0.042 | 0.11 | 0.0088 U | 0.06 | 0.0073 U | 0.51 | 0.0098 U | 0.35 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.0079 U | 0.059 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| EAR3-RA-42g-06 | 0.036 | 0.074 | 0.063 | 0.2 | 0.022 U | 0.13 | 0.018 U | 1.1 | 0.025 U | 0.63 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.13 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42g-12 | 0.0048 | 0.19 | 0.13 | 0.024 | 0.0018 U | 0.19 | 0.0015 U | 1.3 | 0.002 U | 0.092 | 0.002 U | 0.0061 U | 0.002 U | 0.002 U | 0.0041 U | 0.002 U | 0.0016 U | 0.14 | 0.01 | 0.0013 U | 0.0025 U | 0.04 U |
| EAR3-RA-42h-06 | 0.031 | 0.076 | 0.093 | 0.61 | 0.022 U | 0.18 | 0.018 U | 1.7 | 0.025 U | 1.6 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.027 | 0.02 U | 0.2 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42h-12 | 0.029 | 0.067 | 0.042 | 0.72 | 0.022 U | 0.15 | 0.018 U | 1.3 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.032 | 0.02 U | 0.15 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42i-06 | 0.047 U | 0.075 | 0.093 | 3.5 | 0.044 U | 0.33 | 0.036 U | 2.7 | 0.049 U | 3.4 | 0.059 U | 0.15 U | 0.049 U | 0.057 U | 0.1 U | 0.12 | 0.04 U | 0.35 | 0.11 U | 0.032 U | 0.062 U | 1 U |
| EAR3-RA-42i-12 | 0.024 U | 0.045 | 0.04 U | 0.75 | 0.022 U | 0.23 | 0.018 U | 2 | 0.025 U | 1.7 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.03 | 0.02 U | 0.24 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |

**Table A-2**
**Summary of Confirmation Sample Results (mg/kg) for Earhart I-3**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Chlordane | delta-BHC | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAR3-RA-42j-06 | 0.024 U | 0.066 | 0.098 | 0.34 | 0.022 U | 0.18 | 0.018 U | 1.5 | 0.025 U | 1.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.024 | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42j-12 | 0.024 U | 0.083 | 0.13 | 0.36 | 0.022 U | 0.18 | 0.018 U | 1.5 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42k-06 | 0.024 U | 0.071 | 0.11 | 0.95 | 0.022 U | 0.27 | 0.018 U | 2.3 | 0.025 U | 2.3 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.057 | 0.02 U | 0.27 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42k-12 | 0.024 U | 0.069 | 0.088 | 0.54 | 0.022 U | 0.15 | 0.018 U | 1.3 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.023 | 0.02 U | 0.15 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42L-06 | 0.024 U | 0.025 | 0.04 U | 0.24 | 0.022 U | 0.096 | 0.018 U | 0.83 | 0.025 U | 0.77 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.1 | 0.06 U | 0.016 U | 0.031 U | 0.5 U |
| EAR3-RA-42L-12 | 0.0094 U | 0.033 | 0.054 | 0.29 | 0.0088 U | 0.13 | 0.0073 U | 1.1 | 0.0098 U | 0.98 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.019 | 0.0079 U | 0.14 | 0.02 U | 0.0063 U | 0.012 U | 0.2 U |
| Total | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 | 398 |
| Detected | 92 | 376 | 350 | 397 | 0 | 398 | 0 | 394 | 0 | 398 | 0 | 0 | 1 | 4 | 0 | 107 | 0 | 398 | 15 | 9 | 0 | 0 |
| Non-Detects | 306 | 22 | 48 | 1 | 398 | 0 | 398 | 4 | 398 | 0 | 398 | 398 | 397 | 394 | 398 | 291 | 398 | 0 | 383 | 389 | 398 | 398 |

**Notes:**
"U" = not detected at concentration shown

**Table A-3**
**Summary of Confirmation Samle Results (mg/kg) for Onizuka II-1**

| Sample ID | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aldrin | alpha-BHC | alpha-Chlordane | beta-BHC | Technical Chlordane | delta-BHC | Dieldrin | Endo-sulfan I | Endo-sulfan II | Endo-sulfan sulfate | Endrin | Endrin aldehyde | Endrin Ketone | gamma-BHC | gamma-Chlordane | Hepta-chlor | Hepta-chlor epoxide | Meth-oxychlor | Tox-aphene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ONI-RA-1a-06-1 | 0.01 J | 0.053 | 0.054 | 0.03 J | 0.0088 U | 0.11 | 0.007 U | 0.95 | 0.01 U | 0.21 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.008 U | 0.11 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| ONI-RA-1a-06-2 | 0.005 U | 0.032 | 0.036 | 0.041 | 0.0044 U | 0.15 | 0.004 U | 1.4 | 0.005 U | 0.21 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.17 | 0.012 J | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-1a-06-3 | 0.005 U | 0.032 | 0.04 | 0.034 | 0.0044 U | 0.099 | 0.004 U | 0.9 | 0.005 U | 0.18 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.11 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-1a-12 | 0.005 U | 0.017 J | 0.03 | 0.034 | 0.0044 U | 0.083 | 0.004 U | 0.77 | 0.005 U | 0.14 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.088 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-1b-06 | 0.014 J | 0.06 | 0.059 | 0.053 | 0.0044 U | 0.17 | 0.004 U | 1.5 | 0.005 U | 0.21 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.18 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-1b-12 | 0.023 | 0.044 | 0.061 | 0.027 | 0.0044 U | 0.11 | 0.004 U | 0.99 | 0.005 U | 0.13 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.11 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-1c-06 | 0.024 U | 0.026 J | 0.041 J | 0.075 J | 0.022 U | 0.46 | 0.018 U | 4.1 | 0.025 U | 0.31 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.5 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-1c-12 | 0.024 U | 0.024 U | 0.04 U | 0.035 J | 0.022 U | 0.6 | 0.018 U | 5.4 | 0.025 U | 0.16 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.67 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-2a-06 | 0.006 J | 0.089 | 0.099 | 0.041 | 0.0044 U | 0.3 | 0.004 U | 2.8 | 0.005 U | 0.17 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.34 | 0.014 J | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-2a-12 | 0.005 U | 0.055 | 0.062 | 0.0089 J | 0.0044 U | 0.34 | 0.004 U | 3.2 | 0.005 U | 0.07 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.36 | 0.012 J | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-2b-06 | 0.024 U | 0.024 U | 0.046 J | 0.13 | 0.022 U | 0.52 | 0.018 U | 4.7 | 0.025 U | 0.45 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.55 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-2b-12 | 0.024 U | 0.024 U | 0.064 J | 0.022 U | 0.022 U | 0.59 | 0.018 U | 5.5 | 0.025 U | 0.067 J | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.73 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-2c-06 | 0.009 U | 0.06 | 0.08 | 0.067 | 0.0088 U | 0.45 | 0.007 U | 4.3 | 0.01 U | 0.29 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.008 U | 0.55 | 0.023 J | 0.0063 U | 0.012 U | 0.2 U |
| ONI-RA-2c-12 | 0.009 U | 0.045 | 0.066 | 0.034 J | 0.0088 U | 0.39 | 0.007 U | 3.9 | 0.01 U | 0.16 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.008 U | 0.51 | 0.032 J | 0.0063 U | 0.012 U | 0.2 U |
| ONI-RA-2d-06 | 0.024 U | 0.024 U | 0.049 J | 0.12 | 0.022 U | 0.39 | 0.018 U | 3.5 | 0.025 U | 0.34 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.43 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-2d-12 | 0.024 U | 0.024 U | 0.04 U | 0.034 J | 0.022 U | 0.36 | 0.018 U | 3.4 | 0.025 U | 0.1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.44 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-2e-06 | 0.009 U | 0.051 | 0.056 | 0.019 J | 0.0088 U | 0.25 | 0.007 U | 2.3 | 0.01 U | 0.14 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.008 U | 0.27 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| ONI-RA-2e-12 | 0.005 U | 0.063 | 0.051 | 0.011 J | 0.0044 U | 0.088 | 0.004 U | 0.8 | 0.005 U | 0.076 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.092 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-2f-06 | 0.005 U | 0.033 | 0.034 | 0.044 | 0.0044 U | 0.18 | 0.004 U | 1.7 | 0.005 U | 0.19 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.21 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-2f-12 | 0.005 U | 0.022 | 0.023 | 0.028 | 0.0044 U | 0.1 | 0.004 U | 1 | 0.005 U | 0.066 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.12 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-2g-06 | 0.024 U | 0.068 J | 0.08 J | 0.32 | 0.022 U | 0.4 | 0.018 U | 3.7 | 0.025 U | 0.86 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.44 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-2g-12 | 0.009 U | 0.077 | 0.09 | 0.083 | 0.0088 U | 0.3 | 0.007 U | 2.6 | 0.01 U | 0.25 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.008 U | 0.32 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| ONI-RA-2h-06 | 0.009 U | 0.093 | 0.054 | 0.03 J | 0.0088 U | 0.27 | 0.007 U | 2.4 | 0.01 U | 0.16 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.008 U | 0.29 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| ONI-RA-2h-12 | 0.024 U | 0.15 | 0.063 J | 0.3 | 0.022 U | 0.31 | 0.018 U | 2.8 | 0.025 U | 0.54 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.34 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-3a-06 | 0.005 U | 0.021 | 0.033 | 0.076 | 0.0044 U | 0.12 | 0.004 U | 1.1 | 0.005 U | 0.24 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.15 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-3a-12 | 0.005 U | 0.038 | 0.039 | 0.056 | 0.0044 U | 0.25 | 0.004 U | 2.4 | 0.005 U | 0.14 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.32 | 0.017 J | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-3b-06 | 0.011 J | 0.064 | 0.08 | 0.099 | 0.0088 U | 0.15 | 0.007 U | 1.3 | 0.01 U | 0.36 | 0.012 U | 0.031 U | 0.0098 U | 0.011 U | 0.021 U | 0.008 U | 0.008 U | 0.18 | 0.022 U | 0.0063 U | 0.012 U | 0.2 U |
| ONI-RA-3b-12 | 0.01 J | 0.064 | 0.061 | 0.12 | 0.0044 U | 0.12 | 0.004 U | 1.1 | 0.005 U | 0.35 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.16 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-3c-06 | 0.008 J | 0.068 | 0.095 | 0.028 | 0.0044 U | 0.12 | 0.004 U | 1.2 | 0.005 U | 0.11 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.16 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-3c-12 | 0.017 J | 0.072 | 0.11 | 0.029 | 0.0044 U | 0.11 | 0.004 U | 0.96 | 0.005 U | 0.087 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.12 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-3d-06 | 0.005 U | 0.022 | 0.03 | 0.027 | 0.0044 U | 0.18 | 0.004 U | 1.7 | 0.005 U | 0.082 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.2 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-3d-12 | 0.005 U | 0.036 | 0.055 | 0.095 | 0.0044 U | 0.29 | 0.004 U | 2.7 | 0.005 U | 0.21 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.33 | 0.016 J | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-4a-06-1 | 0.005 U | 0.017 J | 0.029 | 0.042 | 0.0044 U | 0.13 | 0.004 U | 1.1 | 0.005 U | 0.14 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.13 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-4a-06-2 | 0.005 U | 0.013 J | 0.029 | 0.043 | 0.0044 U | 0.13 | 0.004 U | 1.2 | 0.005 U | 0.13 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.14 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-4a-06-3 | 0.005 U | 0.022 | 0.03 | 0.033 | 0.0044 U | 0.14 | 0.004 U | 1.3 | 0.005 U | 0.13 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.15 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-4a-12 | 0.005 U | 0.005 U | 0.033 | 0.015 J | 0.0044 U | 0.086 | 0.004 U | 0.88 | 0.005 U | 0.062 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.11 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-4b-06 | 0.006 J | 0.04 | 0.064 | 0.075 | 0.0044 U | 0.15 | 0.004 U | 1.4 | 0.005 U | 0.21 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.16 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-4b-12 | 0.005 U | 0.015 J | 0.041 | 0.087 | 0.0044 U | 0.17 | 0.004 U | 1.7 | 0.005 U | 0.2 | 0.006 U | 0.015 U | 0.0049 U | 0.0057 U | 0.01 U | 0.004 U | 0.004 U | 0.21 | 0.011 U | 0.0032 U | 0.0062 U | 0.1 U |
| ONI-RA-4c-06 | 0.024 U | 0.024 U | 0.04 U | 0.35 | 0.022 U | 0.21 | 0.018 U | 1.9 | 0.025 U | 0.77 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.23 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-4c-12 | 0.024 U | 0.024 U | 0.04 U | 0.27 | 0.022 U | 0.17 | 0.018 U | 1.6 | 0.025 U | 0.54 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.18 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-5a-06 | 0.024 U | 0.079 J | 0.063 J | 0.26 | 0.022 U | 0.23 | 0.018 U | 1.9 | 0.025 U | 0.79 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-5a-12 | 0.024 U | 0.09 J | 0.076 J | 0.54 | 0.022 U | 0.24 | 0.018 U | 2 | 0.025 U | 0.98 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.25 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-5b-06 | 0.024 U | 0.051 J | 0.048 J | 0.23 | 0.022 U | 0.21 | 0.018 U | 1.7 | 0.025 U | 0.73 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.22 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-5b-12 | 0.024 U | 0.066 J | 0.064 J | 0.3 | 0.022 U | 0.23 | 0.018 U | 1.9 | 0.025 U | 0.82 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-5c-06 | 0.024 U | 0.051 J | 0.04 | 0.32 | 0.022 U | 0.21 | 0.018 U | 1.9 | 0.025 U | 1 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.24 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |
| ONI-RA-5c-12 | 0.057 J | 0.036 J | 0.044 J | 0.42 | 0.022 U | 0.23 | 0.018 U | 2 | 0.025 U | 1.2 | 0.03 U | 0.076 U | 0.024 U | 0.028 U | 0.051 U | 0.02 U | 0.02 U | 0.26 | 0.055 U | 0.016 U | 0.031 U | 0.5 U |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| Detected | 1 | 26 | 31 | 35 | 0 | 46 | 0 | 46 | 0 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 46 | 0 | 0 | 0 | 0 |
| "J" qualifier | 9 | 12 | 11 | 10 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 |
| Non-Detects | 36 | 8 | 4 | 1 | 46 | 0 | 46 | 0 | 46 | 0 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 0 | 39 | 46 | 46 | 46 |

**Notes:**
"U" = not detected at concentration shown
"J" = detected between practical quantitation limit and method detection limit

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| EAR2-DU-01a | EAR2-RA-01a-06 | 0.13 | | | 0.038 | | 0.038 | | 0.28 | | 0.072 | |
| | EAR2-RA-01a-12 | 0.19 | | | 0.055 | | 0.06 | | 0.19 | | 0.10 | |
| EAR2-DU-01b | EAR2-RA-01b-06 | 0.24 | | | 0.046 | | 0.093 | | 0.24 | | 0.073 | |
| | EAR2-RA-01b-12 | 0.19 | | | 0.044 | | 0.07 | | 0.19 | | 0.076 | |
| EAR2-DU-02a | EAR2-RA-02a-06 | 0.11 | | | 0.025 | | 0.042 | | 0.11 | | 0.041 | |
| | EAR2-RA-02a-12 | 0.14 | | | 0.037 | | 0.05 | | 0.14 | | 0.065 | |
| EAR2-DU-02b | EAR2-RA-02b-06 | 0.052 | | | 0.012 | | 0.019 | | 0.05 | | 0.020 | |
| | EAR2-RA-02b-12 | 0.063 | | | 0.019 | | 0.020 | | 0.063 | | 0.033 | |
| EAR2-DU-02c | EAR2-RA-02c-06 | 0.29 | | | 0.054 | | 0.11 | | 0.30 | | 0.085 | |
| | EAR2-RA-02c-12 | 0.14 | | | 0.027 | | 0.05 | | 0.14 | | 0.043 | |
| EAR2-DU-03a | EAR2-RA-03a-06 | 0.30 | | | 0.053 | | 0.12 | | 0.30 | | 0.081 | |
| | EAR2-RA-03a-12 | 0.29 | | | 0.051 | | 0.11 | | 0.29 | | 0.077 | |
| EAR2-DU-03b | EAR2-RA-03b-06 | 0.12 | | | 0.023 | | 0.049 | | 0.12 | | 0.037 | |
| | EAR2-RA-03b-12 | 0.10 | | | 0.020 | | 0.04 | | 0.10 | | 0.031 | |
| EAR2-DU-03c | EAR2-RA-03c-06 | 1.10 | | | 0.19 | | 0.43 | | **1.1** | **reseeded** | 0.30 | |
| | EAR2-RA-03c-12 | 0.46 | | | 0.078 | | 0.18 | | 0.46 | | 0.12 | |
| EAR2-DU-04a | EAR2-RA-04a-06 | 0.033 | | | 0.0059 | | 0.013 | | 0.034 | | 0.0091 | |
| | EAR2-RA-04a-12 | 0.022 | | | 0.0038 | | 0.009 | | 0.022 | | 0.0057 | |
| EAR2-DU-04b | EAR2-RA-04b-06 | 0.035 | | | 0.0061 | | 0.014 | | 0.037 | | 0.0093 | |
| | EAR2-RA-04b-12 | 0.026 | | | 0.0052 | | 0.010 | | 0.026 | | 0.0084 | |
| EAR2-DU-04c | EAR2-RA-04c-06 | 1.1 | | | 0.19 | | 0.44 | | **1.1** | **no bare areas** | 0.29 | |
| | EAR2-RA-04c-12 | 0.78 | | | 0.14 | | 0.31 | | 0.78 | | 0.21 | |
| EAR2-DU-05a | EAR2-RA-05a-06-1 | 0.48 | | | 0.086 | | 0.19 | | 0.49 | | 0.13 | |
| | EAR2-RA-05a-06-2 | 0.41 | | | 0.072 | | 0.16 | | 0.41 | | 0.11 | |
| | EAR2-RA-05a-06-3 | 0.64 | | | 0.11 | | 0.25 | | 0.64 | | 0.17 | |
| | EAR2-RA-05a-12 | 0.14 | | | 0.026 | | 0.056 | | 0.14 | | 0.040 | |
| EAR2-DU-05b | EAR2-RA-05b-06 | 0.51 | | | 0.091 | | 0.20 | | 0.51 | | 0.14 | |
| | EAR2-RA-05b-12 | 0.84 | | | 0.13 | | 0.33 | | 0.84 | | 0.19 | |
| EAR2-DU-05c | EAR2-RA-05c-06 | 0.61 | | | 0.11 | | 0.24 | | 0.63 | | 0.16 | |
| | EAR2-RA-05c-12 | 0.37 | | | 0.065 | | 0.15 | | 0.37 | | 0.10 | |
| EAR2-DU-05d | EAR2-RA-05d-06 | 0.31 | | | 0.06 | | 0.12 | | 0.32 | | 0.09 | |
| | EAR2-RA-05d-12 | 0.11 | | | 0.021 | | 0.04 | | 0.11 | | 0.032 | |
| EAR2-DU-05e | EAR2-RA-05e-06 | 0.74 | | | 0.13 | | 0.29 | | 0.78 | | 0.20 | |
| | EAR2-RA-05e-12 | 1.4 | | | 0.24 | | 0.56 | | 1.4 | | 0.36 | |
| EAR2-DU-06a | EAR2-RA-06a-06 | 1.9 | | | 0.32 | | 0.77 | | **2.0** | **no bare areas** | 0.48 | |
| | EAR2-RA-06a-12 | 4.5 | | | 0.63 | | 1.8 | | 4.5 | | 0.88 | |
| EAR2-DU-06b | EAR2-RA-06b-06 | **3.1** | **excavated** | | 0.45 | | **1.2** | **excavated under RO1** | **3.1** | **excavated under RO1** | 0.64 | **excavated under RO-1** |
| | EAR2-RA-06b-12 | 2.5 | **excavated** | | 0.35 | | 1.0 | **excavated under RO1** | 2.5 | **excavated under RO1** | 0.48 | **excavated under RO-1** |
| EAR2-DU-06c | EAR2-RA-06c-06 | **29** | **excavated** | | 3.6 | | 11 | **excavated under RO1** | 29 | **excavated under RO1** | 4.9 | **excavated under RO-1** |
| | EAR2-RA-06c-12 | **22** | **excavated** | | 2.8 | | 8.6 | **excavated under RO1** | 22 | **excavated under RO1** | 3.7 | **excavated under RO-1** |
| EAR2-DU-07a | EAR2-RA-07a-06 | 1.6 | | | 0.27 | | 0.62 | | **1.6** | | 0.41 | |
| | EAR2-RA-07a-12 | 1.2 | | | 0.20 | | 0.46 | | 1.2 | | 0.30 | |
| EAR2-DU-07b | EAR2-RA-07b-06 | 1.5 | | | 0.25 | | 0.59 | | **1.5** | | 0.38 | |
| | EAR2-RA-07b-12 | 0.85 | | | 0.15 | | 0.33 | | 0.85 | | 0.24 | |
| EAR2-DU-08a | EAR2-RA-08a-06 | 0.20 | | | 0.034 | | 0.078 | | 0.21 | | 0.052 | |
| | EAR2-RA-08a-12 | 0.20 | | | 0.038 | | 0.079 | | 0.20 | | 0.060 | |
| EAR2-DU-08b | EAR2-RA-08b-06 | 1.0 | | | 0.14 | | 0.40 | | 1.0 | | 0.20 | |
| | EAR2-RA-08b-12 | 1.6 | | | 0.27 | | 0.63 | | 1.6 | | 0.41 | |
| EAR2-DU-09a | EAR2-RA-09a-06 | 0.81 | | | 0.15 | | 0.32 | | 0.82 | | 0.23 | |
| | EAR2-RA-09a-12 | 0.83 | | | 0.14 | | 0.33 | | 0.83 | | 0.22 | |
| EAR2-DU-09b | EAR2-RA-09b-06 | 0.22 | | | 0.043 | | 0.09 | | 0.23 | | 0.07 | |
| | EAR2-RA-09b-12 | 0.071 | | | 0.014 | | 0.027 | | 0.071 | | 0.023 | |
| EAR2-DU-09c | EAR2-RA-09c-06 | 0.44 | | | 0.081 | | 0.17 | | 0.45 | | 0.13 | |
| | EAR2-RA-09c-12 | 0.24 | | | 0.046 | | 0.09 | | 0.24 | | 0.07 | |
| EAR2-DU-09d | EAR2-RA-09d-06 | **16** | **excavated** | | 2.0 | **excavated under RO1** | 6.1 | **excavated under RO1** | 16 | **excavated under RO1** | 2.7 | **excavated under RO-1** |
| | EAR2-RA-09d-12 | 2.8 | **excavated** | | 0.41 | **excavated under RO1** | 1.1 | **excavated under RO1** | 2.8 | **excavated under RO1** | 0.58 | **excavated under RO1** |
| EAR2-DU-09e | EAR2-RA-09e-06 | 7.4 | **excavated** | | 1.1 | **excavated under RO1** | 2.9 | **excavated under RO1** | 7.4 | **excavated under RO1** | 1.5 | **excavated under RO1** |
| | EAR2-RA-09e-12 | 7.7 | **excavated** | | 1.0 | **excavated under RO1** | 3.0 | **excavated under RO1** | 7.7 | **excavated under RO1** | 1.4 | **excavated under RO1** |
| EAR2-DU-10a | EAR2-RA-10a-06-1 | 0.48 | | | 0.085 | | 0.19 | | 0.49 | | 0.13 | |
| | EAR2-RA-10a-06-2 | 0.48 | | | 0.084 | | 0.19 | | 0.48 | | 0.13 | |
| | EAR2-RA-10a-06-3 | 0.29 | | | 0.052 | | 0.11 | | 0.30 | | 0.08 | |
| | EAR2-RA-10a-12 | 0.68 | | | 0.11 | | 0.26 | | 0.68 | | 0.16 | |
| EAR2-DU-10b | EAR2-RA-10b-06 | 0.60 | | | 0.11 | | 0.23 | | 0.60 | | 0.18 | |
| | EAR2-RA-10b-12 | 0.24 | | | 0.047 | | 0.09 | | 0.24 | | 0.08 | |
| EAR2-DU-11a | EAR2-RA-11a-06 | **3.6** | | | 0.58 | | **1.4** | | **3.6** | **no bare areas** | 0.86 | |
| | EAR2-RA-11a-12 | 2.7 | | | 0.45 | | 1.1 | | 2.7 | | 0.68 | |
| EAR2-DU-11b | EAR2-RA-11b-06 | **5.8** | | | 0.91 | | **2.3** | | **5.8** | **no bare areas** | **1.3** | **excavated** |
| | EAR2-RA-11b-12 | 5.8 | | | 0.89 | | 2.3 | | 5.8 | | 1.3 | |
| EAR2-DU-11c | EAR2-RA-11c-06 | 1.5 | | | 0.25 | | 0.59 | | **1.5** | **no bare areas** | 0.38 | |
| | EAR2-RA-11c-12 | 1.4 | | | 0.24 | | 0.55 | | 1.4 | | 0.36 | |
| EAR2-DU-11d | EAR2-RA-11d-06 | 1.5 | | | 0.27 | | 0.59 | | **1.5** | **no bare areas** | 0.41 | |
| | EAR2-RA-11d-12 | 1.1 | | | 0.19 | | 0.43 | | 1.1 | | 0.30 | |
| EAR2-DU-12a | EAR2-RA-12a-06 | 0.50 | | | 0.092 | | 0.20 | | 0.51 | | 0.14 | |
| | EAR2-RA-12a-12 | 0.59 | | | 0.11 | | 0.23 | | 0.59 | | 0.17 | |
| EAR2-DU-12b | EAR2-RA-12b-06 | 1.4 | | | 0.23 | | 0.56 | | **1.4** | **no bare areas** | 0.35 | |
| | EAR2-RA-12b-12 | 1.4 | | | 0.24 | | 0.56 | | 1.4 | | 0.37 | |
| EAR2-DU-12c | EAR2-RA-12c-06 | **4.4** | | | 0.63 | | **1.7** | **no landscaping strip** | **4.3** | **no bare areas** | 0.90 | |
| | EAR2-RA-12c-12 | 1.5 | | | 0.25 | | 0.58 | | 1.5 | | 0.37 | |
| EAR2-DU-13a | EAR2-RA-13a-06 | **3.7** | | | 0.64 | | **1.5** | **no landscaping strip** | **3.8** | **reseeded** | 0.97 | |
| | EAR2-RA-13a-12 | 2.8 | | | 0.47 | | 1.10 | | 2.8 | | 0.70 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| EAR2-DU-13b | EAR2-RA-13b-06 | 2.0 | | | 0.37 | | 0.81 | | **2.1** | **no bare areas** | 0.57 | |
| | EAR2-RA-13b-12 | 2.1 | | | 0.34 | | 0.83 | | 2.1 | | 0.50 | |
| EAR2-DU-13c | EAR2-RA-13c-06-1 | 1.5 | | | 0.24 | | 0.58 | | **1.5** | **reseeded** | 0.36 | |
| | EAR2-RA-13c-06-2 | 1.1 | | | 0.20 | | 0.45 | | **1.1** | **reseeded** | 0.31 | |
| | EAR2-RA-13c-06-3 | 0.88 | | | 0.16 | | 0.35 | | **0.9** | **reseeded** | 0.24 | |
| | EAR2-RA-13c-12 | 1.3 | | | 0.22 | | 0.51 | | 1.3 | | 0.33 | |
| EAR2-DU-13d | EAR2-RA-13d-06 | 1.7 | | | 0.30 | | 0.67 | | **1.7** | **no bare areas** | 0.45 | |
| | EAR2-RA-13d-12 | 1.2 | | | 0.21 | | 0.48 | | 1.2 | | 0.32 | |
| EAR2-DU-13e | EAR2-RA-13e-06 | 1.8 | | | 0.31 | | 0.71 | | **1.8** | **no bare areas** | 0.48 | |
| | EAR2-RA-13e-12 | 0.69 | | | 0.12 | | 0.27 | | 0.69 | | 0.18 | |
| EAR2-DU-13f | EAR2-RA-13f-06 | 1.3 | | | 0.22 | | 0.50 | | **1.3** | **no bare areas** | 0.33 | |
| | EAR2-RA-13f-12 | 1.7 | | | 0.29 | | 0.68 | | 1.7 | | 0.44 | |
| EAR2-DU-13g | EAR2-RA-13g-06 | 2.8 | | | 0.46 | | **1.1** | **no landscaping strip** | **2.9** | **no bare areas** | 0.70 | |
| | EAR2-RA-13g-12 | 2.5 | | | 0.41 | | 1.0 | | 2.5 | | 0.60 | |
| EAR2-DU-14a | EAR2-RA-14a-06 | 1.0 | | | 0.19 | | 0.41 | | 1.0 | | 0.30 | |
| | EAR2-RA-14a-12 | 1.4 | | | 0.25 | | 0.53 | | 1.4 | | 0.39 | |
| EAR2-DU-14b | EAR2-RA-14b-06 | 2.3 | | | 0.38 | | 0.89 | | **2.3** | **no bare areas** | 0.58 | |
| | EAR2-RA-14b-12 | 2.7 | | | 0.45 | | 1.0 | | 2.7 | | 0.68 | |
| EAR2-DU-14c | EAR2-RA-14c-06 | **4.2** | | | 0.71 | | **1.6** | **no landscaping strip** | **4.3** | **no bare areas** | **1.1** | **excavated** |
| | EAR2-RA-14c-12 | 2.0 | | | 0.32 | | 0.77 | | 2.0 | | 0.48 | |
| EAR2-DU-14d | EAR2-RA-14d-06 | 2.4 | | | 0.41 | | 0.96 | | **2.5** | **reseeded** | 0.62 | |
| | EAR2-RA-14d-12 | 4.0 | | | 0.59 | | 1.6 | | 4.0 | | 0.84 | |
| EAR2-DU-14e | EAR2-RA-14e-06 | **5.2** | | | 0.71 | | **2.0** | **no landscaping strip** | **5.1** | **no bare areas** | 0.99 | |
| | EAR2-RA-14e-12 | 3.9 | | | 0.54 | | 1.5 | | 3.9 | | 0.75 | |
| EAR2-DU-15a | EAR2-RA-15a-06-1 | 0.87 | | | 0.16 | | 0.34 | | 0.88 | | 0.24 | |
| | EAR2-RA-15a-06-2 | 0.79 | | | 0.14 | | 0.31 | | 0.80 | | 0.22 | |
| | EAR2-RA-15a-06-3 | 0.88 | | | 0.16 | | 0.35 | | 0.89 | | 0.25 | |
| | EAR2-RA-15a-12 | 0.85 | | | 0.15 | | 0.33 | | 0.85 | | 0.23 | |
| EAR2-DU-15b | EAR2-RA-15b-06 | **5.9** | | | 0.92 | | **2.3** | **no landscaping strip** | **5.9** | **reseeded** | **1.3** | **excavated** |
| | EAR2-RA-15b-12 | 16 | | | 2.2 | | 6.4 | | 16 | | 3.0 | |
| EAR2-DU-15c | EAR2-RA-15c-06 | **3.2** | | | 0.49 | | **1.2** | **no landscaping strip** | **3.2** | **no bare areas** | 0.72 | |
| | EAR2-RA-15c-12 | 5.3 | | | 0.80 | | 2.1 | | 5.3 | | 1.2 | |
| EAR2-DU-15d | EAR2-RA-15d-06 | **5.7** | | **excavated** | 0.90 | | 2.2 | | 5.7 | | 1.3 | **excavated under RO-1** |
| | EAR2-RA-15d-12 | 5.0 | | **excavated** | 0.78 | | 2.0 | | 5.0 | | 1.1 | **excavated under RO-1** |
| EAR2-DU-16a | EAR2-RA-16a-06-1 | 1.9 | | | 0.33 | | 0.74 | | **1.9** | **no bare areas** | 0.50 | |
| | EAR2-RA-16a-06-2 | 2.1 | | | 0.37 | | 0.83 | | **2.1** | **no bare areas** | 0.56 | |
| | EAR2-RA-16a-06-3 | 1.5 | | | 0.26 | | 0.58 | | **1.5** | **no bare areas** | 0.40 | |
| | EAR2-RA-16a-12 | 1.8 | | | 0.32 | | 0.72 | | 1.8 | | 0.49 | |
| EAR2-DU-16b | EAR2-RA-16b-06 | 0.65 | | | 0.12 | | 0.25 | | 0.65 | | 0.18 | |
| | EAR2-RA-16b-12 | 0.62 | | | 0.10 | | 0.25 | | 0.62 | | 0.16 | |
| EAR2-DU-17a | EAR2-RA-17a-06 | 2.2 | | | 0.37 | | 0.86 | | **2.3** | | 0.57 | |
| | EAR2-RA-17a-12 | 1.8 | | | 0.32 | | 0.72 | | 1.8 | | 0.50 | |
| EAR2-DU-17b | EAR2-RA-17b-06 | 2.3 | | | 0.40 | | 0.89 | | **2.3** | | 0.62 | |
| | EAR2-RA-17b-12 | 2.1 | | | 0.38 | | 0.84 | | 2.1 | | 0.59 | |
| EAR2-DU-18a | EAR2-RA-18a-06 | 0.78 | | | 0.14 | | 0.31 | | 0.79 | | 0.22 | |
| | EAR2-RA-18a-12 | 0.51 | | | 0.089 | | 0.20 | | 0.51 | | 0.14 | |
| EAR2-DU-18b | EAR2-RA-18b-06 | 0.16 | | | 0.029 | | 0.06 | | 0.17 | | 0.05 | |
| | EAR2-RA-18b-12 | 0.087 | | | 0.016 | | 0.034 | | 0.087 | | 0.024 | |
| EAR2-DU-18c | EAR2-RA-18c-06 | 0.68 | | | 0.12 | | 0.27 | | 0.69 | | 0.19 | |
| | EAR2-RA-18c-12 | 0.35 | | | 0.063 | | 0.14 | | 0.35 | | 0.10 | |
| EAR2-DU-18d | EAR2-RA-18d-06 | 0.70 | | | 0.12 | | 0.28 | | 0.71 | | 0.18 | |
| | EAR2-RA-18d-12 | 0.62 | | | 0.10 | | 0.24 | | 0.62 | | 0.16 | |
| EAR2-DU-19a | EAR2-RA-19a-06 | 1.5 | | | 0.25 | | 0.58 | | **1.5** | **no bare areas** | 0.39 | |
| | EAR2-RA-19a-12 | 0.95 | | | 0.17 | | 0.38 | | 0.95 | | 0.26 | |
| EAR2-DU-19b | EAR2-RA-19b-06-1 | **3.5** | | | 0.59 | | **1.4** | **no landscaping strip** | **3.5** | **no bare areas** | 0.89 | |
| | EAR2-RA-19b-06-2 | **3.4** | | | 0.59 | | **1.3** | **no landscaping strip** | **3.4** | **no bare areas** | 0.90 | |
| | EAR2-RA-19b-06-3 | 2.8 | | | 0.50 | | **1.1** | **no landscaping strip** | **2.8** | **no bare areas** | 0.77 | |
| | EAR2-RA-19b-12 | 8.6 | | | 1.3 | | 3.4 | | 8.6 | | 1.8 | |
| EAR2-DU-19c | EAR2-RA-19c-06 | 2.3 | | | 0.39 | | 0.91 | | **2.3** | | 0.58 | |
| | EAR2-RA-19c-12 | 1.48 | | | 0.25 | | 0.59 | | 1.48 | | 0.37 | |
| EAR2-DU-19d | EAR2-RA-19d-06 | 0.60 | | | 0.10 | | 0.24 | | 0.61 | | 0.15 | |
| | EAR2-RA-19d-12 | 0.95 | | | 0.15 | | 0.37 | | 0.95 | | 0.23 | |
| EAR2-DU-19e | EAR2-RA-19e-06 | 1.32 | | | 0.22 | | 0.52 | | **1.3** | | 0.33 | |
| | EAR2-RA-19e-12 | 0.84 | | | 0.14 | | 0.33 | | 0.84 | | 0.21 | |
| EAR2-DU-19f | EAR2-RA-19f-06 | 1.32 | | | 0.23 | | 0.52 | | **1.3** | | 0.35 | |
| | EAR2-RA-19f-12 | 1.02 | | | 0.17 | | 0.40 | | 1.02 | | 0.25 | |
| EAR2-DU-19g | EAR2-RA-19g-06 | 0.56 | | | 0.10 | | 0.22 | | 0.57 | | 0.15 | |
| | EAR2-RA-19g-12 | 0.91 | | | 0.15 | | 0.35 | | 0.91 | | 0.22 | |
| EAR2-DU-20a | EAR2-RA-20a-06-1 | 0.95 | | | 0.17 | | 0.37 | | 0.96 | **no bare areas** | 0.26 | |
| | EAR2-RA-20a-06-2 | 1.1 | | | 0.20 | | 0.44 | | **1.1** | **no bare areas** | 0.30 | |
| | EAR2-RA-20a-06-3 | 1.1 | | | 0.20 | | 0.44 | | **1.1** | **no bare areas** | 0.32 | |
| | EAR2-RA-20a-12 | 0.56 | | | 0.10 | | 0.22 | | 0.56 | | 0.16 | |
| EAR2-DU-20b | EAR2-RA-20b-06 | 0.73 | | | 0.14 | | 0.29 | | 0.73 | | 0.22 | |
| | EAR2-RA-20b-12 | 0.51 | | | 0.10 | | 0.20 | | 0.51 | | 0.15 | |
| EAR2-DU-20c | EAR2-RA-20c-06 | 0.72 | | | 0.13 | | 0.28 | | 0.73 | | 0.20 | |
| | EAR2-RA-20c-12 | 0.62 | | | 0.12 | | 0.24 | | 0.62 | | 0.18 | |
| EAR2-DU-20d | EAR2-RA-20d-06 | 0.70 | | | 0.13 | | 0.28 | | 0.71 | | 0.21 | |
| | EAR2-RA-20d-12 | 2.3 | | | 0.40 | | 0.91 | | 2.3 | | 0.61 | |
| EAR2-DU-20e | EAR2-RA-20e-06 | 0.91 | | | 0.16 | | 0.36 | | 0.92 | | 0.24 | |
| | EAR2-RA-20e-12 | 0.43 | | | 0.079 | | 0.17 | | 0.43 | | 0.12 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| EAR2-DU-20f | EAR2-RA-20f-06 | 0.64 | | | 0.12 | | 0.25 | | 0.65 | | 0.19 | |
| | EAR2-RA-20f-12 | 0.14 | | | 0.029 | | 0.06 | | 0.14 | | 0.05 | |
| EAR2-DU-20g | EAR2-RA-20g-06 | 0.74 | | | 0.14 | | 0.29 | | 0.75 | | 0.22 | |
| | EAR2-RA-20g-12 | 0.27 | | | 0.051 | | 0.10 | | 0.27 | | 0.08 | |
| EAR2-DU-20h | EAR2-RA-20h-06 | 0.39 | | | 0.074 | | 0.15 | | 0.39 | | 0.12 | |
| | EAR2-RA-20h-12 | 0.30 | | | 0.057 | | 0.12 | | 0.30 | | 0.09 | |
| EAR2-DU-20i | EAR2-RA-20i-06 | 0.43 | | | 0.080 | | 0.17 | | 0.44 | | 0.12 | |
| | EAR2-RA-20i-12 | 0.36 | | | 0.063 | | 0.14 | | 0.36 | | 0.10 | |
| EAR2-DU-20j | EAR2-RA-20j-06 | 0.28 | | | 0.051 | | 0.10 | | 0.28 | | 0.081 | |
| | EAR2-RA-20j-12 | 0.26 | | | 0.048 | | 0.10 | | 0.26 | | 0.075 | |
| EAR2-DU-20k | EAR2-RA-20k-06 | 0.52 | | | 0.10 | | 0.20 | | 0.52 | | 0.15 | |
| | EAR2-RA-20k-12 | 0.40 | | | 0.078 | | 0.15 | | 0.40 | | 0.13 | |
| EAR2-DU-20L | EAR2-RA-20L-06 | 0.55 | | | 0.10 | | 0.22 | | 0.56 | | 0.16 | |
| | EAR2-RA-20L-12 | 0.34 | | | 0.065 | | 0.13 | | 0.34 | | 0.10 | |
| EAR2-DU-21a | EAR2-RA-21a-06-1 | 1.5 | | | 0.28 | | 0.6 | | **1.5** | **no bare areas** | 0.43 | |
| | EAR2-RA-21a-06-2 | 1.2 | | | 0.21 | | 0.5 | | **1.2** | **no bare areas** | 0.32 | |
| | EAR2-RA-21a-06-3 | 1.7 | | | 0.28 | | 0.7 | | **1.7** | **no bare areas** | 0.42 | |
| | EAR2-RA-21a-12 | 1.25 | | | 0.22 | | 0.50 | | 1.25 | | 0.33 | |
| EAR2-DU-21b | EAR2-RA-21b-06 | 0.87 | | | 0.15 | | 0.34 | | 0.89 | | 0.23 | |
| | EAR2-RA-21b-12 | 0.32 | | | 0.058 | | 0.13 | | 0.32 | | 0.09 | |
| EAR2-DU-21c | EAR2-RA-21c-06 | 1.6 | | | 0.30 | | 0.65 | | **1.7** | | 0.46 | |
| | EAR2-RA-21c-12 | 0.92 | | | 0.16 | | 0.36 | | 0.92 | | 0.25 | |
| EAR2-DU-21d | EAR2-RA-21d-06 | 2.3 | | | 0.41 | | 0.90 | | **2.3** | | 0.64 | |
| | EAR2-RA-21d-12 | 1.6 | | | 0.29 | | 0.65 | | 1.6 | | 0.44 | |
| EAR2-DU-22a | EAR2-RA-22a-06 | 2.6 | | | 0.45 | | 1.0 | | **2.7** | | 0.69 | |
| | EAR2-RA-22a-12 | 3.0 | | | 0.50 | | 1.2 | | 3.0 | | 0.75 | |
| EAR2-DU-22b | EAR2-RA-22b-06 | 2.2 | | | 0.37 | | 0.86 | | **2.2** | | 0.56 | |
| | EAR2-RA-22b-12 | 3.2 | | | 0.50 | | 1.3 | | 3.2 | | 0.74 | |
| EAR2-DU-22c | EAR2-RA-22c-06 | 1.7 | | | 0.31 | | 0.69 | | **1.8** | | 0.48 | |
| | EAR2-RA-22c-12 | 1.6 | | | 0.27 | | 0.63 | | 1.6 | | 0.41 | |
| EAR2-DU-22d | EAR2-RA-22d-06 | 1.3 | | | 0.24 | | 0.53 | | **1.4** | | 0.37 | |
| | EAR2-RA-22d-12 | 0.67 | | | 0.12 | | 0.26 | | 0.67 | | 0.18 | |
| EAR2-DU-23a | EAR2-RA-23a-06-1 | 0.84 | | | 0.13 | | 0.33 | **no landscaping strip** | 0.83 | **no bare areas** | 0.19 | **excavated** |
| | EAR2-RA-23a-06-2 | **4.57** | | | 0.72 | | **1.8** | | **4.6** | **no bare areas** | **1.1** | **excavated** |
| | EAR2-RA-23a-06-3 | 0.74 | | | 0.13 | | 0.29 | | 0.75 | **no bare areas** | 0.20 | **excavated** |
| | EAR2-RA-23a-12 | 5.7 | | | 0.92 | | 2.3 | | 5.7 | | 1.4 | |
| EAR2-DU-23b | EAR2-RA-23b-06 | **4.6** | | | 0.76 | | **1.8** | **no landscaping strip** | **4.6** | **reseeded** | **1.1** | **excavated** |
| | EAR2-RA-23b-12 | 1.4 | | | 0.21 | | 0.54 | | 1.4 | | 0.31 | |
| EAR2-DU-23c | EAR2-RA-23c-06 | 1.3 | | | 0.23 | | 0.53 | | **1.4** | | 0.35 | |
| | EAR2-RA-23c-12 | 1.1 | | | 0.19 | | 0.44 | | 1.1 | | 0.30 | |
| EAR2-DU-23d | EAR2-RA-23d-06 | 2.0 | | | 0.33 | | 0.79 | | **2.0** | | 0.50 | |
| | EAR2-RA-23d-12 | 5.1 | | | 0.75 | | 2.0 | | 5.1 | | 1.1 | |
| EAR2-DU-24a | EAR2-RA-24a-06 | 0.64 | | | 0.11 | | 0.25 | | 0.64 | | 0.17 | |
| | EAR2-RA-24a-12 | 0.62 | | | 0.11 | | 0.24 | | 0.62 | | 0.16 | |
| EAR2-DU-24b | EAR2-RA-24b-06 | 0.81 | | | 0.15 | | 0.32 | | **1.1** | **reseeded** | 0.23 | |
| | EAR2-RA-24b-12 | 0.48 | | | 0.094 | | 0.18 | | 0.48 | | 0.15 | |
| EAR2-DU-24c | EAR2-RA-24c-06 | 1.7 | | | 0.29 | | 0.66 | | **1.7** | **reseeded** | 0.44 | |
| | EAR2-RA-24c-12 | 1.6 | | | 0.27 | | 0.64 | | 1.6 | | 0.41 | |
| EAR2-DU-24d | EAR2-RA-24d-06 | 0.86 | | | 0.15 | | 0.34 | | 0.86 | | 0.24 | |
| | EAR2-RA-24d-12 | 0.59 | | | 0.10 | | 0.23 | | 0.59 | | 0.15 | |
| EAR2-DU-25a | EAR2-RA-25a-06-1 | 2.0 | | | 0.35 | | 0.77 | | **2.0** | | 0.54 | |
| | EAR2-RA-25a-06-2 | 1.3 | | | 0.24 | | 0.48 | | **1.3** | | 0.38 | |
| | EAR2-RA-25a-06-3 | 1.3 | | | 0.25 | | 0.49 | | **1.3** | | 0.39 | |
| | EAR2-RA-25a-12 | 1.7 | | | 0.31 | | 0.65 | | 1.7 | | 0.48 | |
| EAR2-DU-25b | EAR2-RA-25b-06 | 1.2 | | | 0.22 | | 0.46 | | **1.2** | | 0.34 | |
| | EAR2-RA-25b-12 | 0.40 | | | 0.08 | | 0.15 | | 0.40 | | 0.13 | |
| EAR2-DU-25c | EAR2-RA-25c-06 | 0.63 | | | 0.13 | | 0.24 | | 0.64 | | 0.20 | |
| | EAR2-RA-25c-12 | 0.78 | | | 0.15 | | 0.30 | | 0.78 | | 0.23 | |
| EAR2-DU-25d | EAR2-RA-25d-06 | 1.4 | | | 0.21 | | 0.53 | | **1.4** | **reseeded** | 0.31 | |
| | EAR2-RA-25d-12 | 1.9 | | | 0.27 | | 0.73 | | 1.9 | | 0.39 | |
| EAR2-DU-26a | EAR2-RA-26a-06-1 | 0.65 | | | 0.11 | | 0.26 | | **0.7** | | 0.17 | |
| | EAR2-RA-26a-06-2 | 1.6 | | | 0.28 | | 0.62 | | **1.6** | | 0.43 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| | EAR2-RA-26a-06-3 | 1.3 | | | 0.24 | | 0.53 | | **1.3** | | 0.36 | |
| | EAR2-RA-26a-12 | 1.8 | | | 0.32 | | 0.71 | | 1.8 | | 0.48 | |
| EAR2-DU-26b | EAR2-RA-26b-06 | 0.72 | | | 0.13 | | 0.28 | | 0.72 | | 0.21 | |
| | EAR2-RA-26b-12 | 0.38 | | | 0.07 | | 0.15 | | 0.38 | | 0.11 | |
| EAR2-DU-26c | EAR2-RA-26c-06 | 0.89 | | | 0.16 | | 0.35 | | 0.89 | | 0.25 | |
| | EAR2-RA-26c-12 | 1.1 | | | 0.19 | | 0.43 | | 1.1 | | 0.29 | |
| EAR2-DU-26d | EAR2-RA-26d-06 | 1.3 | | | 0.23 | | 0.51 | | **1.3** | **no bare areas** | 0.35 | |
| | EAR2-RA-26d-12 | 1.2 | | | 0.20 | | 0.47 | | 1.2 | | 0.31 | |
| EAR2-DU-26e | EAR2-RA-26e-06 | **3.5** | | | 0.58 | | **1.4** | **no landscaping strip** | **3.5** | **no bare areas** | 0.88 | |
| | EAR2-RA-26e-12 | 3.1 | | | 0.49 | | 1.2 | | 3.1 | | 0.72 | |
| EAR2-DU-26f | EAR2-RA-26f-06 | 1.0 | | | 0.19 | | 0.40 | | 1.0 | | 0.29 | |
| | EAR2-RA-26f-12 | 1.9 | | | 0.30 | | 0.75 | | 1.9 | | 0.45 | |
| EAR2-DU-26g | EAR2-RA-26g-06 | 1.8 | | | 0.30 | | 0.70 | | **1.8** | **no bare areas** | 0.45 | |
| | EAR2-RA-26g-12 | 1.8 | | | 0.32 | | 0.72 | | 1.8 | | 0.48 | |
| EAR2-DU-27a | EAR2-RA-27a-06 | 2.7 | | | 0.45 | | **1.1** | **replaced (B1, B2)** | **2.7** | **no bare areas** | 0.68 | |
| | EAR2-RA-27a-12 | 2.5 | | | 0.40 | | 1.0 | | 2.5 | | 0.59 | |
| EAR2-DU-27b | EAR2-RA-27b-06 | 2.2 | | | 0.37 | | 0.89 | | **2.3** | **no bare areas** | 0.56 | |
| | EAR2-RA-27b-12 | 1.3 | | | 0.19 | | 0.50 | | 1.3 | | 0.28 | |
| EAR2-DU-27c | EAR2-RA-27c-06 | **3.9** | | | 0.61 | | **1.5** | **replaced (B1, B2)** | **3.9** | **no bare areas** | 0.89 | |
| | EAR2-RA-27c-12 | 7.8 | | | 1.2 | | 3.0 | | 7.8 | | 1.7 | |
| EAR2-DU-27d | EAR2-RA-27d-06 | **7.2** | | | 1.0 | | **2.8** | | **7.1** | **no bare areas** | **1.5** | **excavated** |
| | EAR2-RA-27d-12 | 11 | | | 1.5 | | 4.2 | | 11 | | 2.2 | |
| EAR2-DU-28a | EAR2-RA-28a-06-1 | 1.2 | | | 0.21 | | 0.48 | | **1.2** | **no bare areas** | 0.31 | |
| | EAR2-RA-28a-06-2 | 1.7 | | | 0.28 | | 0.67 | | **1.7** | **no bare areas** | 0.43 | |
| | EAR2-RA-28a-06-3 | 1.5 | | | 0.25 | | 0.58 | | **1.5** | **no bare areas** | 0.38 | |
| | EAR2-RA-28a-12 | 1.3 | | | 0.22 | | 0.53 | | 1.3 | | 0.32 | |
| EAR2-DU-28b | EAR2-RA-28b-06 | 1.6 | | | 0.27 | | 0.61 | | **1.6** | **reseeded** | 0.40 | |
| | EAR2-RA-28b-12 | 2.2 | | | 0.35 | | 0.88 | | 2.2 | | 0.51 | |
| EAR2-DU-28c | EAR2-RA-28c-06 | **4.2** | | | 0.68 | | **1.7** | **replaced (B1)** | **4.2** | **no bare areas** | 1.0 | |
| | EAR2-RA-28c-12 | 4.5 | | | 0.65 | | 1.8 | | 4.5 | | 0.92 | |
| EAR2-DU-28d | EAR2-RA-28d-06 | 2.4 | | | 0.37 | | 1.0 | | **2.5** | **no bare areas** | 0.55 | |
| | EAR2-RA-28d-12 | 8.0 | | | 1.1 | | 3.1 | | 8.0 | | 1.5 | |
| EAR2-DU-29a | EAR2-RA-29a-06 | **6.1** | | | 0.80 | | **2.4** | **replaced (B1)** | **6.1** | **no bare areas** | **1.1** | **excavated** |
| | EAR2-RA-29a-12 | 2.8 | | | 0.40 | | 1.1 | | 2.8 | | 0.57 | |
| EAR2-DU-29b | EAR2-RA-29b-06 | 1.1 | | | 0.19 | | 0.44 | | **1.1** | **reseeded** | 0.28 | |
| | EAR2-RA-29b-12 | 1.4 | | | 0.23 | | 0.56 | | 1.4 | | 0.35 | |
| EAR2-DU-29c | EAR2-RA-29c-06 | 2.2 | | | 0.36 | | 0.87 | | **2.2** | **no bare areas** | 0.54 | |
| | EAR2-RA-29c-12 | 3.1 | | | 0.46 | | 1.2 | | 3.1 | | 0.67 | |
| EAR2-DU-30a | EAR2-RA-30a-06 | 0.68 | | | 0.12 | | 0.27 | | 0.69 | | 0.18 | |
| | EAR2-RA-30a-12 | 0.72 | | | 0.13 | | 0.28 | | 0.72 | | 0.20 | |
| EAR2-DU-30b | EAR2-RA-30b-06 | 1.2 | | | 0.21 | | 0.46 | | **1.2** | **no bare areas** | 0.31 | |
| | EAR2-RA-30b-12 | 1.1 | | | 0.19 | | 0.45 | | 1.1 | | 0.29 | |
| EAR2-DU-30c | EAR2-RA-30c-06 | 0.86 | | | 0.15 | | 0.34 | | 0.87 | | 0.23 | |
| | EAR2-RA-30c-12 | 3.2 | | | 0.46 | | 1.3 | | 3.2 | | 0.66 | |
| EAR2-DU-30d | EAR2-RA-30d-06 | 0.87 | | | 0.16 | | 0.34 | | 0.87 | | 0.24 | |
| | EAR2-RA-30d-12 | 0.73 | | | 0.12 | | 0.29 | | 0.73 | | 0.19 | |
| EAR2-DU-30e | EAR2-RA-30e-06 | 1.3 | | | 0.22 | | 0.52 | | **1.3** | **no bare areas** | 0.34 | |
| | EAR2-RA-30e-12 | 6.3 | | | 0.90 | | 2.5 | | 6.3 | | **1.3** | |
| EAR2-DU-30f | EAR2-RA-30f-06 | **3.4** | | | 0.49 | | **1.3** | **replaced (B1, B2)** | **3.4** | **no bare areas** | 0.70 | |
| | EAR2-RA-30f-12 | 11 | | | 1.4 | | 4.2 | | 11 | | 1.9 | |
| EAR2-DU-31a | EAR2-RA-31a-06-1 | 0.25 | | | 0.048 | | 0.10 | | 0.25 | | 0.08 | |
| | EAR2-RA-31a-06-2 | 0.11 | | | 0.022 | | 0.04 | | 0.11 | | 0.04 | |
| | EAR2-RA-31a-06-3 | 0.16 | | | 0.032 | | 0.06 | | 0.16 | | 0.05 | |
| | EAR2-RA-31a-12 | 0.35 | | | 0.075 | | 0.13 | | 0.35 | | 0.12 | |
| EAR2-DU-31b | EAR2-RA-31b-06 | 0.07 | | | 0.015 | | 0.03 | | 0.07 | | 0.03 | |
| | EAR2-RA-31b-12 | 0.059 | | | 0.014 | | 0.021 | | 0.059 | | 0.023 | |
| EAR2-DU-31c | EAR2-RA-31c-06 | 0.06 | | | 0.015 | | 0.02 | | 0.06 | | 0.03 | |
| | EAR2-RA-31c-12 | 0.066 | | | 0.016 | | 0.023 | | 0.066 | | 0.028 | |
| EAR2-DU-31d | EAR2-RA-31d-06 | 0.27 | | | 0.060 | | 0.10 | | 0.27 | | 0.10 | |
| | EAR2-RA-31d-12 | 0.53 | | | 0.10 | | 0.20 | | 0.53 | | 0.16 | |
| EAR2-DU-31e | EAR2-RA-31e-06 | 0.07 | | | 0.016 | | 0.03 | | 0.07 | | 0.03 | |
| | EAR2-RA-31e-12 | 0.11 | | | 0.026 | | 0.04 | | 0.11 | | 0.04 | |
| EAR2-DU-32a | EAR2-RA-32a-06-1 | 0.34 | | | 0.065 | | 0.13 | | 0.34 | | 0.10 | |
| | EAR2-RA-32a-06-2 | 0.27 | | | 0.056 | | 0.10 | | 0.27 | | 0.09 | |
| | EAR2-RA-32a-06-3 | 0.30 | | | 0.060 | | 0.11 | | 0.30 | | 0.10 | |
| | EAR2-RA-32a-12 | 0.24 | | | 0.051 | | 0.09 | | 0.24 | | 0.083 | |
| EAR2-DU-32b | EAR2-RA-32b-06 | 0.10 | | | 0.023 | | 0.03 | | 0.10 | | 0.04 | |
| | EAR2-RA-32b-12 | 0.085 | | | 0.020 | | 0.030 | | 0.085 | | 0.034 | |
| EAR2-DU-32c | EAR2-RA-32c-06 | 0.14 | | | 0.030 | | 0.05 | | 0.14 | | 0.05 | |
| | EAR2-RA-32c-12 | 0.13 | | | 0.031 | | 0.05 | | 0.13 | | 0.052 | |
| EAR2-DU-32d | EAR2-RA-32d-06 | 0.20 | | | 0.040 | | 0.08 | | 0.20 | | 0.06 | |
| | EAR2-RA-32d-12 | 0.065 | | | 0.014 | | 0.024 | | 0.065 | | 0.024 | |
| EAR2-DU-33a | EAR2-RA-33a-06 | 3.2 | | | 0.50 | | **1.3** | **replaced (B1, B2)** | **3.2** | | 0.73 | |
| | EAR2-RA-33a-12 | 2.5 | | | 0.39 | | 0.99 | | 2.5 | | 0.58 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| EAR2-DU-33b | EAR2-RA-33b-06 | 3.2 | | | 0.46 | | **1.3** | **replaced (B1, B2)** | **3.2** | | 0.65 | |
| | EAR2-RA-33b-12 | 1.8 | | | 0.30 | | 0.73 | | 1.8 | | 0.45 | |
| EAR2-DU-33c | EAR2-RA-33c-06 | 1.8 | | | 0.30 | | 0.73 | | **1.9** | | 0.45 | |
| | EAR2-RA-33c-12 | 1.8 | | | 0.28 | | 0.72 | | 1.8 | | 0.42 | |
| EAR2-DU-33d | EAR2-RA-33d-06 | 0.84 | | | 0.14 | | 0.33 | | 0.86 | | 0.21 | |
| | EAR2-RA-33d-12 | 1.2 | | | 0.21 | | 0.49 | | 1.2 | | 0.32 | |
| EAR2-DU-34a | EAR2-RA-34a-06 | 1.8 | | | 0.31 | | 0.70 | | **1.9** | **no bare areas** | 0.48 | |
| | EAR2-RA-34a-12 | 1.6 | | | 0.26 | | 0.63 | | 1.6 | | 0.38 | |
| EAR2-DU-34b | EAR2-RA-34b-06 | 2.4 | | | 0.37 | | 0.93 | | **2.4** | **no bare areas** | 0.55 | |
| | EAR2-RA-34b-12 | 2.0 | | | 0.30 | | 0.79 | | 2.0 | | 0.43 | |
| EAR2-DU-34c | EAR2-RA-34c-06 | 1.9 | | | 0.30 | | 0.74 | | **1.9** | **no bare areas** | 0.45 | |
| | EAR2-RA-34c-12 | 3.2 | | | 0.50 | | 1.24 | | 3.2 | | 0.73 | |
| EAR2-DU-34d | EAR2-RA-34d-06 | 3.1 | | | 0.48 | | **1.2** | **replaced (partial)** | **3.2** | **no bare areas** | 0.71 | |
| | EAR2-RA-34d-12 | 5.1 | | | 0.72 | | 1.99 | | 5.1 | | 1.0 | |
| EAR2-DU-34e | EAR2-RA-34e-06 | 2.2 | | | 0.34 | | 0.88 | | **2.3** | **no bare areas** | 0.49 | |
| | EAR2-RA-34e-12 | 2.7 | | | 0.40 | | 1.06 | | 2.7 | | 0.57 | |
| EAR2-DU-34f | EAR2-RA-34f-06 | 0.15 | | | 0.027 | | 0.06 | | 0.15 | | 0.04 | |
| | EAR2-RA-34f-12 | 0.024 | | | 0.00 | | 0.0093 | | 0.024 | | 0.0076 | |
| EAR2-DU-34g | EAR2-RA-34g-06 | 1.2 | | | 0.21 | | 0.47 | | **1.2** | **no bare areas** | 0.31 | |
| | EAR2-RA-34g-12 | 0.95 | | | 0.16 | | 0.38 | | 0.95 | | 0.23 | |
| EAR2-DU-34h | EAR2-RA-34h-06 | 2.1 | | | 0.35 | | 0.83 | | **2.2** | **no bare areas** | 0.52 | |
| | EAR2-RA-34h-12 | 3.4 | | | 0.54 | | 1.4 | | 3.4 | | 0.79 | |
| EAR2-DU-35a | EAR2-RA-35a-06-1 | 2.6 | | | 0.44 | | 1.0 | **replaced (B1, B2)** | **2.6** | **no bare areas** | 0.66 | |
| | EAR2-RA-35a-06-2 | 2.9 | | | 0.48 | | **1.1** | **replaced (B1, B2)** | **2.9** | **no bare areas** | 0.73 | |
| | EAR2-RA-35a-06-3 | 2.9 | | | 0.48 | | **1.2** | **replaced (B1, B2)** | **2.9** | **no bare areas** | 0.72 | |
| | EAR2-RA-35a-12 | 3.5 | | | 0.56 | | 1.4 | | 3.5 | | 0.83 | |
| EAR2-DU-35b | EAR2-RA-35b-06 | **3.7** | | | 0.60 | | **1.5** | | **3.8** | **no bare areas** | 0.89 | |
| | EAR2-RA-35b-12 | 6.0 | | | 0.88 | | 2.4 | | 6.0 | | 1.3 | |
| EAR2-DU-35c | EAR2-RA-35c-06 | 1.9 | | | 0.34 | | 0.76 | | **1.9** | **no bare areas** | 0.53 | |
| | EAR2-RA-35c-12 | 4.1 | | | 0.57 | | 1.6 | | 4.1 | | 0.81 | |
| EAR2-DU-35d | EAR2-RA-35d-06 | 2.0 | | | 0.35 | | 0.79 | | **2.0** | **no bare areas** | 0.53 | |
| | EAR2-RA-35d-12 | 3.6 | | | 0.55 | | 1.4 | | 3.6 | | 0.80 | |
| EAR2-DU-36a | EAR2-RA-36a-06 | 2.1 | | | 0.36 | | 0.82 | | **2.1** | **no bare areas** | 0.56 | |
| | EAR2-RA-36a-12 | 2.1 | | | 0.35 | | 0.81 | | 2.1 | | 0.54 | |
| EAR2-DU-36b | EAR2-RA-36b-06 | 1.8 | | | 0.30 | | 0.71 | | **1.8** | **no bare areas** | 0.46 | |
| | EAR2-RA-36b-12 | 3.0 | | | 0.47 | | 1.2 | | 3.0 | | 0.70 | |
| EAR2-DU-36c | EAR2-RA-36c-06 | **3.5** | | | 0.52 | | **1.4** | **replaced (B1, B2)** | **3.5** | **no bare areas** | 0.74 | |
| | EAR2-RA-36c-12 | 1.9 | | | 0.28 | | 0.74 | | 1.9 | | 0.41 | |
| EAR2-DU-36d | EAR2-RA-36d-06 | **3.2** | | | 0.48 | | **1.2** | **replaced (B1, B2)** | **3.2** | **no bare areas** | 0.69 | |
| | EAR2-RA-36d-12 | 4.1 | | | 0.58 | | 1.6 | | 4.1 | | 0.82 | |
| EAR2-DU-37a | EAR2-RA-37a-06-1 | **5.6** | | | 0.82 | | **2.2** | **replaced (B1, B2)** | **5.5** | **no bare areas** | **1.2** | **excavated** |
| | EAR2-RA-37a-06-2 | **3.2** | | | 0.52 | | **1.2** | **replaced (B1, B2)** | **3.2** | **no bare areas** | 0.77 | |
| | EAR2-RA-37a-06-3 | **3.0** | | | 0.48 | | **1.2** | **replaced (B1, B2)** | **2.9** | **no bare areas** | 0.71 | |
| | EAR2-RA-37a-12 | 18 | | | 2.5 | | 7.1 | | 18 | | 3.4 | |
| EAR2-DU-37b | EAR2-RA-37b-06 | 0.56 | | | 0.11 | | 0.21 | | 0.56 | | 0.17 | |
| | EAR2-RA-37b-12 | 1.4 | | | 0.24 | | 0.52 | | 1.4 | | 0.38 | |
| EAR2-DU-37c | EAR2-RA-37c-06 | 1.8 | | | 0.27 | | 0.69 | | **1.8** | **no bare areas** | 0.39 | |
| | EAR2-RA-37c-12 | 1.4 | | | 0.22 | | 0.55 | | 1.4 | | 0.33 | |
| EAR2-DU-37d | EAR2-RA-37d-06 | 1.7 | | | 0.29 | | 0.67 | | **1.7** | **no bare areas** | 0.43 | |
| | EAR2-RA-37d-12 | 3.2 | | | 0.47 | | 1.2 | | 3.2 | | 0.68 | |
| EAR2-DU-37e | EAR2-RA-37e-06 | 0.90 | | | 0.15 | | 0.34 | | 0.90 | | 0.22 | |
| | EAR2-RA-37e-12 | 0.21 | | | 0.037 | | 0.08 | | 0.21 | | 0.06 | |
| EAR2-DU-37f | EAR2-RA-37f-06 | 0.75 | | | 0.14 | | 0.29 | | 0.75 | | 0.21 | |
| | EAR2-RA-37f-12 | 0.44 | | | 0.081 | | 0.17 | | 0.44 | | 0.13 | |
| EAR2-DU-37g | EAR2-RA-37g-06 | 0.55 | | | 0.11 | | 0.21 | | 0.55 | | 0.18 | |
| | EAR2-RA-37g-12 | 0.15 | | | 0.037 | | 0.05 | | 0.15 | | 0.06 | |
| EAR2-DU-37h | EAR2-RA-37h-06 | 0.62 | | | 0.10 | | 0.24 | | 0.62 | | 0.16 | |
| | EAR2-RA-37h-12 | 1.0 | | | 0.16 | | 0.39 | | 1.0 | | 0.24 | |
| EAR2-DU-38a | EAR2-RA-38a-06-1 | 0.56 | | | 0.10 | | 0.22 | | 0.56 | | 0.16 | |
| | EAR2-RA-38a-06-2 | 0.63 | | | 0.11 | | 0.25 | | 0.63 | | 0.17 | |
| | EAR2-RA-38a-06-3 | 0.64 | | | 0.11 | | 0.25 | | 0.65 | | 0.17 | |
| | EAR2-RA-38a-12 | 0.21 | | | 0.044 | | 0.08 | | 0.21 | | 0.07 | |
| EAR2-DU-38b | EAR2-RA-38b-06 | 0.98 | | | 0.16 | | 0.38 | | 0.98 | | 0.25 | |
| | EAR2-RA-38b-12 | 0.80 | | | 0.13 | | 0.31 | | 0.80 | | 0.20 | |
| EAR2-DU-38c | EAR2-RA-38c-06 | 2.2 | | | 0.35 | | 0.88 | | **2.3** | **no bare areas** | 0.52 | |
| | EAR2-RA-38c-12 | 3.9 | | | 0.59 | | 1.5 | | 3.9 | | 0.87 | |
| EAR2-DU-38d | EAR2-RA-38d-06 | **6.9** | | | 0.97 | | **2.7** | **replaced (B2)** | **6.9** | **no bare areas** | **1.4** | **excavated** |
| | EAR2-RA-38d-12 | 4.3 | | | 0.63 | | 1.7 | | 4.3 | | 0.90 | |
| EAR2-DU-38e | EAR2-RA-38e-06 | 1.9 | | | 0.32 | | 0.77 | | **2.0** | **no bare areas** | 0.49 | |
| | EAR2-RA-38e-12 | 2.4 | | | 0.38 | | 0.95 | | 2.4 | | 0.56 | |
| EAR2-DU-39a | EAR2-RA-39a-06 | 7.1 | | | **1.1** | **excavated** | 2.8 | **excavated under RO-2A** | 7.2 | **excavated under RO-2A** | 1.6 | **excavated under RO-2A** |
| | EAR2-RA-39a-12 | 12 | | | 1.8 | **excavated** | 4.7 | **excavated under RO-2A** | 12 | **excavated under RO-2A** | 2.6 | **excavated under RO-2A** |
| EAR2-DU-39b | EAR2-RA-39b-06 | 2.3 | | | 0.39 | | 0.93 | | **2.4** | **no bare areas** | 0.59 | |
| | EAR2-RA-39b-12 | 4.8 | | | 0.72 | | 1.9 | | 4.8 | | 1.0 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| EAR2-DU-39c | EAR2-RA-39c-06 | 2.2 | | | 0.37 | | 0.87 | | **2.2** | **no bare areas** | 0.56 | |
| | EAR2-RA-39c-12 | 2.7 | | | 0.43 | | 1.1 | | 2.7 | | 0.63 | |
| EAR2-DU-39d | EAR2-RA-39d-06 | 1.4 | | | 0.25 | | 0.55 | | **1.4** | **no bare areas** | 0.38 | |
| | EAR2-RA-39d-12 | 0.82 | | | 0.14 | | 0.32 | | 0.82 | | 0.21 | |
| EAR2-DU-39e | EAR2-RA-39e-06 | 2.0 | | | 0.35 | | 0.80 | | **2.0** | **no bare areas** | 0.53 | |
| | EAR2-RA-39e-12 | 2.7 | | | 0.41 | | 1.0 | | 2.7 | | 0.61 | |
| EAR2-DU-40a | EAR2-RA-40a-06-1 | 2.2 | | | 0.35 | | 0.86 | | **2.2** | **no bare areas** | 0.53 | |
| | EAR2-RA-40a-06-2 | 1.3 | | | 0.21 | | 0.50 | | **1.3** | **no bare areas** | 0.31 | |
| | EAR2-RA-40a-06-3 | 1.2 | | | 0.20 | | 0.46 | | **1.2** | **no bare areas** | 0.30 | |
| | EAR2-RA-40a-12 | 4.0 | | | 0.61 | | 1.6 | | 4.0 | | 0.90 | |
| EAR2-DU-40b | EAR2-RA-40b-06 | 1.8 | | | 0.31 | | 0.72 | | **1.9** | **no bare areas** | 0.47 | |
| | EAR2-RA-40b-12 | 1.9 | | | 0.30 | | 0.73 | | 1.9 | | 0.44 | |
| EAR2-DU-40c | EAR2-RA-40c-06 | **4.1** | | | 0.63 | | **1.6** | **replaced (B2)** | **4.2** | **no bare areas** | 0.91 | |
| | EAR2-RA-40c-12 | 3.7 | | | 0.50 | | 1.5 | | 3.7 | | 0.70 | |
| EAR2-DU-40d | EAR2-RA-40d-06 | 0.53 | | | 0.10 | | 0.21 | | 0.53 | | 0.15 | |
| | EAR2-RA-40d-12 | 0.27 | | | 0.050 | | 0.11 | | 0.27 | | 0.077 | |
| EAR2-DU-41a | EAR2-RA-41a-06 | 1.3 | | | 0.23 | | 0.53 | | **1.3** | **no bare areas** | 0.35 | |
| | EAR2-RA-41a-12 | 1.1 | | | 0.19 | | 0.43 | | 1.1 | | 0.28 | |
| EAR2-DU-41b | EAR2-RA-41b-06 | 1.7 | | | 0.29 | | 0.66 | | **1.7** | **no bare areas** | 0.44 | |
| | EAR2-RA-41b-12 | 2.9 | | | 0.45 | | 1.1 | | 2.9 | | 0.67 | |
| EAR2-DU-41c | EAR2-RA-41c-06 | 1.4 | | | 0.24 | | 0.55 | | **1.4** | **no bare areas** | 0.36 | |
| | EAR2-RA-41c-12 | 2.7 | | | 0.41 | | 1.1 | | 2.7 | | 0.59 | |
| EAR2-DU-41d | EAR2-RA-41d-06 | 0.52 | | | 0.10 | | 0.20 | | 0.52 | | 0.15 | |
| | EAR2-RA-41d-12 | 0.52 | | | 0.088 | | 0.20 | | 0.52 | | 0.13 | |
| EAR2-DU-41e | EAR2-RA-41e-06 | 1.9 | | | 0.32 | | 0.76 | | **1.9** | **no bare areas** | 0.48 | |
| | EAR2-RA-41e-12 | 0.88 | | | 0.15 | | 0.35 | | 0.88 | | 0.22 | |
| EAR2-DU-42a | EAR2-RA-42a-06 | **4.3** | | | 0.66 | | **1.7** | **replaced (B2)** | **4.5** | **no bare areas** | 0.96 | |
| | EAR2-RA-42a-12 | 11 | | | 1.5 | | 4.2 | | 11 | | **2.0** | |
| EAR2-DU-42b | EAR2-RA-42b-06 | **6.4** | | | 0.88 | | **2.5** | | **6.5** | **no bare areas** | **1.2** | **excavated** |
| | EAR2-RA-42b-12 | 14 | | | 1.8 | | 5.3 | | 14 | | 2.5 | |
| EAR2-DU-42c | EAR2-RA-42c-06 | **17** | **excavated** | | **2.2** | **excavated under RO1** | 6.7 | **excavated under RO1** | 17 | **excavated under RO1** | 3.0 | **excavated under RO-1** |
| | EAR2-RA-42c-12 | 12 | **excavated** | | 1.5 | **excavated under RO1** | 4.5 | **excavated under RO1** | 12 | **excavated under RO1** | 2.1 | **excavated under RO-1** |
| EAR2-DU-42d | EAR2-RA-42d-06 | 0.43 | | | 0.087 | | 0.16 | | 0.4 | | 0.14 | |
| | EAR2-RA-42d-12 | 0.36 | | | 0.066 | | 0.14 | | 0.36 | | 0.10 | |
| EAR2-DU-42e | EAR2-RA-42e-06 | 2.0 | | | 0.32 | | 0.80 | | **2.0** | **no bare areas** | 0.48 | |
| | EAR2-RA-42e-12 | 0.88 | | | 0.15 | | 0.35 | | 0.88 | | 0.23 | |
| EAR2-DU-42f | EAR2-RA-42f-06 | 0.65 | | | 0.12 | | 0.26 | | 0.7 | | 0.18 | |
| | EAR2-RA-42f-12 | 0.65 | | | 0.11 | | 0.25 | | 0.65 | | 0.18 | |
| EAR2-DU-43a | EAR2-RA-43a-06-1 | 2.2 | | | 0.36 | | 0.85 | | **2.2** | **no bare areas** | 0.54 | |
| | EAR2-RA-43a-06-2 | 2.1 | | | 0.35 | | 0.83 | | **2.1** | **no bare areas** | 0.53 | |
| | EAR2-RA-43a-06-3 | 2.5 | | | 0.40 | | 0.99 | | **2.5** | **no bare areas** | 0.59 | |
| | EAR2-RA-43a-12 | 3.2 | | | 0.51 | | 1.3 | | 3.2 | | 0.76 | |
| EAR2-DU-43b | EAR2-RA-43b-06 | 1.2 | | | 0.21 | | 0.46 | | **1.2** | **no bare areas** | 0.32 | |
| | EAR2-RA-43b-12 | 0.98 | | | 0.17 | | 0.38 | | 0.98 | | 0.25 | |
| EAR2-DU-43c | EAR2-RA-43c-06 | 0.56 | | | 0.10 | | 0.22 | | 0.56 | | 0.16 | |
| | EAR2-RA-43c-12 | 0.81 | | | 0.15 | | 0.32 | | 0.81 | | 0.23 | |
| EAR2-DU-44a | EAR2-RA-44a-06 | 0.61 | | | 0.11 | | 0.24 | | 0.61 | | 0.18 | |
| | EAR2-RA-44a-12 | 0.47 | | | 0.087 | | 0.18 | | 0.47 | | 0.14 | |
| EAR2-DU-44b | EAR2-RA-44b-06 | 2.0 | | | 0.34 | | 0.77 | | **2.0** | **no bare areas** | 0.51 | |
| | EAR2-RA-44b-12 | 3.9 | | | 0.64 | | 1.5 | | 3.9 | | 0.97 | |
| EAR2-DU-44c | EAR2-RA-44c-06 | 1.5 | | | 0.25 | | 0.60 | | **1.5** | **no bare areas** | 0.38 | |
| | EAR2-RA-44c-12 | 2.0 | | | 0.31 | | 0.78 | | 2.0 | | 0.46 | |
| EAR2-DU-44d | EAR2-RA-44d-06 | 1.4 | | | 0.24 | | 0.56 | | **1.4** | **no bare areas** | 0.35 | |
| | EAR2-RA-44d-12 | 2.7 | | | 0.43 | | 1.1 | | 2.7 | | 0.64 | |
| EAR2-DU-45a | EAR2-RA-45a-06-1 | 0.16 | | | 0.034 | | 0.06 | | 0.16 | | 0.06 | |
| | EAR2-RA-45a-06-2 | 0.16 | | | 0.032 | | 0.06 | | 0.16 | | 0.05 | |
| | EAR2-RA-45a-06-3 | 0.16 | | | 0.034 | | 0.06 | | 0.16 | | 0.06 | |
| | EAR2-RA-45a-12 | 0.11 | | | 0.027 | | 0.04 | | 0.11 | | 0.048 | |
| EAR2-DU-45b | EAR2-RA-45b-06 | 0.094 | | | 0.019 | | 0.035 | | 0.095 | | 0.032 | |
| | EAR2-RA-45b-12 | 0.08 | | | 0.022 | | 0.03 | | 0.08 | | 0.038 | |
| EAR2-DU-45c | EAR2-RA-45c-06 | 0.15 | | | 0.034 | | 0.06 | | 0.16 | | 0.056 | |
| | EAR2-RA-45c-12 | 0.20 | | | 0.041 | | 0.07 | | 0.20 | | 0.066 | |
| EAR2-DU-45d | EAR2-RA-45d-06 | 0.32 | | | 0.068 | | 0.12 | | 0.32 | | 0.11 | |
| | EAR2-RA-45d-12 | 0.24 | | | 0.050 | | 0.09 | | 0.24 | | 0.083 | |
| EAR2-DU-45e | EAR2-RA-45e-06 | 0.068 | | | 0.019 | | 0.022 | | 0.074 | | 0.033 | |
| | EAR2-RA-45e-12 | 0.061 | | | 0.018 | | 0.019 | | 0.061 | | 0.032 | |
| EAR2-DU-45f | EAR2-RA-45f-06 | 0.19 | | | 0.039 | | 0.07 | | 0.19 | | 0.064 | |
| | EAR2-RA-45f-12 | 0.19 | | | 0.047 | | 0.06 | | 0.19 | | 0.08 | |
| EAR2-DU-46a | EAR2-RA-46a-06 | 0.16 | | | 0.030 | | 0.06 | | 0.16 | | 0.047 | |
| | EAR2-RA-46a-12 | 0.10 | | | 0.022 | | 0.04 | | 0.10 | | 0.04 | |
| EAR2-DU-46b | EAR2-RA-46b-06 | 0.018 | | | 0.0044 | | 0.0064 | | 0.019 | | 0.0076 | |
| | EAR2-RA-46b-12 | 0.018 | | | 0.0047 | | 0.0060 | | 0.018 | | 0.0082 | |
| EAR2-DU-46c | EAR2-RA-46c-06 | 0.024 | | | 0.0055 | | 0.0085 | | 0.024 | | 0.0093 | |
| | EAR2-RA-46c-12 | 0.020 | | | 0.0055 | | 0.0066 | | 0.020 | | 0.010 | |
| EAR2-DU-46d | EAR2-RA-46d-06 | 0.52 | | | 0.090 | | 0.21 | | 0.54 | | 0.14 | |
| | EAR2-RA-46d-12 | 0.68 | | | 0.12 | | 0.27 | | 0.68 | | 0.18 | |
| EAR2-DU-46e | EAR2-RA-46e-06 | 0.50 | | | 0.091 | | 0.19 | | 0.50 | | 0.14 | |
| | EAR2-RA-46e-12 | 0.50 | | | 0.089 | | 0.19 | | 0.50 | | 0.14 | |
| EAR2-DU-47a | EAR2-RA-47a-06-1 | 0.022 | | | 0.0062 | | 0.0073 | | 0.023 | | 0.011 | |
| | EAR2-RA-47a-06-2 | 0.023 | | | 0.0063 | | 0.0076 | | 0.023 | | 0.011 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| | EAR2-RA-47a-06-3 | 0.024 | | | 0.0063 | | 0.0080 | | 0.024 | | 0.011 | |
| | EAR2-RA-47a-12 | 0.054 | | | 0.015 | | 0.017 | | 0.054 | | 0.028 | |
| EAR2-DU-47b | EAR2-RA-47b-06 | 0.026 | | | 0.0070 | | 0.0083 | | 0.032 | | 0.013 | |
| | EAR2-RA-47b-12 | 0.15 | | | 0.043 | | 0.05 | | 0.15 | | 0.08 | |
| EAR2-DU-47c | EAR2-RA-47c-06 | 0.029 | | | 0.0076 | | 0.010 | | 0.029 | | 0.013 | |
| | EAR2-RA-47c-12 | 0.029 | | | 0.0081 | | 0.0094 | | 0.029 | | 0.014 | |
| EAR2-DU-47d | EAR2-RA-47d-06 | 0.078 | | | 0.015 | | 0.030 | | 0.078 | | 0.023 | |
| | EAR2-RA-47d-12 | 0.055 | | | 0.013 | | 0.019 | | 0.055 | | 0.022 | |
| EAR2-DU-47e | EAR2-RA-47e-06 | 0.66 | | | 0.12 | | 0.26 | | 0.66 | | 0.18 | |
| | EAR2-RA-47e-12 | 0.55 | | | 0.10 | | 0.22 | | 0.55 | | 0.15 | |
| EAR2-DU-47f | EAR2-RA-47f-06 | 0.52 | | | 0.10 | | 0.20 | | 0.53 | | 0.15 | |
| | EAR2-RA-47f-12 | 0.49 | | | 0.090 | | 0.19 | | 0.49 | | 0.14 | |
| EAR2-DU-47g | EAR2-RA-47g-06 | 0.28 | | | 0.050 | | 0.11 | | 0.28 | | 0.078 | |
| | EAR2-RA-47g-12 | 0.27 | | | 0.049 | | 0.10 | | 0.27 | | 0.075 | |
| EAR2-DU-47h | EAR2-RA-47h-06 | 0.31 | | | 0.054 | | 0.12 | | 0.31 | | 0.082 | |
| | EAR2-RA-47h-12 | 0.31 | | | 0.056 | | 0.12 | | 0.31 | | 0.088 | |
| EAR2-DU-47i | EAR2-RA-47i-06 | 0.62 | | | 0.11 | | 0.25 | | 0.63 | | 0.18 | |
| | EAR2-RA-47i-12 | 0.73 | | | 0.14 | | 0.29 | | 0.73 | | 0.21 | |
| EAR2-DU-48a | EAR2-RA-48a-06 | 1.28 | | | 0.22 | | 0.50 | | **1.29** | **no bare areas** | 0.34 | |
| | EAR2-RA-48a-12 | 1.1 | | | 0.18 | | 0.42 | | 1.1 | | 0.28 | |
| EAR2-DU-48b | EAR2-RA-48b-06-1 | 0.88 | | | 0.16 | | 0.35 | | 0.89 | **no bare areas** | 0.25 | |
| | EAR2-RA-48b-06-2 | 1.29 | | | 0.22 | | 0.51 | | **1.29** | **no bare areas** | 0.34 | |
| | EAR2-RA-48b-06-3 | 1.07 | | | 0.19 | | 0.42 | | **1.08** | **no bare areas** | 0.29 | |
| | EAR2-RA-48b-12 | 1.1 | | | 0.20 | | 0.45 | | 1.1 | | 0.31 | |
| EAR2-DU-48c | EAR2-RA-48c-06 | 1.45 | | | 0.25 | | 0.57 | | **1.45** | **no bare areas** | 0.38 | |
| | EAR2-RA-48c-12 | 1.4 | | | 0.24 | | 0.56 | | 1.4 | | 0.36 | |
| EAR2-DU-48d | EAR2-RA-48d-06 | 1.30 | | | 0.22 | | 0.51 | | **1.31** | **no bare areas** | 0.34 | |
| | EAR2-RA-48d-12 | 1.2 | | | 0.21 | | 0.48 | | 1.2 | | 0.32 | |
| EAR2-DU-48e | EAR2-RA-48e-06 | 0.19 | | | 0.034 | | 0.07 | | 0.19 | | 0.05 | |
| | EAR2-RA-48e-12 | 0.15 | | | 0.036 | | 0.054 | | 0.15 | | 0.061 | |
| EAR2-DU-49a | EAR2-RA-49a-06 | 0.34 | | | 0.064 | | 0.13 | | 0.35 | | 0.10 | |
| | EAR2-RA-49a-12 | 0.40 | | | 0.074 | | 0.15 | | 0.40 | | 0.12 | |
| EAR2-DU-49b | EAR2-RA-49b-06 | 0.25 | | | 0.045 | | 0.10 | | 0.27 | | 0.07 | |
| | EAR2-RA-49b-12 | 0.10 | | | 0.018 | | 0.039 | | 0.10 | | 0.029 | |
| EAR2-DU-49c | EAR2-RA-49c-06 | 0.66 | | | 0.11 | | 0.26 | | 0.68 | | 0.17 | |
| | EAR2-RA-49c-12 | 0.30 | | | 0.052 | | 0.12 | | 0.30 | | 0.078 | |
| EAR2-DU-49d | EAR2-RA-49d-06 | 0.95 | | | 0.17 | | 0.38 | | 0.97 | | 0.26 | |
| | EAR2-RA-49d-12 | 0.25 | | | 0.047 | | 0.10 | | 0.25 | | 0.074 | |
| EAR2-DU-49e | EAR2-RA-49e-06 | 0.86 | | | 0.15 | | 0.34 | | 0.88 | | 0.23 | |
| | EAR2-RA-49e-12 | 0.31 | | | 0.054 | | 0.12 | | 0.31 | | 0.083 | |
| EAR2-DU-49f | EAR2-RA-49f-06 | 0.53 | | | 0.091 | | 0.21 | | 0.55 | | 0.14 | |
| | EAR2-RA-49f-12 | 0.87 | | | 0.13 | | 0.34 | | 0.87 | | 0.20 | |
| EAR2-DU-50a | EAR2-RA-50a-06-1 | 0.89 | | | 0.16 | | 0.35 | | 0.90 | **no bare areas** | 0.25 | |
| | EAR2-RA-50a-06-2 | 1.1 | | | 0.20 | | 0.44 | | **1.1** | **no bare areas** | 0.30 | |
| | EAR2-RA-50a-06-3 | 0.97 | | | 0.17 | | 0.39 | | 0.98 | **no bare areas** | 0.26 | |
| | EAR2-RA-50a-12 | 0.92 | | | 0.16 | | 0.37 | | 0.92 | | 0.25 | |
| EAR2-DU-50b | EAR2-RA-50b-06 | 0.81 | | | 0.14 | | 0.32 | | 0.83 | | 0.22 | |
| | EAR2-RA-50b-12 | 0.57 | | | 0.10 | | 0.23 | | 0.57 | | 0.16 | |
| EAR2-DU-50c | EAR2-RA-50c-06 | 0.50 | | | 0.088 | | 0.20 | | 0.52 | | 0.13 | |
| | EAR2-RA-50c-12 | 0.38 | | | 0.066 | | 0.15 | | 0.38 | | 0.10 | |
| EAR2-DU-50d | EAR2-RA-50d-06 | 0.60 | | | 0.11 | | 0.24 | | 0.62 | | 0.16 | |
| | EAR2-RA-50d-12 | 0.98 | | | 0.17 | | 0.39 | | 0.98 | | 0.27 | |
| EAR2-DU-50e | EAR2-RA-50e-06 | 1.4 | | | 0.24 | | 0.54 | | **1.4** | **no bare areas** | 0.36 | |
| | EAR2-RA-50e-12 | 1.2 | | | 0.21 | | 0.49 | | 1.2 | | 0.32 | |
| EAR2-DU-50f | EAR2-RA-50f-06 | 1.4 | | | 0.25 | | 0.56 | | **1.5** | **no bare areas** | 0.38 | |
| | EAR2-RA-50f-12 | 0.93 | | | 0.16 | | 0.37 | | 0.93 | | 0.25 | |
| EAR2-DU-50g | EAR2-RA-50g-06 | 1.1 | | | 0.20 | | 0.45 | | **1.2** | **no bare areas** | 0.30 | |
| | EAR2-RA-50g-12 | 1.2 | | | 0.20 | | 0.46 | | 1.2 | | 0.31 | |
| EAR2-DU-50h | EAR2-RA-50h-06 | 1.0 | | | 0.18 | | 0.40 | | **1.1** | **no bare areas** | 0.28 | |
| | EAR2-RA-50h-12 | 1.4 | | | 0.25 | | 0.54 | | 1.4 | | 0.38 | |
| EAR2-DU-50i | EAR2-RA-50i-06 | 0.32 | | | 0.059 | | 0.13 | | 0.34 | | 0.09 | |
| | EAR2-RA-50i-12 | 0.17 | | | 0.03 | | 0.07 | | 0.17 | | 0.054 | |
| EAR2-DU-50j | EAR2-RA-50j-06 | 0.95 | | | 0.17 | | 0.37 | | 0.96 | | 0.27 | |
| | EAR2-RA-50j-12 | 0.41 | | | 0.073 | | 0.16 | | 0.41 | | 0.11 | |
| EAR2-DU-50k | EAR2-RA-50k-06 | 1.2 | | | 0.22 | | 0.45 | | **1.2** | **no bare areas** | 0.34 | |
| | EAR2-RA-50k-12 | 0.51 | | | 0.10 | | 0.20 | | 0.51 | | 0.16 | |
| EAR2-DU-51a | EAR2-RA-51a-06-1 | 0.71 | | | 0.13 | | 0.28 | | 0.72 | | 0.20 | |
| | EAR2-RA-51a-06-2 | 0.49 | | | 0.09 | | 0.19 | | 0.50 | | 0.14 | |
| | EAR2-RA-51a-06-3 | 0.47 | | | 0.08 | | 0.19 | | 0.47 | | 0.13 | |
| | EAR2-RA-51a-12 | 0.79 | | | 0.14 | | 0.31 | | 0.79 | | 0.21 | |
| EAR2-DU-51b | EAR2-RA-51b-06 | 0.80 | | | 0.14 | | 0.32 | | 0.81 | | 0.21 | |
| | EAR2-RA-51b-12 | 1.1 | | | 0.20 | | 0.4 | | 1.1 | | 0.30 | |
| EAR2-DU-51c | EAR2-RA-51c-06 | 0.88 | | | 0.16 | | 0.35 | | 0.90 | | 0.24 | |
| | EAR2-RA-51c-12 | 1.1 | | | 0.20 | | 0.5 | | 1.1 | | 0.31 | |
| EAR2-DU-51d | EAR2-RA-51d-06 | 1.7 | | | 0.30 | | 0.69 | | 1.8 | | 0.45 | |
| | EAR2-RA-51d-12 | 1.8 | | | 0.29 | | 0.7 | | 1.8 | | 0.43 | |
| EAR2-DU-51e | EAR2-RA-51e-06 | 0.82 | | | 0.14 | | 0.33 | | 0.84 | | 0.21 | |
| | EAR2-RA-51e-12 | 0.39 | | | 0.066 | | 0.15 | | 0.39 | | 0.10 | |
| EAR2-DU-51f | EAR2-RA-51f-06 | 0.89 | | | 0.16 | | 0.35 | | 0.91 | | 0.25 | |
| | EAR2-RA-51f-12 | 0.94 | | | 0.16 | | 0.37 | | 0.94 | | 0.24 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| EAR2-DU-52a | EAR2-RA-52a-06 | **17** | **excavated** | | 2.2 | **excavated under RO1** | 6.5 | **excavated under RO1** | 17 | **excavated under RO1** | 3.0 | **excavated under RO-1** |
| | EAR2-RA-52a-12 | 6.8 | **excavated** | | 0.90 | **excavated under RO1** | 2.7 | **excavated under RO1** | 6.8 | **excavated under RO1** | 1.2 | **excavated under RO-1** |
| EAR2-DU-52b | EAR2-RA-52b-06 | 5.9 | **excavated** | | 0.88 | **excavated under RO1** | 2.3 | **excavated under RO1** | 5.9 | **excavated under RO1** | 1.3 | **excavated under RO-1** |
| | EAR2-RA-52b-12 | 5.6 | **excavated** | | 0.80 | **excavated under RO1** | 2.2 | **excavated under RO1** | 5.6 | **excavated under RO1** | 1.1 | **excavated under RO-1** |
| EAR2-DU-52c | EAR2-RA-52c-06 | 0.47 | | | 0.085 | | 0.18 | | 0.47 | | 0.13 | |
| | EAR2-RA-52c-12 | 0.34 | | | 0.059 | | 0.13 | | 0.34 | | 0.09 | |
| EAR2-DU-52d | EAR2-RA-52d-06 | 0.25 | | | 0.055 | | 0.09 | | 0.25 | | 0.09 | |
| | EAR2-RA-52d-12 | 0.12 | | | 0.028 | | 0.043 | | 0.12 | | 0.05 | |
| EAR2-DU-52e | EAR2-RA-52e-06 | 0.36 | | | 0.070 | | 0.14 | | 0.37 | | 0.11 | |
| | EAR2-RA-52e-12 | 0.42 | | | 0.079 | | 0.16 | | 0.42 | | 0.13 | |
| EAR2-DU-53a | EAR2-RA-53a-06-1 | 0.02 | | | 0.0037 | | 0.01 | | 0.02 | | 0.01 | |
| | EAR2-RA-53a-06-2 | 0.04 | | | 0.0071 | | 0.02 | | 0.04 | | 0.01 | |
| | EAR2-RA-53a-06-3 | 0.04 | | | 0.0071 | | 0.01 | | 0.04 | | 0.01 | |
| | EAR2-RA-53a-12 | 0.020 | | | 0.0034 | | 0.008 | | 0.020 | | 0.0051 | |
| EAR2-DU-53b | EAR2-RA-53b-06 | 0.25 | | | 0.046 | | 0.10 | | 0.26 | | 0.07 | |
| | EAR2-RA-53b-12 | 0.22 | | | 0.037 | | 0.085 | | 0.22 | | 0.056 | |
| EAR2-DU-53c | EAR2-RA-53c-06 | 0.19 | | | 0.035 | | 0.07 | | 0.20 | | 0.05 | |
| | EAR2-RA-53c-12 | 0.18 | | | 0.034 | | 0.073 | | 0.18 | | 0.053 | |
| EAR2-DU-53d | EAR2-RA-53d-06 | 0.85 | | | 0.15 | | 0.34 | | 0.87 | | 0.23 | |
| | EAR2-RA-53d-12 | 0.50 | | | 0.090 | | 0.20 | | 0.50 | | 0.14 | |
| EAR2-DU-53e | EAR2-RA-53e-06 | 0.26 | | | 0.048 | | 0.10 | | 0.26 | | 0.07 | |
| | EAR2-RA-53e-12 | 0.13 | | | 0.025 | | 0.051 | | 0.13 | | 0.040 | |
| EAR2-DU-53f | EAR2-RA-53f-06 | 2.1 | | | 0.35 | | 0.81 | | **2.1** | **no bare areas** | 0.54 | |
| | EAR2-RA-53f-12 | 0.85 | | | 0.14 | | 0.34 | | 0.85 | | 0.21 | |
| EAR2-DU-53g | EAR2-RA-53g-06 | 1.9 | | | 0.28 | | 0.73 | | **1.9** | **no bare areas** | 0.41 | |
| | EAR2-RA-53g-12 | 4.1 | | | 0.54 | | 1.6 | | 4.1 | | 0.73 | |
| EAR2-DU-53h | EAR2-RA-53h-06 | 0.96 | | | 0.16 | | 0.38 | | 0.98 | | 0.25 | |
| | EAR2-RA-53h-12 | 1.0 | | | 0.17 | | 0.4 | | 1.0 | | 0.25 | |
| EAR2-DU-53i | EAR2-RA-53i-06 | 0.18 | | | 0.033 | | 0.07 | | 0.18 | | 0.05 | |
| | EAR2-RA-53i-12 | 0.22 | | | 0.041 | | 0.086 | | 0.22 | | 0.065 | |
| EAR2-DU-53j | EAR2-RA-53j-06-1 | 0.19 | | | 0.034 | | 0.07 | | 0.19 | | 0.05 | |
| | EAR2-RA-53j-06-2 | 0.24 | | | 0.043 | | 0.09 | | 0.24 | | 0.07 | |
| | EAR2-RA-53j-06-3 | 0.18 | | | 0.031 | | 0.07 | | 0.18 | | 0.05 | |
| | EAR2-RA-53j-12 | 0.11 | | | 0.019 | | 0.042 | | 0.11 | | 0.029 | |
| EAR2-DU-53k | EAR2-RA-53k-06 | 0.40 | | | 0.074 | | 0.16 | | 0.42 | | 0.11 | |
| | EAR2-RA-53k-12 | 0.19 | | | 0.035 | | 0.076 | | 0.19 | | 0.054 | |
| EAR2-DU-53l | EAR2-RA-53l-06 | 0.80 | | | 0.14 | | 0.32 | | 0.82 | | 0.21 | |
| | EAR2-RA-53l-12 | 0.43 | | | 0.080 | | 0.17 | | 0.43 | | 0.12 | |
| EAR2-DU-53m | EAR2-RA-53m-06 | 0.22 | | | 0.03 | | 0.08 | | 0.22 | | 0.05 | |
| | EAR2-RA-53m-12 | 0.10 | | | 0.018 | | 0.039 | | 0.10 | | 0.027 | |
| EAR2-DU-54a | EAR2-RA-54a-06 | 2.0 | | | 0.33 | | 0.79 | | **2.0** | **no bare areas** | 0.49 | |
| | EAR2-RA-54a-12 | 3.4 | | | 0.49 | | 1.3 | | 3.4 | | 0.71 | |
| EAR2-DU-54b | EAR2-RA-54b-06 | 2.1 | | | 0.34 | | 0.82 | | **2.1** | **no bare areas** | 0.51 | |
| | EAR2-RA-54b-12 | 1.5 | | | 0.24 | | 0.61 | | 1.5 | | 0.35 | |
| EAR2-DU-54c | EAR2-RA-54c-06 | 1.9 | | | 0.32 | | 0.74 | | **1.9** | **no bare areas** | 0.48 | |
| | EAR2-RA-54c-12 | 1.5 | | | 0.25 | | 0.61 | | 1.5 | | 0.38 | |
| EAR2-DU-54d | EAR2-RA-54d-06 | 2.1 | | | 0.37 | | 0.84 | | **2.2** | **no bare areas** | 0.56 | |
| | EAR2-RA-54d-12 | 2.0 | | | 0.32 | | 0.78 | | 2.0 | | 0.48 | |
| EAR2-DU-54e | EAR2-RA-54e-06 | 1.3 | | | 0.22 | | 0.51 | | **1.3** | **no bare areas** | 0.34 | |
| | EAR2-RA-54e-12 | 1.6 | | | 0.26 | | 0.64 | | 1.6 | | 0.38 | |
| EAR2-DU-54f | EAR2-RA-54f-06 | 1.4 | | | 0.25 | | 0.56 | | **1.5** | **no bare areas** | 0.39 | |
| | EAR2-RA-54f-12 | 0.59 | | | 0.11 | | 0.23 | | 0.59 | | 0.16 | |
| EAR2-DU-54g | EAR2-RA-54g-06 | 0.47 | | | 0.074 | | 0.18 | | 0.48 | | 0.11 | |
| | EAR2-RA-54g-12 | 0.57 | | | 0.10 | | 0.23 | | 0.57 | | 0.15 | |
| EAR2-DU-54h | EAR2-RA-54h-06 | 2.0 | | | 0.35 | | 0.81 | | **2.1** | **no bare areas** | 0.53 | |
| | EAR2-RA-54h-12 | 0.77 | | | 0.13 | | 0.30 | | 0.77 | | 0.20 | |
| EAR2-DU-55a | EAR2-RA-55a-06-1 | 0.0048 | | | 0.0010 | | 0.0019 | | 0.0048 | | 0.0016 | |
| | EAR2-RA-55a-06-2 | 0.0068 | | | 0.0014 | | 0.0027 | | 0.0069 | | 0.0022 | |
| | EAR2-RA-55a-06-3 | 0.0081 | | | 0.0016 | | 0.0032 | | 0.0082 | | 0.0026 | |
| | EAR2-RA-55a-12 | 0.0048 | | | 0.0010 | | 0.0019 | | 0.0048 | | 0.0015 | |
| EAR2-DU-55b | EAR2-RA-55b-06 | 0.011 | | | 0.0023 | | 0.0045 | | 0.017 | | 0.0036 | |
| | EAR2-RA-55b-12 | 0.0039 | | | 0.0008 | | 0.0016 | | 0.0039 | | 0.0012 | |
| EAR2-DU-55c | EAR2-RA-55c-06 | 0.0063 | | | 0.0013 | | 0.0025 | | 0.012 | | 0.0021 | |
| | EAR2-RA-55c-12 | 0.010 | | | 0.0025 | | 0.0034 | | 0.0098 | | 0.0043 | |
| EAR2-DU-55d | EAR2-RA-55d-06 | 0.011 | | | 0.0020 | | 0.0045 | | 0.015 | | 0.0031 | |
| | EAR2-RA-55d-12 | 0.0080 | | | 0.0017 | | 0.0031 | | 0.0080 | | 0.0027 | |
| EAR2-DU-55e | EAR2-RA-55e-06 | 0.0065 | | | 0.0013 | | 0.0026 | | 0.013 | | 0.0020 | |
| | EAR2-RA-55e-12 | 0.016 | | | 0.0025 | | 0.0062 | | 0.016 | | 0.0037 | |
| EAR2-DU-55f | EAR2-RA-55f-06 | 0.50 | | | 0.085 | | 0.20 | | 0.52 | | 0.13 | |
| | EAR2-RA-55f-12 | 0.77 | | | 0.12 | | 0.30 | | 0.77 | | 0.17 | |
| EAR2-DU-55g | EAR2-RA-55g-06 | 0.41 | | | 0.073 | | 0.16 | | 0.43 | | 0.11 | |
| | EAR2-RA-55g-12 | 0.25 | | | 0.04 | | 0.10 | | 0.25 | | 0.064 | |
| EAR2-DU-55h | EAR2-RA-55h-06 | 0.90 | | | 0.15 | | 0.36 | | 0.92 | | 0.23 | |
| | EAR2-RA-55h-12 | 0.58 | | | 0.10 | | 0.23 | | 0.58 | | 0.15 | |
| EAR2-DU-56a | EAR2-RA-56a-06-1 | 0.57 | | | 0.088 | | 0.23 | | 0.57 | | 0.13 | |
| | EAR2-RA-56a-06-2 | 0.20 | | | 0.034 | | 0.08 | | 0.20 | | 0.050 | |
| | EAR2-RA-56a-06-3 | 0.18 | | | 0.032 | | 0.07 | | 0.18 | | 0.050 | |
| | EAR2-RA-56a-12 | 0.068 | | | 0.012 | | 0.027 | | 0.068 | | 0.019 | |
| EAR2-DU-56b | EAR2-RA-56b-06 | 0.36 | | | 0.065 | | 0.14 | | 0.38 | | 0.10 | |
| | EAR2-RA-56b-12 | 0.050 | | | 0.010 | | 0.019 | | 0.050 | | 0.017 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| EAR2-DU-56c | EAR2-RA-56c-06 | 0.60 | | | 0.11 | | 0.24 | | 0.61 | | 0.17 | |
| | EAR2-RA-56c-12 | 0.26 | | | 0.049 | | 0.10 | | 0.26 | | 0.077 | |
| EAR2-DU-56d | EAR2-RA-56d-06 | 0.73 | | | 0.13 | | 0.29 | | 0.75 | | 0.20 | |
| | EAR2-RA-56d-12 | 0.15 | | | 0.027 | | 0.058 | | 0.15 | | 0.041 | |
| EAR2-DU-56e | EAR2-RA-56e-06 | 0.05 | | | 0.009 | | 0.02 | | 0.05 | | 0.01 | |
| | EAR2-RA-56e-12 | 0.011 | | | 0.0021 | | 0.004 | | 0.011 | | 0.0033 | |
| EAR2-DU-56f | EAR2-RA-56f-06 | 0.29 | | | 0.053 | | 0.11 | | 0.29 | | 0.08 | |
| | EAR2-RA-56f-12 | 0.061 | | | 0.012 | | 0.024 | | 0.061 | | 0.018 | |
| EAR2-DU-56g | EAR2-RA-56g-06 | 0.51 | | | 0.092 | | 0.20 | | 0.51 | | 0.14 | |
| | EAR2-RA-56g-12 | 0.22 | | | 0.045 | | 0.08 | | 0.22 | | 0.074 | |
| EAR2-DU-56h | EAR2-RA-56h-06 | 0.066 | | | 0.012 | | 0.026 | | 0.067 | | 0.019 | |
| | EAR2-RA-56h-12 | 0.12 | | | 0.030 | | 0.039 | | 0.12 | | 0.055 | |
| EAR2-DU-56i | EAR2-RA-56i-06 | 1.9 | | | 0.32 | | 0.74 | | **1.9** | **no bare areas** | 0.48 | |
| | EAR2-RA-56i-12 | 0.23 | | | 0.041 | | 0.092 | | 0.23 | | 0.062 | |
| EAR2-DU-56j | EAR2-RA-56j-06-1 | 2.0 | | | 0.34 | | 0.80 | | **2.0** | **reseeded** | 0.51 | |
| | EAR2-RA-56j-06-2 | 1.8 | | | 0.31 | | 0.72 | | **1.8** | **reseeded** | 0.47 | |
| | EAR2-RA-56j-06-3 | 0.57 | | | 0.10 | | 0.23 | | 0.57 | **reseeded** | 0.15 | |
| | EAR2-RA-56j-12 | 0.29 | | | 0.048 | | 0.12 | | 0.29 | | 0.072 | |
| EAR2-DU-56k | EAR2-RA-56k-06 | 1.37 | | | 0.23 | | 0.54 | | **1.4** | **no bare areas** | 0.35 | |
| | EAR2-RA-56k-12 | 3.5 | | | 0.61 | | 1.4 | | 3.5 | | 0.93 | |
| EAR2-DU-56l | EAR2-RA-56l-06 | 0.70 | | | 0.12 | | 0.28 | | 0.72 | | 0.19 | |
| | EAR2-RA-56l-12 | 3.8 | | | 0.63 | | 1.5 | | 3.8 | | 0.95 | |
| EAR2-DU-56m | EAR2-RA-56m-06 | 0.59 | | | 0.10 | | 0.23 | | 0.59 | | 0.15 | |
| | EAR2-RA-56m-12 | 0.16 | | | 0.027 | | 0.062 | | 0.16 | | 0.042 | |
| EAR2-DU-56n | EAR2-RA-56n-06 | 1.5 | | | 0.26 | | 0.57 | | **1.5** | **no bare areas** | 0.40 | |
| | EAR2-RA-56n-12 | 1.3 | | | 0.23 | | 0.53 | | 1.3 | | 0.34 | |
| EAR2-DU-57a | EAR2-RA-57a-06 | 1.3 | | | 0.22 | | 0.50 | | **1.3** | **no bare areas** | 0.33 | |
| | EAR2-RA-57a-12 | 1.2 | | | 0.20 | | 0.47 | | 1.2 | | 0.30 | |
| EAR2-DU-57b | EAR2-RA-57b-06 | 1.1 | | | 0.20 | | 0.44 | | **1.1** | **no bare areas** | 0.31 | |
| | EAR2-RA-57b-12 | 0.84 | | | 0.15 | | 0.33 | | 0.84 | | 0.23 | |
| EAR2-DU-57c | EAR2-RA-57c-06 | 0.81 | | | 0.15 | | 0.32 | | 0.82 | | 0.23 | |
| | EAR2-RA-57c-12 | 0.88 | | | 0.16 | | 0.35 | | 0.88 | | 0.25 | |
| EAR2-DU-57d | EAR2-RA-57d-06 | 0.79 | | | 0.15 | | 0.31 | | 0.80 | | 0.23 | |
| | EAR2-RA-57d-12 | 0.61 | | | 0.11 | | 0.24 | | 0.61 | | 0.18 | |
| EAR2-DU-57e | EAR2-RA-57e-06 | 0.39 | | | 0.070 | | 0.16 | | 0.41 | | 0.11 | |
| | EAR2-RA-57e-12 | 0.28 | | | 0.049 | | 0.11 | | 0.28 | | 0.075 | |
| EAR2-DU-57f | EAR2-RA-57f-06 | 0.24 | | | 0.044 | | 0.09 | | 0.24 | | 0.07 | |
| | EAR2-RA-57f-12 | 0.20 | | | 0.037 | | 0.080 | | 0.20 | | 0.058 | |
| EAR2-DU-57g | EAR2-RA-57g-06 | 0.48 | | | 0.086 | | 0.19 | | 0.50 | | 0.13 | |
| | EAR2-RA-57g-12 | 1.2 | | | 0.19 | | 0.46 | | 1.2 | | 0.29 | |
| EAR2-DU-57h | EAR2-RA-57h-06 | 0.31 | | | 0.054 | | 0.12 | | 0.32 | | 0.08 | |
| | EAR2-RA-57h-12 | 0.48 | | | 0.086 | | 0.19 | | 0.48 | | 0.13 | |
| EAR2-DU-58a | EAR2-RA-58a-06-1 | 2.0 | | | 0.35 | | 0.8 | | **2.0** | **no bare areas** | 0.54 | |
| | EAR2-RA-58a-06-2 | 1.1 | | | 0.21 | | 0.5 | | **1.1** | **no bare areas** | 0.33 | |
| | EAR2-RA-58a-06-3 | 1.4 | | | 0.26 | | 0.6 | | **1.4** | **no bare areas** | 0.40 | |
| | EAR2-RA-58a-12 | 1.6 | | | 0.28 | | 0.63 | | 1.6 | | 0.44 | |
| EAR2-DU-58b | EAR2-RA-58b-06 | 1.8 | | | 0.31 | | 0.7 | | **1.8** | **reseeded** | 0.47 | |
| | EAR2-RA-58b-12 | 1.5 | | | 0.27 | | 0.59 | | 1.5 | | 0.41 | |
| EAR2-DU-58c | EAR2-RA-58c-06 | 1.3 | | | 0.24 | | 0.5 | | **1.3** | **no bare areas** | 0.37 | |
| | EAR2-RA-58c-12 | 0.93 | | | 0.17 | | 0.37 | | 0.93 | | 0.27 | |
| EAR2-DU-58d | EAR2-RA-58d-06 | 0.88 | | | 0.16 | | 0.35 | | 0.89 | | 0.25 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| | EAR2-RA-58d-12 | 0.96 | | | 0.17 | | 0.38 | | 0.96 | | 0.27 | |
| EAR2-DU-58e | EAR2-RA-58e-06 | 1.2 | | | 0.21 | | 0.5 | | **1.2** | **no bare areas** | 0.32 | |
| | EAR2-RA-58e-12 | 1.0 | | | 0.18 | | 0.39 | | 1.0 | | 0.28 | |
| EAR2-DU-58f | EAR2-RA-58f-06 | 1.4 | | | 0.25 | | 0.6 | | **1.4** | **no bare areas** | 0.38 | |
| | EAR2-RA-58f-12 | 1.4 | | | 0.26 | | 0.57 | | 1.4 | | 0.39 | |
| EAR2-DU-59a | EAR2-RA-59a-06 | 0.94 | | | 0.16 | | 0.37 | | 0.94 | | 0.25 | |
| | EAR2-RA-59a-12 | 1.7 | | | 0.28 | | 0.67 | | 1.7 | | 0.42 | |
| EAR2-DU-59b | EAR2-RA-59b-06 | 1.1 | | | 0.20 | | 0.4 | | **1.1** | **no bare areas** | 0.31 | |
| | EAR2-RA-59b-12 | 0.69 | | | 0.12 | | 0.27 | | 0.69 | | 0.19 | |
| EAR2-DU-59c | EAR2-RA-59c-06 | 1.8 | | | 0.33 | | 0.73 | | **1.8** | **no bare areas** | 0.50 | |
| | EAR2-RA-59c-12 | 2.1 | | | 0.36 | | 0.82 | | 2.1 | | 0.55 | |
| EAR2-DU-60a | EAR2-RA-60a-06-1 | 3.2 | | | 0.53 | | **1.3** | | **3.2** | **no bare areas** | 0.79 | |
| | EAR2-RA-60a-06-2 | 4.0 | | | 0.65 | | **1.6** | | **4.0** | **no bare areas** | 0.97 | |
| | EAR2-RA-60a-06-3 | 1.6 | | | 0.26 | | 0.61 | | **1.6** | **no bare areas** | 0.40 | |
| | EAR2-RA-60a-12 | 2.1 | | | 0.34 | | 0.84 | | 2.1 | | 0.51 | |
| EAR2-DU-60b | EAR2-RA-60b-06 | 0.85 | | | 0.15 | | 0.33 | | 0.86 | | 0.24 | |
| | EAR2-RA-60b-12 | 0.92 | | | 0.16 | | 0.36 | | 0.92 | | 0.24 | |
| EAR2-DU-60c | EAR2-RA-60c-06 | 0.74 | | | 0.13 | | 0.29 | | 0.75 | | 0.21 | |
| | EAR2-RA-60c-12 | 0.51 | | | 0.086 | | 0.20 | | 0.51 | | 0.13 | |
| EAR2-DU-60d | EAR2-RA-60d-06 | 0.61 | | | 0.11 | | 0.24 | | 0.61 | | 0.17 | |
| | EAR2-RA-60d-12 | 0.79 | | | 0.14 | | 0.31 | | 0.79 | | 0.21 | |
| EAR2-DU-61a | EAR2-RA-61a-06-1 | 0.71 | | | 0.12 | | 0.27 | | 0.71 | | 0.19 | |
| | EAR2-RA-61a-06-2 | 0.64 | | | 0.12 | | 0.25 | | 0.64 | | 0.19 | |
| | EAR2-RA-61a-06-3 | 0.56 | | | 0.10 | | 0.22 | | 0.56 | | 0.16 | |
| | EAR2-RA-61a-12 | 0.77 | | | 0.13 | | 0.30 | | 0.77 | | 0.20 | |
| EAR2-DU-61b | EAR2-RA-61b-06 | 0.24 | | | 0.047 | | 0.09 | | 0.24 | | 0.08 | |
| | EAR2-RA-61b-12 | 0.21 | | | 0.043 | | 0.08 | | 0.21 | | 0.07 | |
| EAR2-DU-61c | EAR2-RA-61c-06 | 0.37 | | | 0.070 | | 0.14 | | 0.37 | | 0.11 | |
| | EAR2-RA-61c-12 | 0.24 | | | 0.051 | | 0.09 | | 0.24 | | 0.08 | |
| EAR2-DU-61d | EAR2-RA-61d-06 | 1.9 | | | 0.31 | | 0.75 | | **1.9** | **no bare areas** | 0.45 | |
| | EAR2-RA-61d-12 | 2.7 | | | 0.44 | | 1.0 | | 2.7 | | 0.68 | |
| EAR2-DU-61e | EAR2-RA-61e-06 | 0.91 | | | 0.16 | | 0.36 | | 0.92 | | 0.24 | |
| | EAR2-RA-61e-12 | 1.4 | | | 0.23 | | 0.54 | | 1.4 | | 0.36 | |
| EAR2-DU-61f | EAR2-RA-61f-06 | 0.95 | | | 0.18 | | 0.38 | | 0.96 | | 0.27 | |
| | EAR2-RA-61f-12 | 0.92 | | | 0.14 | | 0.36 | | 0.92 | | 0.20 | |
| EAR2-DU-61g | EAR2-RA-61g-06 | 0.38 | | | 0.066 | | 0.15 | | 0.39 | | 0.10 | |
| | EAR2-RA-61g-12 | 0.20 | | | 0.035 | | 0.077 | | 0.20 | | 0.055 | |
| EAR2-DU-62a | EAR2-RA-62a-06-1 | 0.64 | | | 0.11 | | 0.25 | | 0.64 | | 0.17 | |
| | EAR2-RA-62a-06-2 | 0.44 | | | 0.079 | | 0.17 | | 0.43 | | 0.12 | |
| | EAR2-RA-62a-06-3 | 0.36 | | | 0.064 | | 0.14 | | 0.36 | | 0.10 | |
| | EAR2-RA-62a-12 | 0.33 | | | 0.057 | | 0.13 | | 0.33 | | 0.087 | |
| EAR2-DU-62b | EAR2-RA-62b-06 | 0.12 | | | 0.022 | | 0.05 | | 0.12 | | 0.03 | |
| | EAR2-RA-62b-12 | 0.047 | | | 0.009 | | 0.018 | | 0.047 | | 0.013 | |
| EAR2-DU-62c | EAR2-RA-62c-06 | 0.46 | | | 0.085 | | 0.18 | | 0.46 | | 0.13 | |
| | EAR2-RA-62c-12 | 0.35 | | | 0.060 | | 0.13 | | 0.35 | | 0.09 | |
| EAR2-DU-62d | EAR2-RA-62d-06 | 0.65 | | | 0.11 | | 0.25 | | 0.65 | | 0.17 | |
| | EAR2-RA-62d-12 | 0.50 | | | 0.083 | | 0.19 | | 0.50 | | 0.12 | |
| EAR2-DU-62e | EAR2-RA-62e-06 | 0.69 | | | 0.11 | | 0.27 | | 0.69 | | 0.17 | |
| | EAR2-RA-62e-12 | 1.2 | | | 0.17 | | 0.48 | | 1.2 | | 0.23 | |
| EAR2-DU-62f | EAR2-RA-62f-06 | 0.19 | | | 0.035 | | 0.07 | | 0.19 | | 0.06 | |
| | EAR2-RA-62f-12 | 0.24 | | | 0.043 | | 0.093 | | 0.24 | | 0.067 | |
| EAR3-DU-01a | EAR3-RA-01a-06 | 1.15 | | | 0.21 | | 0.44 | | **1.15** | **no bare areas** | 0.33 | |
| | EAR3-RA-01a-12 | 1.46 | | | 0.25 | | 0.57 | | 1.5 | | 0.38 | |
| EAR3-DU-01b | EAR3-RA-01b-06 | 0.51 | | | 0.094 | | 0.20 | | 0.51 | | 0.15 | |
| | EAR3-RA-01b-12 | 0.26 | | | 0.044 | | 0.099 | | 0.26 | | 0.067 | |
| EAR3-DU-01c | EAR3-RA-01c-06 | 1.14 | | | 0.20 | | 0.44 | | **1.14** | **reseeded** | 0.31 | |
| | EAR3-RA-01c-12 | 1.21 | | | 0.20 | | 0.47 | | 1.2 | | 0.31 | |
| EAR3-DU-02a | EAR3-RA-02a-06 | **10.7** | **excavated** | | 1.3 | **excavated under RO1** | 4.2 | **excavated under RO1** | 10.6 | **excavated under RO1** | 1.8 | **excavated under RO-1** |
| | EAR3-RA-02a-12 | **1.80** | **excavated** | | 0.27 | **excavated under RO1** | 0.70 | **excavated under RO1** | 1.8 | **excavated under RO1** | 0.40 | **excavated under RO-1** |
| EAR3-DU-02b | EAR3-RA-02b-06 | 1.53 | | | 0.28 | | 0.58 | | **1.53** | **reseeded** | 0.44 | |
| | EAR3-RA-02b-12 | 2.78 | | | 0.45 | | 1.1 | | 2.8 | | 0.69 | |
| EAR3-DU-03a | EAR3-RA-03a-06 | 0.75 | | | 0.15 | | 0.28 | | 0.75 | | 0.25 | |
| | EAR3-RA-03a-12 | 0.71 | | | 0.15 | | 0.26 | | 0.71 | | 0.24 | |
| EAR3-DU-03b | EAR3-RA-03b-06 | 0.41 | | | 0.073 | | 0.16 | | 0.41 | | 0.11 | |
| | EAR3-RA-03b-12 | 0.53 | | | 0.094 | | 0.20 | | 0.53 | | 0.15 | |
| EAR3-DU-04a | EAR3-RA-04a-06 | 0.76 | | | 0.14 | | 0.29 | | 0.76 | | 0.23 | |
| | EAR3-RA-04a-12 | 0.71 | | | 0.15 | | 0.26 | | 0.71 | | 0.24 | |
| EAR3-DU-04b | EAR3-RA-04b-06 | 2.17 | | | 0.39 | | 0.83 | | **2.17** | | 0.60 | |
| | EAR3-RA-04b-12 | 6.72 | | | 0.98 | | 2.6 | | 6.7 | | 1.4 | |
| EAR3-DU-05a | EAR3-RA-05a-06-1 | 1.29 | | | 0.22 | | 0.50 | | **1.29** | **no bare areas** | 0.34 | |
| | EAR3-RA-05a-06-2 | **3.80** | | | 0.61 | | **1.5** | | **3.78** | **no bare areas** | 0.90 | |
| | EAR3-RA-05a-06-3 | 1.47 | | | 0.25 | | 0.57 | | **1.47** | **no bare areas** | 0.38 | |
| | EAR3-RA-05a-12 | 1.39 | | | 0.24 | | 0.54 | | 1.4 | | 0.36 | |
| EAR3-DU-05b | EAR3-RA-05b-06 | 0.66 | | | 0.12 | | 0.25 | | 0.66 | | 0.19 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| | EAR3-RA-05b-12 | 0.58 | | | 0.11 | | 0.22 | | 0.58 | | 0.17 | |
| EAR3-DU-06a | EAR3-RA-06a-06 | 2.43 | | | 0.43 | | 0.94 | | **2.43** | **no bare areas** | 0.67 | |
| | EAR3-RA-06a-12 | 3.11 | | | 0.54 | | 1.2 | | 3.1 | | 0.82 | |
| EAR3-DU-06b | EAR3-RA-06b-06 | 0.94 | | | 0.16 | | 0.36 | | 0.94 | | 0.25 | |
| | EAR3-RA-06b-12 | 1.21 | | | 0.21 | | 0.47 | | 1.2 | | 0.33 | |
| EAR3-DU-07a | EAR3-RA-07a-06 | 0.61 | | | 0.13 | | 0.22 | | 0.61 | | 0.22 | |
| | EAR3-RA-07a-12 | 0.42 | | | 0.09 | | 0.15 | | 0.42 | | 0.16 | |
| EAR3-DU-07b | EAR3-RA-07b-06 | 0.35 | | | 0.075 | | 0.13 | | 0.35 | | 0.12 | |
| | EAR3-RA-07b-12 | 0.26 | | | 0.061 | | 0.09 | | 0.26 | | 0.10 | |
| EAR3-DU-07c | EAR3-RA-07c-06 | 0.47 | | | 0.092 | | 0.18 | | 0.47 | | 0.15 | |
| | EAR3-RA-07c-12 | 0.30 | | | 0.060 | | 0.12 | | 0.30 | | 0.10 | |
| EAR3-DU-07d | EAR3-RA-07d-06 | 0.36 | | | 0.070 | | 0.14 | | 0.36 | | 0.11 | |
| | EAR3-RA-07d-12 | 0.10 | | | 0.019 | | 0.038 | | 0.10 | | 0.030 | |
| EAR3-DU-08a | EAR3-RA-08a-06-1 | 0.40 | | | 0.076 | | 0.15 | | 0.40 | | 0.12 | |
| | EAR3-RA-08a-06-2 | 0.46 | | | 0.086 | | 0.18 | | 0.46 | | 0.14 | |
| | EAR3-RA-08a-06-3 | 0.35 | | | 0.066 | | 0.13 | | 0.35 | | 0.11 | |
| | EAR3-RA-08a-12 | 0.66 | | | 0.11 | | 0.26 | | 0.66 | | 0.16 | |
| EAR3-DU-08b | EAR3-RA-08b-06 | 0.16 | | | 0.031 | | 0.061 | | 0.16 | | 0.050 | |
| | EAR3-RA-08b-12 | 0.12 | | | 0.022 | | 0.045 | | 0.12 | | 0.035 | |
| EAR3-DU-08c | EAR3-RA-08c-06 | 0.30 | | | 0.057 | | 0.11 | | 0.30 | | 0.090 | |
| | EAR3-RA-08c-12 | 0.31 | | | 0.056 | | 0.12 | | 0.31 | | 0.088 | |
| EAR3-DU-09a | EAR3-RA-09a-06 | 0.60 | | | 0.11 | | 0.23 | | 0.60 | | 0.18 | |
| | EAR3-RA-09a-12 | 0.40 | | | 0.074 | | 0.15 | | 0.40 | | 0.12 | |
| EAR3-DU-09b | EAR3-RA-09b-06 | 0.61 | | | 0.12 | | 0.24 | | 0.62 | | 0.18 | |
| | EAR3-RA-09b-12 | 0.47 | | | 0.090 | | 0.18 | | 0.47 | | 0.14 | |
| EAR3-DU-09c | EAR3-RA-09c-06 | 0.84 | | | 0.15 | | 0.32 | | 0.84 | | 0.24 | |
| | EAR3-RA-09c-12 | 0.55 | | | 0.10 | | 0.21 | | 0.55 | | 0.16 | |
| EAR3-DU-09d | EAR3-RA-09d-06 | 0.44 | | | 0.084 | | 0.17 | | 0.44 | | 0.13 | |
| | EAR3-RA-09d-12 | 0.32 | | | 0.059 | | 0.12 | | 0.32 | | 0.093 | |
| EAR3-DU-09e | EAR3-RA-09e-06 | 1.02 | | | 0.18 | | 0.39 | | 1.02 | | 0.29 | |
| | EAR3-RA-09e-12 | 0.34 | | | 0.067 | | 0.13 | | 0.34 | | 0.11 | |
| EAR3-DU-10a | EAR3-RA-10a-06-1 | 0.29 | | | 0.059 | | 0.11 | | 0.29 | | 0.10 | |
| | EAR3-RA-10a-06-2 | 0.26 | | | 0.052 | | 0.10 | | 0.26 | | 0.084 | |
| | EAR3-RA-10a-06-3 | 0.41 | | | 0.074 | | 0.16 | | 0.41 | | 0.11 | |
| | EAR3-RA-10a-12 | 0.23 | | | 0.043 | | 0.087 | | 0.23 | | 0.067 | |
| EAR3-DU-10b | EAR3-RA-10b-06 | 1.49 | | | 0.25 | | 0.58 | | **1.48** | **no bare areas** | 0.37 | |
| | EAR3-RA-10b-12 | 1.69 | | | 0.27 | | 0.66 | | 1.7 | | 0.40 | |
| EAR3-DU-10c | EAR3-RA-10c-06 | 0.87 | | | 0.15 | | 0.33 | | 0.87 | | 0.23 | |
| | EAR3-RA-10c-12 | 1.06 | | | 0.18 | | 0.40 | | 1.1 | | 0.27 | |
| EAR3-DU-10d | EAR3-RA-10d-06 | 0.69 | | | 0.13 | | 0.26 | | 0.69 | | 0.21 | |
| | EAR3-RA-10d-12 | 0.51 | | | 0.10 | | 0.19 | | 0.51 | | 0.16 | |
| EAR3-DU-11a | EAR3-RA-11a-06 | 0.39 | | | 0.074 | | 0.15 | | 0.39 | | 0.12 | |
| | EAR3-RA-11a-12 | 0.25 | | | 0.057 | | 0.09 | | 0.25 | | 0.10 | |
| EAR3-DU-11b | EAR3-RA-11b-06 | 0.80 | | | 0.15 | | 0.30 | | 0.80 | | 0.25 | |
| | EAR3-RA-11b-12 | 0.68 | | | 0.13 | | 0.26 | | 0.68 | | 0.20 | |
| EAR3-DU-11c | EAR3-RA-11c-06 | 0.41 | | | 0.078 | | 0.16 | | 0.42 | | 0.12 | |
| | EAR3-RA-11c-12 | 0.13 | | | 0.029 | | 0.049 | | 0.13 | | 0.048 | |
| EAR3-DU-12a | EAR3-RA-12a-06 | 0.41 | | | 0.078 | | 0.16 | | 0.42 | | 0.12 | |
| | EAR3-RA-12a-12 | 0.81 | | | 0.13 | | 0.31 | | 0.81 | | 0.20 | |
| EAR3-DU-12b | EAR3-RA-12b-06-1 | **6.50** | | | 0.97 | | **2.5** | **no landscaping strip** | **6.45** | **no bare areas** | **1.4** | **excavated** |
| | EAR3-RA-12b-06-2 | **3.38** | | | 0.53 | | 1.3 | **no landscaping strip** | **3.37** | **no bare areas** | 0.79 | **excavated** |
| | EAR3-RA-12b-06-3 | 2.79 | | | 0.47 | | **1.1** | **no landscaping strip** | **2.79** | **no bare areas** | 0.72 | **excavated** |
| | EAR3-RA-12b-12 | 12.97 | | | 1.9 | | 5.0 | | 12.8 | | **2.7** | |
| EAR3-DU-12c | EAR3-RA-12c-06 | 0.48 | | | 0.088 | | 0.18 | | 0.48 | | 0.14 | |
| | EAR3-RA-12c-12 | 0.46 | | | 0.082 | | 0.17 | | 0.45 | | 0.13 | |
| EAR3-DU-12d | EAR3-RA-12d-06 | 0.62 | | | 0.12 | | 0.24 | | 0.62 | | 0.18 | |
| | EAR3-RA-12d-12 | 2.06 | | | 0.48 | | 0.7 | | 2.1 | | 0.81 | |
| EAR3-DU-12e | EAR3-RA-12e-06 | 0.46 | | | 0.087 | | 0.18 | | 0.46 | | 0.14 | |
| | EAR3-RA-12e-12 | 0.11 | | | 0.024 | | 0.042 | | 0.11 | | 0.039 | |
| EAR3-DU-13a | EAR3-RA-13a-06 | 1.47 | | | 0.26 | | 0.57 | | **1.47** | **no bare areas** | 0.40 | |
| | EAR3-RA-13a-12 | 0.56 | | | 0.10 | | 0.22 | | 0.56 | | 0.15 | |
| EAR3-DU-13b | EAR3-RA-13b-06 | 0.85 | | | 0.16 | | 0.32 | | 0.85 | | 0.25 | |
| | EAR3-RA-13b-12 | 0.67 | | | 0.12 | | 0.26 | | 0.67 | | 0.19 | |
| EAR3-DU-13c | EAR3-RA-13c-06 | 0.60 | | | 0.11 | | 0.23 | | 0.60 | | 0.17 | |
| | EAR3-RA-13c-12 | 0.34 | | | 0.062 | | 0.13 | | 0.34 | | 0.10 | |
| EAR3-DU-13d | EAR3-RA-13d-06 | 0.39 | | | 0.076 | | 0.15 | | 0.39 | | 0.12 | |
| | EAR3-RA-13d-12 | 0.21 | | | 0.041 | | 0.080 | | 0.21 | | 0.065 | |
| EAR3-DU-14a | EAR3-RA-14a-06 | 0.40 | | | 0.076 | | 0.16 | | 0.40 | **reseeded** | 0.12 | |
| | EAR3-RA-14a-12 | 1.08 | | | 0.18 | | 0.42 | | 1.1 | | 0.28 | |
| EAR3-DU-14b | EAR3-RA-14b-06 | 0.82 | | | 0.15 | | 0.32 | | 0.82 | | 0.24 | |
| | EAR3-RA-14b-12 | 3.50 | | | 0.64 | | 1.3 | | 3.5 | | 1.0 | |
| EAR3-DU-14c | EAR3-RA-14c-06 | 0.41 | | | 0.084 | | 0.16 | | 0.41 | | 0.14 | |
| | EAR3-RA-14c-12 | 0.28 | | | 0.057 | | 0.10 | | 0.28 | | 0.092 | |
| EAR3-DU-15a | EAR3-RA-15a-06-1 | 0.21 | | | 0.041 | | 0.080 | | 0.21 | | 0.065 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| | EAR3-RA-15a-06-2 | 0.26 | | | 0.052 | | 0.10 | | 0.26 | | 0.083 | |
| | EAR3-RA-15a-06-3 | 0.27 | | | 0.063 | | 0.09 | | 0.27 | | 0.11 | |
| | EAR3-RA-15a-12 | 0.12 | | | 0.024 | | 0.044 | | 0.12 | | 0.039 | |
| EAR3-DU-15b | EAR3-RA-15b-06 | 0.32 | | | 0.058 | | 0.12 | | 0.32 | | 0.091 | |
| | EAR3-RA-15b-12 | 0.47 | | | 0.083 | | 0.18 | | 0.47 | | 0.13 | |
| EAR3-DU-15c | EAR3-RA-15c-06 | 0.47 | | | 0.084 | | 0.18 | | 0.47 | | 0.13 | |
| | EAR3-RA-15c-12 | 0.55 | | | 0.095 | | 0.21 | | 0.55 | | 0.15 | |
| EAR3-DU-15d | EAR3-RA-15d-06 | 0.80 | | | 0.14 | | 0.31 | | 0.80 | | 0.22 | |
| | EAR3-RA-15d-12 | 0.84 | | | 0.14 | | 0.33 | | 0.84 | | 0.22 | |
| EAR3-DU-15e | EAR3-RA-15e-06 | 0.87 | | | 0.16 | | 0.34 | | 0.87 | | 0.25 | |
| | EAR3-RA-15e-12 | 0.63 | | | 0.11 | | 0.24 | | 0.63 | | 0.17 | |
| EAR3-DU-15f | EAR3-RA-15f-06 | 0.45 | | | 0.086 | | 0.17 | | 0.45 | | 0.14 | |
| | EAR3-RA-15f-12 | 1.04 | | | 0.18 | | 0.41 | | 1.0 | | 0.28 | |
| EAR3-DU-16a | EAR3-RA-16a-06 | 0.73 | | | 0.13 | | 0.28 | | 0.73 | | 0.21 | |
| | EAR3-RA-16a-12 | 0.39 | | | 0.071 | | 0.15 | | 0.39 | | 0.11 | |
| EAR3-DU-16b | EAR3-RA-16b-06 | 0.40 | | | 0.070 | | 0.15 | | 0.40 | | 0.11 | |
| | EAR3-RA-16b-12 | 0.26 | | | 0.046 | | 0.101 | | 0.26 | | 0.071 | |
| EAR3-DU-16c | EAR3-RA-16c-06 | 0.21 | | | 0.040 | | 0.083 | | 0.21 | | 0.063 | |
| | EAR3-RA-16c-12 | 0.39 | | | 0.070 | | 0.15 | | 0.39 | | 0.11 | |
| EAR3-DU-16d | EAR3-RA-16d-06 | 1.05 | | | 0.18 | | 0.41 | | **1.05** | **reseeded** | 0.28 | |
| | EAR3-RA-16d-12 | 0.62 | | | 0.10 | | 0.24 | | 0.62 | | 0.16 | |
| EAR3-DU-16e | EAR3-RA-16e-06 | 0.81 | | | 0.15 | | 0.32 | | 0.81 | | 0.23 | |
| | EAR3-RA-16e-12 | 0.45 | | | 0.082 | | 0.17 | | 0.45 | | 0.13 | |
| EAR3-DU-17a | EAR3-RA-17a-06 | 0.91 | | | 0.15 | | 0.36 | | 0.91 | | 0.23 | |
| | EAR3-RA-17a-12 | 0.94 | | | 0.16 | | 0.37 | | 0.94 | | 0.24 | |
| EAR3-DU-17b | EAR3-RA-17b-06 | 0.67 | | | 0.12 | | 0.26 | | 0.68 | | 0.19 | |
| | EAR3-RA-17b-12 | 0.80 | | | 0.13 | | 0.31 | | 0.80 | | 0.20 | |
| EAR3-DU-17c | EAR3-RA-17c-06 | 0.62 | | | 0.11 | | 0.24 | | 0.62 | | 0.17 | |
| | EAR3-RA-17c-12 | 0.39 | | | 0.077 | | 0.15 | | 0.40 | | 0.12 | |
| EAR3-DU-18a | EAR3-RA-18a-06-1 | 1.75 | | | 0.29 | | 0.68 | | **1.74** | **no bare areas** | 0.44 | |
| | EAR3-RA-18a-06-2 | 1.75 | | | 0.29 | | 0.68 | | **1.75** | **no bare areas** | 0.44 | |
| | EAR3-RA-18a-06-3 | 2.04 | | | 0.34 | | 0.80 | | **2.04** | **no bare areas** | 0.52 | |
| | EAR3-RA-18a-12 | 1.98 | | | 0.32 | | 0.77 | | 2.0 | | 0.48 | |
| EAR3-DU-18b | EAR3-RA-18b-06 | 0.85 | | | 0.15 | | 0.33 | | 0.85 | | 0.22 | |
| | EAR3-RA-18b-12 | 0.53 | | | 0.092 | | 0.20 | | 0.53 | | 0.14 | |
| EAR3-DU-18c | EAR3-RA-18c-06 | 0.87 | | | 0.15 | | 0.34 | | 0.87 | | 0.23 | |
| | EAR3-RA-18c-12 | 0.29 | | | 0.054 | | 0.11 | | 0.29 | | 0.085 | |
| EAR3-DU-19a | EAR3-RA-19a-06 | 1.20 | | | 0.22 | | 0.46 | | **1.20** | **no bare areas** | 0.34 | |
| | EAR3-RA-19a-12 | 1.00 | | | 0.17 | | 0.39 | | 1.0 | | 0.27 | |
| EAR3-DU-19b | EAR3-RA-19b-06 | 1.08 | | | 0.20 | | 0.41 | | **1.08** | **no bare areas** | 0.32 | |
| | EAR3-RA-19b-12 | 1.08 | | | 0.21 | | 0.40 | | 1.1 | | 0.34 | |
| EAR3-DU-19c | EAR3-RA-19c-06 | 0.78 | | | 0.14 | | 0.30 | | 0.78 | | 0.23 | |
| | EAR3-RA-19c-12 | 0.38 | | | 0.068 | | 0.15 | | 0.38 | | 0.10 | |
| EAR3-DU-19d | EAR3-RA-19d-06 | 1.88 | | | 0.33 | | 0.73 | | **1.88** | **reseeded** | 0.51 | |
| | EAR3-RA-19d-12 | 2.32 | | | 0.41 | | 0.90 | | 2.3 | | 0.62 | |
| EAR3-DU-20a | EAR3-RA-20a-06-1 | **5.36** | | | 0.81 | | **2.1** | **no landscaping strip** | **5.33** | **no bare areas** | **1.2** | **excavated** |
| | EAR3-RA-20a-06-2 | **3.51** | | | 0.54 | | **1.4** | **no landscaping strip** | **3.50** | **no bare areas** | 0.80 | **excavated** |
| | EAR3-RA-20a-06-3 | **3.76** | | | 0.58 | | **1.5** | **no landscaping strip** | **3.74** | **no bare areas** | 0.85 | **excavated** |
| | EAR3-RA-20a-12 | 8.96 | | | 1.3 | | 3.5 | | 8.9 | | **1.9** | |
| EAR3-DU-20b | EAR3-RA-20b-06 | 2.27 | | | 0.37 | | 0.89 | | **2.27** | **reseeded** | 0.56 | |
| | EAR3-RA-20b-12 | 1.72 | | | 0.28 | | 0.67 | | 1.7 | | 0.43 | |
| EAR3-DU-21a | EAR3-RA-21a-06 | 0.49 | | | 0.092 | | 0.19 | | 0.49 | | 0.14 | |
| | EAR3-RA-21a-12 | 0.39 | | | 0.071 | | 0.15 | | 0.39 | | 0.11 | |
| EAR3-DU-21b | EAR3-RA-21b-06 | 0.23 | | | 0.046 | | 0.089 | | 0.23 | | 0.075 | |
| | EAR3-RA-21b-12 | 0.055 | | | 0.012 | | 0.020 | | 0.055 | | 0.021 | |
| EAR3-DU-21c | EAR3-RA-21c-06 | 0.18 | | | 0.037 | | 0.068 | | 0.18 | | 0.060 | |
| | EAR3-RA-21c-12 | 0.14 | | | 0.030 | | 0.052 | | 0.14 | | 0.048 | |
| EAR3-DU-21d | EAR3-RA-21d-06 | 0.32 | | | 0.062 | | 0.13 | | 0.32 | | 0.10 | |
| | EAR3-RA-21d-12 | 0.36 | | | 0.065 | | 0.14 | | 0.36 | | 0.10 | |
| EAR3-DU-22a | EAR3-RA-22a-06 | 0.97 | | | 0.17 | | 0.38 | | 0.97 | | 0.26 | |
| | EAR3-RA-22a-12 | 1.23 | | | 0.22 | | 0.48 | | 1.2 | | 0.33 | |
| EAR3-DU-22b | EAR3-RA-22b-06 | 0.50 | | | 0.093 | | 0.20 | | 0.51 | | 0.15 | |
| | EAR3-RA-22b-12 | 0.48 | | | 0.089 | | 0.18 | | 0.48 | | 0.14 | |
| EAR3-DU-22c | EAR3-RA-22c-06 | 1.01 | | | 0.18 | | 0.40 | | 1.02 | | 0.27 | |
| | EAR3-RA-22c-12 | 0.90 | | | 0.16 | | 0.35 | | 0.90 | | 0.24 | |
| EAR3-DU-22d | EAR3-RA-22d-06 | 0.61 | | | 0.11 | | 0.24 | | 0.61 | | 0.17 | |
| | EAR3-RA-22d-12 | 0.30 | | | 0.057 | | 0.11 | | 0.30 | | 0.091 | |
| EAR3-DU-23a | EAR3-RA-23a-06-1 | 0.30 | | | 0.058 | | 0.12 | | 0.31 | | 0.093 | |
| | EAR3-RA-23a-06-2 | 0.29 | | | 0.056 | | 0.11 | | 0.29 | | 0.090 | |
| | EAR3-RA-23a-06-3 | 0.27 | | | 0.053 | | 0.10 | | 0.27 | | 0.085 | |
| | EAR3-RA-23a-12 | 0.13 | | | 0.026 | | 0.051 | | 0.14 | | 0.042 | |
| EAR3-DU-23b | EAR3-RA-23b-06 | 0.86 | | | 0.15 | | 0.33 | | 0.86 | | 0.24 | |
| | EAR3-RA-23b-12 | 0.19 | | | 0.040 | | 0.071 | | 0.19 | | 0.065 | |
| EAR3-DU-23c | EAR3-RA-23c-06 | 1.68 | | | 0.29 | | 0.65 | | **1.68** | **no bare areas** | 0.44 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| | EAR3-RA-23c-12 | 1.79 | | | 0.28 | | 0.70 | | 1.8 | | 0.42 | |
| EAR3-DU-23d | EAR3-RA-23d-06 | 0.26 | | | 0.047 | | 0.099 | | 0.26 | | 0.074 | |
| | EAR3-RA-23d-12 | 0.34 | | | 0.060 | | 0.13 | | 0.34 | | 0.093 | |
| EAR3-DU-23e | EAR3-RA-23e-06 | 0.35 | | | 0.067 | | 0.13 | | 0.35 | | 0.11 | |
| | EAR3-RA-23e-12 | 0.18 | | | 0.037 | | 0.068 | | 0.18 | | 0.060 | |
| EAR3-DU-24a | EAR3-RA-24a-06 | 0.63 | | | 0.11 | | 0.24 | | 0.63 | | 0.18 | |
| | EAR3-RA-24a-12 | 1.02 | | | 0.17 | | 0.40 | | 1.0 | | 0.25 | |
| EAR3-DU-24b | EAR3-RA-24b-06 | 0.66 | | | 0.13 | | 0.25 | | 0.66 | | 0.20 | |
| | EAR3-RA-24b-12 | 0.71 | | | 0.13 | | 0.27 | | 0.71 | | 0.21 | |
| EAR3-DU-24c | EAR3-RA-24c-06 | 1.48 | | | 0.23 | | 0.57 | | **1.47** | **no bare areas** | 0.34 | |
| | EAR3-RA-24c-12 | 1.48 | | | 0.25 | | 0.57 | | 1.5 | | 0.37 | |
| EAR3-DU-24d | EAR3-RA-24d-06 | 1.06 | | | 0.19 | | 0.41 | | **1.06** | **no bare areas** | 0.29 | |
| | EAR3-RA-24d-12 | 1.39 | | | 0.25 | | 0.53 | | 1.4 | | 0.40 | |
| EAR3-DU-24e | EAR3-RA-24e-06 | 1.65 | | | 0.28 | | 0.64 | | **1.64** | **no bare areas** | 0.43 | |
| | EAR3-RA-24e-12 | 1.35 | | | 0.22 | | 0.52 | | 1.3 | | 0.34 | |
| EAR3-DU-25a | EAR3-RA-25a-06-1 | 0.35 | | | 0.069 | | 0.13 | | 0.35 | | 0.11 | |
| | EAR3-RA-25a-06-2 | 0.25 | | | 0.050 | | 0.10 | | 0.25 | | 0.081 | |
| | EAR3-RA-25a-06-3 | 0.33 | | | 0.065 | | 0.12 | | 0.33 | | 0.11 | |
| | EAR3-RA-25a-12 | 0.28 | | | 0.056 | | 0.11 | | 0.28 | | 0.091 | |
| EAR3-DU-25b | EAR3-RA-25b-06 | 0.34 | | | 0.066 | | 0.13 | | 0.34 | | 0.11 | |
| | EAR3-RA-25b-12 | 0.38 | | | 0.073 | | 0.14 | | 0.38 | | 0.12 | |
| EAR3-DU-25c | EAR3-RA-25c-06 | 0.47 | | | 0.083 | | 0.18 | | 0.47 | | 0.13 | |
| | EAR3-RA-25c-12 | 0.33 | | | 0.057 | | 0.13 | | 0.33 | | 0.087 | |
| EAR3-DU-25d | EAR3-RA-25d-06 | 0.89 | | | 0.14 | | 0.34 | | 0.88 | | 0.20 | |
| | EAR3-RA-25d-12 | 1.02 | | | 0.17 | | 0.39 | | 1.0 | | 0.26 | |
| EAR3-DU-25e | EAR3-RA-25e-06 | 0.72 | | | 0.14 | | 0.28 | | 0.72 | | 0.21 | |
| | EAR3-RA-25e-12 | 1.09 | | | 0.21 | | 0.41 | | 1.1 | | 0.34 | |
| EAR3-DU-26a | EAR3-RA-26a-06 | 0.25 | | | 0.046 | | 0.097 | | 0.25 | | 0.072 | |
| | EAR3-RA-26a-12 | 0.11 | | | 0.022 | | 0.041 | | 0.11 | | 0.036 | |
| EAR3-DU-26b | EAR3-RA-26b-06 | 0.39 | | | 0.070 | | 0.15 | | 0.39 | | 0.11 | |
| | EAR3-RA-26b-12 | 0.34 | | | 0.059 | | 0.13 | | 0.34 | | 0.091 | |
| EAR3-DU-26c | EAR3-RA-26c-06 | 0.57 | | | 0.096 | | 0.22 | | 0.57 | | 0.15 | |
| | EAR3-RA-26c-12 | 0.32 | | | 0.056 | | 0.13 | | 0.32 | | 0.086 | |
| EAR3-DU-26d | EAR3-RA-26d-06 | 0.74 | | | 0.12 | | 0.29 | | 0.74 | | 0.18 | |
| | EAR3-RA-26d-12 | 0.89 | | | 0.15 | | 0.35 | | 0.89 | | 0.22 | |
| EAR3-DU-26e | EAR3-RA-26e-06 | 0.56 | | | 0.10 | | 0.22 | | 0.56 | | 0.15 | |
| | EAR3-RA-26e-12 | 0.58 | | | 0.10 | | 0.23 | | 0.58 | | 0.15 | |
| EAR3-DU-26f | EAR3-RA-26f-06 | 0.22 | | | 0.043 | | 0.085 | | 0.22 | | 0.068 | |
| | EAR3-RA-26f-12 | 0.23 | | | 0.042 | | 0.087 | | 0.23 | | 0.067 | |
| EAR3-DU-27a | EAR3-RA-27a-06-1 | 0.25 | | | 0.048 | | 0.093 | | 0.25 | | 0.076 | |
| | EAR3-RA-27a-06-2 | 0.31 | | | 0.060 | | 0.12 | | 0.31 | | 0.10 | |
| | EAR3-RA-27a-06-3 | 0.26 | | | 0.050 | | 0.10 | | 0.26 | | 0.080 | |
| | EAR3-RA-27a-12 | 0.44 | | | 0.078 | | 0.17 | | 0.44 | | 0.12 | |
| EAR3-DU-27b | EAR3-RA-27b-06 | 0.90 | | | 0.16 | | 0.35 | | 0.90 | | 0.24 | |
| | EAR3-RA-27b-12 | 2.34 | | | 0.36 | | 0.89 | | 2.3 | | 0.54 | |
| EAR3-DU-27c | EAR3-RA-27c-06 | 0.49 | | | 0.079 | | 0.19 | | 0.49 | | 0.12 | |
| | EAR3-RA-27c-12 | 0.48 | | | 0.077 | | 0.18 | | 0.48 | | 0.11 | |
| EAR3-DU-28a | EAR3-RA-28a-06 | 1.09 | | | 0.18 | | 0.42 | | **1.09** | **reseeded** | 0.28 | |
| | EAR3-RA-28a-12 | 1.62 | | | 0.26 | | 0.62 | | 1.6 | | 0.38 | |
| EAR3-DU-28b | EAR3-RA-28b-06 | 2.55 | | | 0.40 | | 0.99 | | **2.54** | **no bare areas** | 0.60 | |
| | EAR3-RA-28b-12 | 1.28 | | | 0.21 | | 0.49 | | 1.3 | | 0.32 | |
| EAR3-DU-28c | EAR3-RA-28c-06 | 0.79 | | | 0.14 | | 0.31 | | 0.79 | | 0.22 | |
| | EAR3-RA-28c-12 | 0.46 | | | 0.083 | | 0.18 | | 0.46 | | 0.13 | |
| EAR3-DU-28d | EAR3-RA-28d-06 | 0.57 | | | 0.10 | | 0.22 | | 0.57 | | 0.16 | |
| | EAR3-RA-28d-12 | 0.57 | | | 0.10 | | 0.22 | | 0.57 | | 0.15 | |
| EAR3-DU-29a | EAR3-RA-29a-06 | 0.38 | | | 0.074 | | 0.14 | | 0.38 | | 0.12 | |
| | EAR3-RA-29a-12 | 0.37 | | | 0.083 | | 0.13 | | 0.37 | | 0.14 | |
| EAR3-DU-29b | EAR3-RA-29b-06 | 1.04 | | | 0.18 | | 0.40 | | 1.03 | | 0.27 | |
| | EAR3-RA-29b-12 | 1.37 | | | 0.23 | | 0.53 | | 1.4 | | 0.35 | |
| EAR3-DU-29c | EAR3-RA-29c-06 | 1.61 | | | 0.25 | | 0.62 | | **1.60** | **no bare areas** | 0.37 | |
| | EAR3-RA-29c-12 | 1.23 | | | 0.19 | | 0.47 | | 1.2 | | 0.27 | |
| EAR3-DU-29d | EAR3-RA-29d-06 | 1.15 | | | 0.20 | | 0.44 | | **1.15** | **no bare areas** | 0.31 | |
| | EAR3-RA-29d-12 | 1.68 | | | 0.28 | | 0.65 | | 1.7 | | 0.42 | |
| EAR3-DU-30a | EAR3-RA-30a-06-1 | 0.48 | | | 0.086 | | 0.18 | | 0.48 | | 0.13 | |
| | EAR3-RA-30a-06-2 | 0.50 | | | 0.091 | | 0.19 | | 0.50 | | 0.14 | |
| | EAR3-RA-30a-06-3 | 0.78 | | | 0.13 | | 0.30 | | 0.77 | | 0.19 | |
| | EAR3-RA-30a-12 | 0.53 | | | 0.085 | | 0.21 | | 0.53 | | 0.13 | |
| EAR3-DU-30b | EAR3-RA-30b-06 | 0.95 | | | 0.16 | | 0.36 | | 0.94 | | 0.24 | |
| | EAR3-RA-30b-12 | 1.33 | | | 0.20 | | 0.51 | | 1.3 | | 0.30 | |
| EAR3-DU-30c | EAR3-RA-30c-06 | 1.72 | | | 0.28 | | 0.67 | | **1.72** | **no bare areas** | 0.42 | |
| | EAR3-RA-30c-12 | 2.16 | | | 0.34 | | 0.84 | | 2.1 | | 0.50 | |
| EAR3-DU-31a | EAR3-RA-31a-06 | 0.64 | | | 0.12 | | 0.25 | | 0.64 | | 0.18 | |
| | EAR3-RA-31a-12 | 0.40 | | | 0.070 | | 0.15 | | 0.40 | | 0.11 | |
| EAR3-DU-31b | EAR3-RA-31b-06 | 0.42 | | | 0.085 | | 0.15 | | 0.42 | | 0.14 | |
| | EAR3-RA-31b-12 | 0.27 | | | 0.050 | | 0.10 | | 0.27 | | 0.079 | |
| EAR3-DU-31c | EAR3-RA-31c-06 | 0.41 | | | 0.075 | | 0.16 | | 0.41 | | 0.12 | |
| | EAR3-RA-31c-12 | 1.36 | | | 0.21 | | 0.53 | | 1.4 | | 0.31 | |
| EAR3-DU-31d | EAR3-RA-31d-06 | 1.73 | | | 0.28 | | 0.67 | | **1.72** | **no bare areas** | 0.42 | |
| | EAR3-RA-31d-12 | 2.95 | | | 0.46 | | 1.1 | | 2.9 | | 0.68 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| EAR3-DU-31e | EAR3-RA-31e-06 | 0.78 | | | 0.14 | | 0.30 | | 0.78 | | 0.21 | |
| | EAR3-RA-31e-12 | 1.16 | | | 0.19 | | 0.45 | | 1.2 | | 0.28 | |
| EAR3-DU-32a | EAR3-RA-32a-06-1 | 0.67 | | | 0.12 | | 0.26 | | 0.67 | | 0.18 | |
| | EAR3-RA-32a-06-2 | 0.51 | | | 0.093 | | 0.20 | | 0.51 | | 0.15 | |
| | EAR3-RA-32a-06-3 | 0.36 | | | 0.066 | | 0.14 | | 0.36 | | 0.10 | |
| | EAR3-RA-32a-12 | 0.71 | | | 0.12 | | 0.27 | | 0.71 | | 0.19 | |
| EAR3-DU-32b | EAR3-RA-32b-06 | 2.55 | | | 0.42 | | 0.98 | | **2.54** | **no bare areas** | 0.64 | |
| | EAR3-RA-32b-12 | 3.06 | | | 0.47 | | 1.2 | | 3.0 | | 0.68 | |
| EAR3-DU-32c | EAR3-RA-32c-06 | 1.04 | | | 0.17 | | 0.40 | | 1.04 | | 0.27 | |
| | EAR3-RA-32c-12 | 2.09 | | | 0.33 | | 0.81 | | 2.1 | | 0.49 | |
| EAR3-DU-32d | EAR3-RA-32d-06 | 0.71 | | | 0.12 | | 0.28 | | 0.71 | | 0.19 | |
| | EAR3-RA-32d-12 | 0.98 | | | 0.16 | | 0.38 | | 0.97 | | 0.25 | |
| EAR3-DU-32e | EAR3-RA-32e-06 | 1.86 | | | 0.30 | | 0.72 | | **1.85** | **no bare areas** | 0.44 | |
| | EAR3-RA-32e-12 | 4.08 | | | 0.60 | | 1.6 | | 4.0 | | 0.88 | |
| EAR3-DU-32F | EAR3-RA-32F-06 | 0.80 | | | 0.13 | | 0.31 | | 0.80 | | 0.19 | |
| | EAR3-RA-32F-12 | 1.20 | | | 0.19 | | 0.47 | | 1.2 | | 0.28 | |
| EAR3-DU-33a | EAR3-RA-33a-06 | 5.10 | | | 0.72 | | **2.0** | **replaced (B2)** | **5.05** | **no bare areas** | 1.0 | |
| | EAR3-RA-33a-12 | 2.25 | | | 0.31 | | 0.88 | | 2.2 | | 0.45 | |
| EAR3-DU-33b | EAR3-RA-33b-06 | 0.75 | | | 0.13 | | 0.29 | | 0.75 | | 0.20 | |
| | EAR3-RA-33b-12 | 7.22 | | | 0.99 | | 2.8 | | 7.2 | | **1.4** | |
| EAR3-DU-33c | EAR3-RA-33c-06-1 | **5.06** | | | 0.78 | | **2.0** | **replaced (B2)** | **5.03** | **no bare areas** | **1.2** | **excavated** |
| | EAR3-RA-33c-06-2 | **4.19** | | | 0.67 | | **1.6** | **replaced (B2)** | **4.17** | **no bare areas** | 0.99 | **excavated** |
| | EAR3-RA-33c-06-3 | 1.79 | | | 0.29 | | **0.70** | **replaced (B2)** | **1.79** | **no bare areas** | 0.43 | **excavated** |
| | EAR3-RA-33c-12 | 4.28 | | | 0.64 | | 1.7 | | 4.2 | | 0.93 | |
| EAR3-DU-33d | EAR3-RA-33d-06 | 1.20 | | | 0.20 | | 0.47 | | **1.19** | **no bare areas** | 0.30 | |
| | EAR3-RA-33d-12 | 1.04 | | | 0.17 | | 0.41 | | 1.0 | | 0.26 | |
| EAR3-DU-33e | EAR3-RA-33e-06 | 1.49 | | | 0.25 | | 0.58 | | **1.48** | **no bare areas** | 0.38 | |
| | EAR3-RA-33e-12 | 1.72 | | | 0.28 | | 0.67 | | 1.7 | | 0.42 | |
| EAR3-DU-33f | EAR3-RA-33f-06 | 0.98 | | | 0.17 | | 0.38 | | 0.98 | | 0.26 | |
| | EAR3-RA-33f-12 | 1.40 | | | 0.22 | | 0.55 | | 1.4 | | 0.32 | |
| EAR3-DU-33g | EAR3-RA-33g-06 | 0.47 | | | 0.085 | | 0.18 | | 0.47 | | 0.13 | |
| | EAR3-RA-33g-12 | 0.23 | | | 0.042 | | 0.091 | | 0.23 | | 0.065 | |
| EAR3-DU-34a | EAR3-RA-34a-06 | 0.78 | | | 0.11 | | 0.30 | | 0.77 | | 0.16 | |
| | EAR3-RA-34a-12 | 0.37 | | | 0.058 | | 0.14 | | 0.37 | | 0.086 | |
| EAR3-DU-34b | EAR3-RA-34b-06 | 0.55 | | | 0.10 | | 0.21 | | 0.55 | | 0.15 | |
| | EAR3-RA-34b-12 | 0.48 | | | 0.085 | | 0.18 | | 0.48 | | 0.13 | |
| EAR3-DU-34c | EAR3-RA-34c-06 | 6.29 | | | **0.95** | | **2.4** | **replaced (B2)** | **6.24** | **no bare areas** | **1.4** | **excavated** |
| | EAR3-RA-34c-12 | 1.43 | | | 0.24 | | 0.56 | | 1.4 | | 0.37 | |
| EAR3-DU-34d | EAR3-RA-34d-06 | 1.60 | | | 0.26 | | 0.62 | | **1.59** | **no bare areas** | 0.39 | |
| | EAR3-RA-34d-12 | 1.61 | | | 0.24 | | 0.62 | | 1.6 | | 0.35 | |
| EAR3-DU-35a | EAR3-RA-35a-06-1 | 2.49 | | | 0.42 | | 0.96 | | **2.48** | **no bare areas** | 0.63 | |
| | EAR3-RA-35a-06-2 | 1.66 | | | 0.28 | | 0.65 | | **1.66** | **no bare areas** | 0.43 | |
| | EAR3-RA-35a-06-3 | 1.72 | | | 0.29 | | 0.67 | | **1.71** | **no bare areas** | 0.44 | |
| | EAR3-RA-35a-12 | 3.34 | | | 0.55 | | 1.3 | | 3.3 | | 0.82 | |
| EAR3-DU-35b | EAR3-RA-35b-06 | 1.26 | | | 0.22 | | 0.49 | | **1.26** | **no bare areas** | 0.34 | |
| | EAR3-RA-35b-12 | 2.34 | | | 0.36 | | 0.91 | | 2.3 | | 0.53 | |
| EAR3-DU-35c | EAR3-RA-35c-06 | 1.00 | | | 0.18 | | 0.39 | | 1.00 | | 0.28 | |
| | EAR3-RA-35c-12 | 1.19 | | | 0.21 | | 0.46 | | 1.2 | | 0.32 | |
| EAR3-DU-35d | EAR3-RA-35d-06 | 1.30 | | | 0.23 | | 0.50 | | **1.30** | **reseeded** | 0.35 | |
| | EAR3-RA-35d-12 | 1.47 | | | 0.25 | | 0.57 | | 1.5 | | 0.38 | |
| EAR3-DU-36a | EAR3-RA-36a-06 | 1.72 | | | 0.29 | | 0.67 | | **1.72** | **no bare areas** | 0.45 | |
| | EAR3-RA-36a-12 | 1.72 | | | 0.29 | | 0.66 | | 1.7 | | 0.45 | |
| EAR3-DU-36b | EAR3-RA-36b-06 | 1.65 | | | 0.28 | | 0.64 | | **1.64** | **no bare areas** | 0.43 | |
| | EAR3-RA-36b-12 | 3.99 | | | 0.63 | | 1.5 | | 4.0 | | 0.93 | |
| EAR3-DU-36c | EAR3-RA-36c-06 | 0.30 | | | 0.057 | | 0.11 | | 0.30 | | 0.089 | |
| | EAR3-RA-36c-12 | 0.29 | | | 0.056 | | 0.11 | | 0.29 | | 0.089 | |
| EAR3-DU-36d | EAR3-RA-36d-06 | 0.57 | | | 0.11 | | 0.22 | | 0.57 | | 0.17 | |
| | EAR3-RA-36d-12 | 0.22 | | | 0.045 | | 0.084 | | 0.22 | | 0.073 | |
| EAR3-DU-36e | EAR3-RA-36e-06 | 0.16 | | | 0.034 | | 0.056 | | 0.16 | | 0.057 | |
| | EAR3-RA-36e-12 | 0.22 | | | 0.055 | | 0.07 | | 0.22 | | 0.10 | |
| EAR3-DU-36f | EAR3-RA-36f-06 | 0.12 | | | 0.026 | | 0.044 | | 0.12 | | 0.043 | |
| | EAR3-RA-36f-12 | 0.047 | | | 0.011 | | 0.016 | | 0.047 | | 0.019 | |
| EAR3-DU-37a | EAR3-RA-37a-06-1 | 0.18 | | | 0.036 | | 0.070 | | 0.18 | | 0.058 | |
| | EAR3-RA-37a-06-2 | 0.19 | | | 0.045 | | 0.065 | | 0.19 | | 0.076 | |
| | EAR3-RA-37a-06-3 | 0.20 | | | 0.045 | | 0.072 | | 0.20 | | 0.076 | |
| | EAR3-RA-37a-12 | 0.28 | | | 0.054 | | 0.11 | | 0.28 | | 0.087 | |
| EAR3-DU-37b | EAR3-RA-37b-06 | 0.17 | | | 0.036 | | 0.065 | | 0.17 | | 0.058 | |
| | EAR3-RA-37b-12 | 0.14 | | | 0.036 | | 0.049 | | 0.14 | | 0.061 | |
| EAR3-DU-37c | EAR3-RA-37c-06 | 0.16 | | | 0.036 | | 0.060 | | 0.16 | | 0.060 | |
| | EAR3-RA-37c-12 | 0.18 | | | 0.038 | | 0.065 | | 0.18 | | 0.063 | |
| EAR3-DU-37d | EAR3-RA-37d-06 | 0.24 | | | 0.045 | | 0.094 | | 0.24 | | 0.071 | |
| | EAR3-RA-37d-12 | 0.18 | | | 0.037 | | 0.070 | | 0.18 | | 0.060 | |
| EAR3-DU-38a | EAR3-RA-38a-06 | 0.82 | | | 0.14 | | 0.32 | | 0.82 | | 0.22 | |
| | EAR3-RA-38a-12 | 0.94 | | | 0.16 | | 0.36 | | 0.94 | | 0.24 | |
| EAR3-DU-38b | EAR3-RA-38b-06 | 0.54 | | | 0.10 | | 0.21 | | 0.54 | | 0.15 | |
| | EAR3-RA-38b-12 | 0.36 | | | 0.068 | | 0.14 | | 0.36 | | 0.11 | |
| EAR3-DU-38c | EAR3-RA-38c-06 | 1.12 | | | 0.19 | | 0.43 | | **1.12** | **no bare areas** | 0.28 | |
| | EAR3-RA-38c-12 | 0.61 | | | 0.10 | | 0.23 | | 0.61 | | 0.16 | |
| EAR3-DU-38d | EAR3-RA-38d-06 | 1.25 | | | 0.21 | | 0.49 | | **1.25** | **no bare areas** | 0.32 | |
| | EAR3-RA-38d-12 | 0.014 | | | 0.002 | | 0.006 | | 0.014 | | 0.004 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interval)I | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| EAR3-DU-39a | EAR3-RA-39a-06 | 0.40 | | | 0.077 | | 0.15 | | 0.40 | | 0.12 | |
| | EAR3-RA-39a-12 | 0.18 | | | 0.036 | | 0.070 | | 0.18 | | 0.057 | |
| EAR3-DU-39b | EAR3-RA-39b-06 | 0.70 | | | 0.15 | | 0.26 | | 0.71 | | 0.24 | |
| | EAR3-RA-39b-12 | 1.01 | | | 0.18 | | 0.39 | | 1.0 | | 0.28 | |
| EAR3-DU-39c | EAR3-RA-39c-06 | 0.39 | | | 0.073 | | 0.15 | | 0.39 | | 0.12 | |
| | EAR3-RA-39c-12 | 0.31 | | | 0.059 | | 0.12 | | 0.31 | | 0.094 | |
| EAR3-DU-40a | EAR3-RA-40a-06-1 | 0.98 | | | 0.18 | | 0.38 | | **0.98** | **no bare areas** | 0.29 | |
| | EAR3-RA-40a-06-2 | 1.06 | | | 0.20 | | 0.40 | | **1.06** | **no bare areas** | 0.31 | |
| | EAR3-RA-40a-06-3 | 1.18 | | | 0.22 | | 0.45 | | **1.18** | **no bare areas** | 0.35 | |
| | EAR3-RA-40a-12 | 0.55 | | | 0.11 | | 0.21 | | 0.55 | | 0.17 | |
| EAR3-DU-40b | EAR3-RA-40b-06 | 1.14 | | | 0.22 | | 0.43 | | **1.14** | **no bare areas** | 0.35 | |
| | EAR3-RA-40b-12 | 1.00 | | | 0.19 | | 0.38 | | 1.0 | | 0.31 | |
| EAR3-DU-40c | EAR3-RA-40c-06 | 0.50 | | | 0.083 | | 0.19 | | 0.49 | | 0.13 | |
| | EAR3-RA-40c-12 | 0.39 | | | 0.064 | | 0.15 | | 0.38 | | 0.10 | |
| EAR3-DU-40d | EAR3-RA-40d-06 | 1.75 | | | 0.28 | | 0.68 | | **1.74** | **no bare areas** | 0.42 | |
| | EAR3-RA-40d-12 | 3.65 | | | 0.53 | | 1.4 | | 3.6 | | 0.76 | |
| EAR3-DU-40e | EAR3-RA-40e-06 | 3.30 | | | 0.52 | | **1.3** | **replaced (B2)** | **3.29** | **no bare areas** | 0.77 | |
| | EAR3-RA-40e-12 | 3.62 | | | 0.55 | | 1.4 | | 3.6 | | 0.81 | |
| EAR3-DU-40f | EAR3-RA-40f-06 | 0.42 | | | 0.077 | | 0.16 | | 0.42 | | 0.12 | |
| | EAR3-RA-40f-12 | 0.46 | | | 0.082 | | 0.18 | | 0.46 | | 0.13 | |
| EAR3-DU-40g | EAR3-RA-40g-06 | 1.56 | | | 0.25 | | 0.61 | | **1.55** | **no bare areas** | 0.38 | |
| | EAR3-RA-40g-12 | 4.75 | | | 0.65 | | 1.8 | | 4.7 | | 0.90 | |
| EAR3-DU-40h | EAR3-RA-40h-06 | 0.24 | | | 0.043 | | 0.096 | | 0.24 | | 0.065 | |
| | EAR3-RA-40h-12 | 0.46 | | | 0.084 | | 0.18 | | 0.46 | | 0.13 | |
| EAR3-DU-40i | EAR3-RA-40i-06 | 0.15 | | | 0.030 | | 0.055 | | 0.15 | | 0.048 | |
| | EAR3-RA-40i-12 | 0.13 | | | 0.025 | | 0.049 | | 0.13 | | 0.040 | |
| EAR3-DU-40j | EAR3-RA-40j-06 | 0.19 | | | 0.036 | | 0.071 | | 0.19 | | 0.058 | |
| | EAR3-RA-40j-12 | 0.038 | | | 0.008 | | 0.014 | | 0.038 | | 0.014 | |
| EAR3-DU-41a | EAR3-RA-41a-06-1 | 0.21 | | | 0.041 | | 0.080 | | 0.21 | | 0.066 | |
| | EAR3-RA-41a-06-2 | 0.28 | | | 0.053 | | 0.11 | | 0.28 | | 0.085 | |
| | EAR3-RA-41a-06-3 | 0.25 | | | 0.047 | | 0.095 | | 0.25 | | 0.075 | |
| | EAR3-RA-41a-12 | 0.10 | | | 0.021 | | 0.036 | | 0.10 | | 0.034 | |
| EAR3-DU-41b | EAR3-RA-41b-06 | 0.20 | | | 0.039 | | 0.076 | | 0.20 | | 0.062 | |
| | EAR3-RA-41b-12 | 0.076 | | | 0.016 | | 0.028 | | 0.076 | | 0.027 | |
| EAR3-DU-41c | EAR3-RA-41c-06 | 0.25 | | | 0.048 | | 0.098 | | 0.26 | | 0.075 | |
| | EAR3-RA-41c-12 | 0.18 | | | 0.037 | | 0.069 | | 0.19 | | 0.060 | |
| EAR3-DU-41d | EAR3-RA-41d-06 | 0.33 | | | 0.063 | | 0.13 | | 0.33 | | 0.10 | |
| | EAR3-RA-41d-12 | 0.39 | | | 0.074 | | 0.15 | | 0.39 | | 0.12 | |
| EAR3-DU-41e | EAR3-RA-41e-06 | 0.26 | | | 0.048 | | 0.100 | | 0.26 | | 0.075 | |
| | EAR3-RA-41e-12 | 0.48 | | | 0.078 | | 0.18 | | 0.48 | | 0.12 | |
| EAR3-DU-41f | EAR3-RA-41f-06 | 0.35 | | | 0.064 | | 0.13 | | 0.35 | | 0.10 | |
| | EAR3-RA-41f-12 | 0.22 | | | 0.041 | | 0.083 | | 0.22 | | 0.064 | |
| EAR3-DU-42a | EAR3-RA-42a-06-1 | 0.23 | | | 0.049 | | 0.084 | | 0.23 | | 0.081 | |
| | EAR3-RA-42a-06-2 | 0.31 | | | 0.070 | | 0.11 | | 0.31 | | 0.12 | |
| | EAR3-RA-42a-06-3 | 0.19 | | | 0.046 | | 0.067 | | 0.19 | | 0.078 | |
| | EAR3-RA-42a-12 | 0.23 | | | 0.063 | | 0.07 | | 0.23 | | 0.11 | |
| EAR3-DU-42b | EAR3-RA-42b-06 | 0.25 | | | 0.059 | | 0.09 | | 0.25 | | 0.10 | |
| | EAR3-RA-42b-12 | 0.18 | | | 0.049 | | 0.060 | | 0.18 | | 0.086 | |
| EAR3-DU-42c | EAR3-RA-42c-06 | 0.34 | | | 0.064 | | 0.13 | | 0.34 | | 0.10 | |
| | EAR3-RA-42c-12 | 0.24 | | | 0.048 | | 0.087 | | 0.24 | | 0.078 | |
| EAR3-DU-42d | EAR3-RA-42d-06 | 0.34 | | | 0.063 | | 0.13 | | 0.34 | | 0.10 | |
| | EAR3-RA-42d-12 | 0.18 | | | 0.033 | | 0.068 | | 0.18 | | 0.052 | |
| EAR3-DU-42e | EAR3-RA-42e-06 | 0.16 | | | 0.031 | | 0.062 | | 0.16 | | 0.050 | |
| | EAR3-RA-42e-12 | 0.091 | | | 0.020 | | 0.033 | | 0.091 | | 0.034 | |
| EAR3-DU-42f | EAR3-RA-42f-06 | 0.41 | | | 0.072 | | 0.16 | | 0.41 | | 0.11 | |
| | EAR3-RA-42f-12 | 0.19 | | | 0.034 | | 0.074 | | 0.19 | | 0.053 | |
| EAR3-DU-42g | EAR3-RA-42g-06 | 0.35 | | | 0.064 | | 0.13 | | 0.35 | | 0.10 | |
| | EAR3-RA-42g-12 | 0.084 | | | 0.020 | | 0.029 | | 0.084 | | 0.034 | |
| EAR3-DU-42h | EAR3-RA-42h-06 | 0.91 | | | 0.16 | | 0.35 | | 0.91 | | 0.24 | |
| | EAR3-RA-42h-12 | 0.79 | | | 0.13 | | 0.31 | | 0.79 | | 0.19 | |
| EAR3-DU-42i | EAR3-RA-42i-06 | 3.13 | | | 0.47 | | **1.2** | **no landscaping strip** | **3.10** | **no bare areas** | 0.69 | |
| | EAR3-RA-42i-12 | 1.02 | | | 0.18 | | 0.40 | | 1.0 | | 0.27 | |
| EAR3-DU-42j | EAR3-RA-42j-06 | 0.59 | | | 0.11 | | 0.23 | | 0.59 | | 0.17 | |
| | EAR3-RA-42j-12 | 0.63 | | | 0.11 | | 0.25 | | 0.64 | | 0.18 | |
| EAR3-DU-42k | EAR3-RA-42k-06 | 1.34 | | | 0.23 | | 0.52 | | **1.34** | **no bare areas** | 0.35 | |
| | EAR3-RA-42k-12 | 0.73 | | | 0.12 | | 0.28 | | 0.73 | | 0.19 | |
| EAR3-DU-42L | EAR3-RA-42L-06 | 0.41 | | | 0.072 | | 0.16 | | 0.41 | | 0.11 | |
| | EAR3-RA-42L-12 | 0.51 | | | 0.092 | | 0.20 | | 0.51 | | 0.14 | |
| ONI-DU-1a | ONI-RA-1a-06-1 | 0.11 | | | nc | | nc | | nc | | 0.040 | |
| | ONI-RA-1a-06-2 | 0.13 | | | nc | | nc | | nc | | 0.047 | |
| | ONI-RA-1a-06-3 | 0.10 | | | nc | | nc | | nc | | 0.036 | |
| | ONI-RA-1a-12 | 0.087 | | | nc | | nc | | nc | | 0.030 | |
| ONI-DU-1b | ONI-RA-1b-06 | 0.14 | | | nc | | nc | | nc | | 0.050 | |
| | ONI-RA-1b-12 | 0.09 | | | nc | | nc | | nc | | 0.032 | |
| ONI-DU-1c | ONI-RA-1c-06 | 0.26 | | | nc | | nc | | nc | | 0.10 | |
| | ONI-RA-1c-12 | 0.22 | | | nc | | nc | | nc | | 0.10 | |
| ONI-DU-2a | ONI-RA-2a-06 | 0.16 | | | nc | | nc | | nc | | 0.066 | |
| | ONI-RA-2a-12 | 0.12 | | | nc | | nc | | nc | | 0.059 | |
| ONI-DU-2b | ONI-RA-2b-06 | 0.35 | | | nc | | nc | | nc | | 0.13 | |
| | ONI-RA-2b-12 | 0.18 | | | nc | | nc | | nc | | 0.094 | |

**Table A-4**
**Summary of Hazard Indices and Actions for Earhart I-2, Earhart I-3, and Onizuka II-1.**

| DU | Sample ID | Removal Action No. 1 [a] | | | Removal Action No. 2A | | Removal Action No. 2B [b] | | Removal Action No. 2C | | Removal Action No. 3 [c] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hazard Index (2006 HHRA) | Excavate to 12 inches (if HI>10 in 0 to 6-inch interval) | Excavate to 12 inches (if HI>3 in 0 to 6-inch interval and > 200 sq ft bare area) | Hazard Index (2010 APRA 3) | Excavate to 12 inches (if HI>1 in 0 to 6-inch interval) | Hazard Index (2010 APRA 2) | Replace soil in landscape strips if present (HI>1 in 0 to 6-inch interva)l | Hazard Index (2010 APRA 1) | Reseed grass if in poor condition (HI>1 in 0 to 6-inch interval) | Hazard Index (2011 HHRE) | Excavate to 6 inches (HI>1 in 0 to 6-inch interval) |
| | | 5 DUs at HI>10<br>22 DUs at 10>HI>3<br>(0 to 6-inch interval) | 5 DUs Identified<br>5 DUs Excavated | 22 DUs Identified<br>1 DU Excavated | 1 DUs with an HI>1<br>(0 to 6-inch interval) | 1 DU Identified<br>1 DU Excavated | 41 DUs with an HI>1<br>(0 to 6-inch interval) | 41 DUs Identfied<br>19 DUs Acted On | 195 DUs with an HI>1<br>(0 to 6-inch interval) | 195 DUs Identified<br>21 DUs Acted On | 14 DUs with an HI>1<br>(0 to 6-inch interval) | 14 DUs Identified<br>14 DUs Excavated |
| ONI-DU-2c | ONI-RA-2c-06 | 0.26 | | | nc | | nc | | nc | | 0.10 | |
| | ONI-RA-2c-12 | 0.18 | | | nc | | nc | | nc | | 0.081 | |
| ONI-DU-2d | ONI-RA-2d-06 | 0.28 | | | nc | | nc | | nc | | 0.10 | |
| | ONI-RA-2d-12 | 0.15 | | | nc | | nc | | nc | | 0.066 | |
| ONI-DU-2e | ONI-RA-2e-06 | 0.12 | | | nc | | nc | | nc | | 0.053 | |
| | ONI-RA-2e-12 | 0.05 | | | nc | | nc | | nc | | 0.022 | |
| ONI-DU-2f | ONI-RA-2f-06 | 0.13 | | | nc | | nc | | nc | | 0.050 | |
| | ONI-RA-2f-12 | 0.07 | | | nc | | nc | | nc | | 0.025 | |
| ONI-DU-2g | ONI-RA-2g-06 | 0.56 | | | nc | | nc | | nc | | 0.17 | |
| | ONI-RA-2g-12 | 0.20 | | | nc | | nc | | nc | | 0.074 | |
| ONI-DU-2h | ONI-RA-2h-06 | 0.14 | | | nc | | nc | | nc | | 0.057 | |
| | ONI-RA-2h-12 | 0.42 | | | nc | | nc | | nc | | 0.12 | |
| ONI-DU-3a | ONI-RA-3a-06 | 0.15 | | | nc | | nc | | nc | | 0.049 | |
| | ONI-RA-3a-12 | 0.15 | | | nc | | nc | | nc | | 0.057 | |
| ONI-DU-3b | ONI-RA-3b-06 | 0.21 | | | nc | | nc | | nc | | 0.066 | |
| | ONI-RA-3b-12 | 0.21 | | | nc | | nc | | nc | | 0.064 | |
| ONI-DU-3c | ONI-RA-3c-06 | 0.088 | | | nc | | nc | | nc | | 0.034 | |
| | ONI-RA-3c-12 | 0.075 | | | nc | | nc | | nc | | 0.028 | |
| ONI-DU-3d | ONI-RA-3d-06 | 0.09 | | | nc | | nc | | nc | | 0.038 | |
| | ONI-RA-3d-12 | 0.20 | | | nc | | nc | | nc | | 0.072 | |
| ONI-DU-4a | ONI-RA-4a-06-1 | 0.10 | | | nc | | nc | | nc | | 0.035 | |
| | ONI-RA-4a-06-2 | 0.10 | | | nc | | nc | | nc | | 0.036 | |
| | ONI-RA-4a-06-3 | 0.10 | | | nc | | nc | | nc | | 0.037 | |
| | ONI-RA-4a-12 | 0.05 | | | nc | | nc | | nc | | 0.022 | |
| ONI-DU-4b | ONI-RA-4b-06 | 0.15 | | | nc | | nc | | nc | | 0.051 | |
| | ONI-RA-4b-12 | 0.16 | | | nc | | nc | | nc | | 0.055 | |
| ONI-DU-4c | ONI-RA-4c-06 | 0.50 | | | nc | | nc | | nc | | 0.14 | |
| | ONI-RA-4c-12 | 0.37 | | | nc | | nc | | nc | | 0.10 | |
| ONI-DU-5a | ONI-RA-5a-06 | 0.46 | | | nc | | nc | | nc | | 0.13 | |
| | ONI-RA-5a-12 | 0.68 | | | nc | | nc | | nc | | 0.18 | |
| ONI-DU-5b | ONI-RA-5b-06 | 0.41 | | | nc | | nc | | nc | | 0.12 | |
| | ONI-RA-5b-12 | 0.49 | | | nc | | nc | | nc | | 0.14 | |
| ONI-DU-5c | ONI-RA-5c-06 | 0.56 | | | nc | | nc | | nc | | 0.16 | |
| | ONI-RA-5c-12 | 0.68 | | | nc | | nc | | nc | | 0.19 | |

**Notes:**

[a] Soil replaced to depth of 12 inches. Soil voluntarily replaced in DUs 6b, 9e, and 52b

[b] Soil in landscape strips of affected housing units replaced after inspection based on nature of plantings: B1 = fully replaced; B2 = partially replaced; See table 4-1 in the Removal Action Report.

[c] Soil replaced to depth of 9 inches

"nc" = not calculated; HI values all lower than 1. No action required.

= triplicate samples

# APPENDIX B

## Risk Evaluations and Memorandums

***B1- HC Action Plan***
***B2- APRA Memorandum***
***B3- HHRE Work Plan***

# APPENDIX B1

## Hickam Communities LLC Action Plan

# HC ACTION PLAN

TIME LINE
(BUSINESS DAYS)

PROTOCOL

DAY 1

ANALYTICAL REPORT RECEIVED BY TETRA TECH

TETRA TECH TRANSMITS ANALYTICAL REPORT TO HDOH

DAY 2 & 3

PRELIMINARY RISK ANALYSIS

PREPARATION OF PRELIMINARY RISK ESTIMATE MAPS

DAY 4

NOTIFICATION OF HC & HDOH

IMPLEMENT ACTION PLAN

FOR SOIL IN THE 0 TO 6-INCH DEPTH INTERVAL

DAY 5

**NON-CANC: HI < 3**

NO IMMEDIATE ACTION

**NON-CANC: HI 3 to 10**

VSI OF AFFECTED DU FOR EXPOSED SOIL

NO EXPOSED SOIL

EXPOSED SOIL

**NON-CANC: HI >10**

SECURE DU / COMMUNICATE TO RESIDENTS

DAY 7

NO FURTHER IMMEDIATE ACTION

< 200 SQ FT

> 200 SQ FT

PLACE SOD BASED ON SOP

SMP SUBMITTED TO HDOH

HDOH APPROVAL OF SMP

MOB FOR DIG & HAUL
5 DAYS AFTER RECEIVING HDOH APPROVAL

- ENVIRONMENTAL OVERSIGHT DURING OPERATIONS
- BACKFILL WITH 1-FT OF CERTIFIED CLEAN FILL
- HYDROSEEDING FOLLOWING BACKFILL

MITIGATE AFFECTED DU

- DIG & HAUL
- CAPPING

*September 22, 2010*

# APPENDIX B2

## APRA Memorandum

TETRA TECH

**MEMORANDUM**

**To:** Fenix Grange, M.S., Supervisor, Site Discovery, Assessment and Remediation, Hazard Evaluation and Emergency Response Office, Hawai`i Department of Environmental Health
Roger Franklin, Director Environmental Services, Actus Lend Lease

**C:** Gary Floyd, Tetra Tech
Tom Whitehead, P.G. C.HG., Tetra Tech
Randy Westhaus, P.E., Tetra Tech
Gail Eaton, P.G., Tetra Tech
Yvonne Parry, Tetra Tech

**From:** Kay Johnson, Tetra Tech
Matt Horrigan, Tetra Tech

**Subject:** **REVISED ANALYSIS OF POTENTIAL REMOVAL ALTERNATIVES, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawai`i. DCN: 2653504.006.F01**

**Date:** November 24, 2010

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## 1.0 INTRODUCTION

On behalf of Hickam Communities LLC (HC), Tetra Tech has prepared this memorandum in response to comments received from the Hawai`i Department of Health (HDOH) in a letter dated November 5, 2010 entitled *Hickam Communities Removal Action #2, 2010-682-ES* (HDOH 2010). The HDOH comments were in regard to the memorandum titled *Analysis of Potential Removal Alternatives, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawai`i* (the "APRA Memo") dated November 3, 2010 (Tetra Tech 2010b).

In its comments, HDOH requested that Tetra Tech submit a revised APRA Memo that incorporated modifications to address the following issues:

- Applicability of alternative action levels (ALs) for *Removal Action Work Plan No. 2* (RO#2) (Tetra Tech 2010c);

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- Clarification of alternative ALs to be applied to specific decision unit (DU) sub-areas (e.g., grassed lawns and planters):

- Modification of histogram bin assignments to be based on rounding hazard index (HI) values to two significant figures rather than one significant figure as presented in the APRA Memo dated November 3, 2010 (Tetra Tech 2010b); and

- Modifications to histogram figures.

Section 2.0 of this memorandum provides the rationale for the selection of an alternative child soil ingestion rate and oral reference dose (RfD), which were used to develop two additional sets of residential ALs.

Section 3.0 presents histograms summarizing the potential non-cancer hazards estimated using three alternative sets of residential non-cancer ALs as follows: Alternative 1) current site-specific residential non-cancer ALs (Tetra Tech, 2006); Alternative 2) residential ALs derived based on use of an alternative child soil ingestion rate; and Alternative 3) residential ALs derived based on use of an alternative child soil ingestion rate and an alternative oral reference dose (RfD).

Sections 4.0, 5.0, and 6.0 provide a summary of how proposed adjustments to the residential ALs would affect determinations regarding the need for, or scope of, a second removal action.

## 2.0 RATIONALE FOR USE OF ALTERNATIVE CHILD INGESTION RATE AND ORAL RFD

### 2.1 Child Soil Ingestion Rate

Alternative 2 presents residential ALs developed using a child soil ingestion rate of 45 milligrams per day (mg/day). As described in a memorandum from Bureau Veritas dated October 27, 2010 (Bureau Veritas 2010), the New Zealand Ministry for the Environment (ME) conducted an extensive review of available literature regarding child soil ingestion rates and identified a median soil ingestion rate ranging from 20 to 30 mg/day and a mean ingestion rate of 60 mg/day. Based on its review, the New Zealand ME opted to use a child soil ingestion rate representing the midpoint between the median and mean values (i.e., 45 mg/day) for the development of its dieldrin soil action level. Based on the information presented, HDOH requested that residential ALs be developed using a child soil ingestion rate of 45 mg/day to determine what impact this would have regarding the identification of DUs where a removal action may be considered. It should be noted that engineering controls, such as maintaining good lawn cover, would accompany a removal action based on this modified soil ingestion rate.

The residential soil ALs for aldrin and dieldrin are presented in Table 1. As shown in the table, the child non-cancer soil ALs developed for aldrin and dieldrin, which are using a child soil ingestion rate of 45 mg/day, are 4.7 milligrams per kilogram (mg/kg) and 7.7 mg/kg, respectively.

### 2.2 Non-Cancer Toxicity Criteria

Alternative 3 is based on residential ALs developed using the residential child soil ingestion rate (described above) and an alternative non-cancer toxicity criterion based on the intermediate minimal risk level (MRL) of $1 \times 10^{-4}$ mg/kg per day (mg/kg-day) developed by the Agency for Toxic Substances and Disease Registry (ATSDR). An intermediate MRL is applicable to exposure durations of up to approximately 1 year. Although this toxicity criterion is two-fold higher than the oral reference dose (RfD) for dieldrin (i.e., $5 \times 10^{-5}$ mg/kg-day) listed in US Environmental Protection Agency (USEPA) Integrated Risk Information System (IRIS) (USEPA 1989), the New Zealand ME identified the same dose ($1 \times 10^{-4}$ mg/kg-day) as the its chronic tolerable daily intake. Similarly, Health Canada has also identified this dose as the chronic acceptable daily intake (ADI) to derive the Canadian maximum acceptable concentration (MAC) for aldrin and dieldrin in drinking water. It should be noted that due to the limited time frame associated with the potential implementation of the final remedial alternative, the use of the interim MRL should be acceptable/health protective, and likely conservative, since $1 \times 10^{-4}$ is used as a chronic oral reference value by other environmental agencies (e.g., New Zealand ME and Health Canada) based on extensive reviews. As indicated above, engineering controls, such as maintaining good lawn cover, would also accompany a removal action based on this modified soil ingestion rate.

As shown in Table 1, the child non-cancer soil ALs developed for aldrin and dieldrin using a child soil ingestion rate of 45 mg/day and an oral RfD of $1 \times 10^{-4}$ mg/kg-day are both 15 mg/kg.

## 3.0 HISTOGRAMS OF PRELIMINARY HAZARD ESTIMATES

The histograms in Figures 1 through 4 show the number of DUs that fall into each of the HI ranges shown on the x-axis. In each range there are three bars representing the three alternative ALs used to calculate the non-cancer hazard. (The bars for Alternatives 1, 2, and 3 are respectively white, light purple and dark purple). At the direction of HDOH, HIs were rounded to two significant figures for sorting into risk ranges.

Figure 1 shows the results for the upper 6 inches of soil for DUs in Earhart I-2. Figure 2 shows the results for the upper 6 inches of soil for DUs in Earhart I-3. For reference purposes, histograms summarizing the non-cancer hazards for the 6 to 12-inch depth interval for Earhart I-2 and Earhart I-3 are presented in Figures 3 and 4, respectively.

As part of the removal action being conducted under *Removal Action Work Plan No. 1* (RO #1) (Tetra Tech 2010a), which is currently underway, 8 DUs in Earhart I-2 and one DU in Earhart I-3 are being addressed by excavation of soil from the 0 to 12-inch depth interval and replacement with clean fill. These DUs were included in the histograms with a post-removal HI assumed to be less than 1.0 for each of the alternative sets of hazard calculation.

### 3.1 Alternative 1: Site-specific Residential Soil ALs (Tetra Tech 2006)

As indicated in Table 1, the site-specific aldrin and dieldrin residential ALs are 1.8 mg/kg and 3.1 mg/kg, respectively.

As shown for Alternative 1 (white histogram bars) on Figure 1, out of a total of 325 DUs, 178 have a HI of less than or equal to 1.0, 117 DUs have HIs ranging from 1.1 to 3.0, and 30 DUs have HIs greater than 3.0 (ranging from 3.1 to 8.0).

Figure 2 summarizes the non-cancer hazards for the DUs in Earhart I-3 estimated using the current site-specific residential soil ALs. As shown in the figure, out of a total of 182 DUs, 134 have a HI of less than or equal to 1.0, 40 DUs have HIs ranging from 1.1 to 3.0, and 8 DUs have HIs greater than 3.0 (ranging from 3.1 to 7.0).

### 3.2 Alternative 2: Residential Soil ALs Modified Based on Alternative Child Soil Ingestion Rate

As indicated in Table 1, the aldrin and dieldrin residential soil ALs for this scenario (using a soil ingestion rate of 45 mg/day) are 4.7 mg/kg and 7.7 mg/kg, respectively.

As shown for Alternative 2 (light purple shading) on Figure 1, out of a total of 325 DUs, 292 have a HI of less than or equal to 1.0, 33 DUs have HIs ranging from 1.1 to 3.0, and no DUs have HIs greater than 3.0.

As shown for Alternative 2 on Figure 2, out of a total of 182 DUs, 174 have a HI of less than or equal to 1.0, 8 DUs have HIs ranging from 1.1 to 3.0, and no DUs have HIs greater than 3.0.

### 3.3 Alternative 3: Residential Soil ALs Modified Based on Alternative Child Soil Ingestion Rate and Alternative Oral RfD

As indicated in Table 1, the aldrin and dieldrin residential soil ALs for this scenario are both 15 mg/kg.

Figure 1 summarizes the non-cancer hazards for the DUs in Earhart I-2 estimated using the residential soil ALs modified using a child soil ingestion rate of 45 mg/day and an oral RfD of $1 \times 10^{-4}$ mg/kg-day. As shown for Alternative 3 (dark purple shading) on

Figure 1, out of a total of 325 DUs, only one has an HI greater than 1.0. (The HI for this DU, rounded to two significant figures, is 1.1).

Figure 2 summarizes the non-cancer hazards for the DUs in Earhart I-3. As shown for Alternative 3 (dark purple shading) on Figure 2, out of a total of 182 DUs, none has a HI greater than 1.0.

## 4.0 SUMMARY OF DECISION UNIT SCREENING USING PROPOSED RESIDENTIAL ALS

Comparison of the results associated with Alternatives 1, 2, and 3 for Earhart I-2 on Figure 1 indicates the following: for Alternative 1 a total of 147 DUs have a HI greater than 1.0; for Alternative 2 a total of 33 DUs have a HI greater than 1.0; and for Alternative 3 one DU has a HI greater than 1.0.

Comparison of the results associated with Alternatives 1, 2, and 3 for Earhart I-3 on Figure 2 shows the following: for Alternative 1 a total of 48 DUs have a HI greater than 1.0; for Alternative 2 a total of 8 DUs have an HI greater than 1.0; and for Alternative 3 no DUs have a HI greater than 1.0.

The results of this screening indicate that there is a significant difference in the number of DUs that exceed a HI of 1.0 in both Earhart I-2 and Earhart I-3, depending on which residential soil ALs are used.

## 5.0 CONCLUSION

The HDOH concluded that it is appropriate to use Alternative 3 (the alternative with a modified child ingestion rate and a modified toxicity value) as the basis for the second removal action (HDOH 2010). Considering that the oral RfD used for this determination is used as the basis for evaluating chronic exposures in New Zealand and Canada, Alternative 3 is considered protective of human health, (especially if implemented in conjunction with engineering controls to maintain good lawn cover and minimize bare soil areas in landscaping strips around building perimeters as described below).

Based on Alternative 3 ALs, the HI for assumed soil exposure in one DU (DU-39a) located in Earhart I-2 exceeds the HI of 1.0 in the 0 to 6-inch depth interval. Therefore, based on recommendations from HDOH, the soil in this DU should be excavated to a depth of at least 6 inches followed by replacement of the excavated soil with acceptable clean fill.

It is important to note that in the APRA Memo dated November 3, 2010 (Tetra Tech 2010), the HI for this DU was estimated to be 1 based on rounding to one significant figure. When rounded to two significant figures as requested by HDOH, the HI for this DU is 1.1.

## 6.0 RECOMMENDED ENGINEERING CONTROLS

The following engineering controls will be applied to reduce the risk of exposure to residents. Additional detail concerning the implementation of engineering controls will be presented in the RO# 2 (in development).

### 6.1. Maintenance of Grass Cover

Visual inspections will be conducted monthly of DUs with HI greater than 1.0 under Alternative 1. If exposed soil is observed during these visual inspections then the affected areas will be re-seeded.

### 6.2. Landscape Strips around Building Perimeters

Landscape strips about 2 to 3-feet wide around the perimeters of buildings are planted with shrubs and other plants, rather than grass, leaving some soil exposed. In order to address potential residential exposure to this soil, a layer of geotextile fabric will be placed over the soil, followed by a layer of gravel to hold the geotextile in place. This engineering control will be applied to landscape strips within DUs with HI >1.0 (Figures 1 and 2) as determined under Alternative 2.

## 7.0 REFERENCES

Bureau Veritas. 2010. *Analysis of the Adjustment of Site-Specific Action Levels, Earhart I-2*, Hickam Air Force Base. October 27.

HDOH (Hawai`i Department of Health). 2010. *Hickam Communities Removal Action #2, Air Force MFH HAFB Earhart Phase I-2 and Phase I-3, 2010-682-ES*. Letter to Roger Franklin, Actus Lend Lease from Eric Sadoyama, HDOH. November 5, 2010.

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Tetra Tech. 2010a. *Removal Action Work Plan No. 1, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawai`i*. Prepared for Hickam Communities LLC. October 11, 2010.

Tetra Tech. 2010b. *Revised Analysis of Potential Removal Alternatives, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawai`i*. Memorandum to Fenix Grange, HDOH. Prepared by Tetra Tech on behalf of Hickam Communities LLC. November 3, 2010.

USEPA (United States Environmental Protection Agency). 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final. EPA/540/1-89/002.* December.

**Table 1**
**Summary of Alternative Action Levels**
**Proposed for Earhart I-2 and I-3 Neighborhoods**
**Hickam Air Force Base**
**Oahu, Hawaii**

| Scenario | Chemical | Proposed Non-cancer Alternative Action Levels[a] (mg/kg) |
|---|---|---|
| Alternative 1[b] | Aldrin | 1.8 |
| | Dieldrin | 3.1 |
| Alternative 2[c] | Aldrin | 4.7 |
| | Dieldrin | 7.7 |
| Alternative 3[d] | Aldrin | 15 |
| | Dieldrin | 15 |

**Notes:**

[a] All alternative action levels derived based on a target hazard quotient of 1.

[b] Current site-specific non-cancer alternative action levels (Tetra Tech 2006).

[c] Alternative action levels modified based on use of child soil ingestion rate of 45 mg/day.

[d] Alternative action levels modified based on use of child soil ingestion rate of 45 mg/day and an oral reference dose of $1 \times 10^{-4}$ mg/kg-day.

**Sources:**

Tetra Tech. 2006. Summary of Human Health Risk Assessment of Chlordane (including Heptachlor and Heptachlor Epoxide), Dieldrin, and Aldrin in Soil, Hickam Community Housing Areas, Hickam Air Force Base, Hawaii. June 30th.

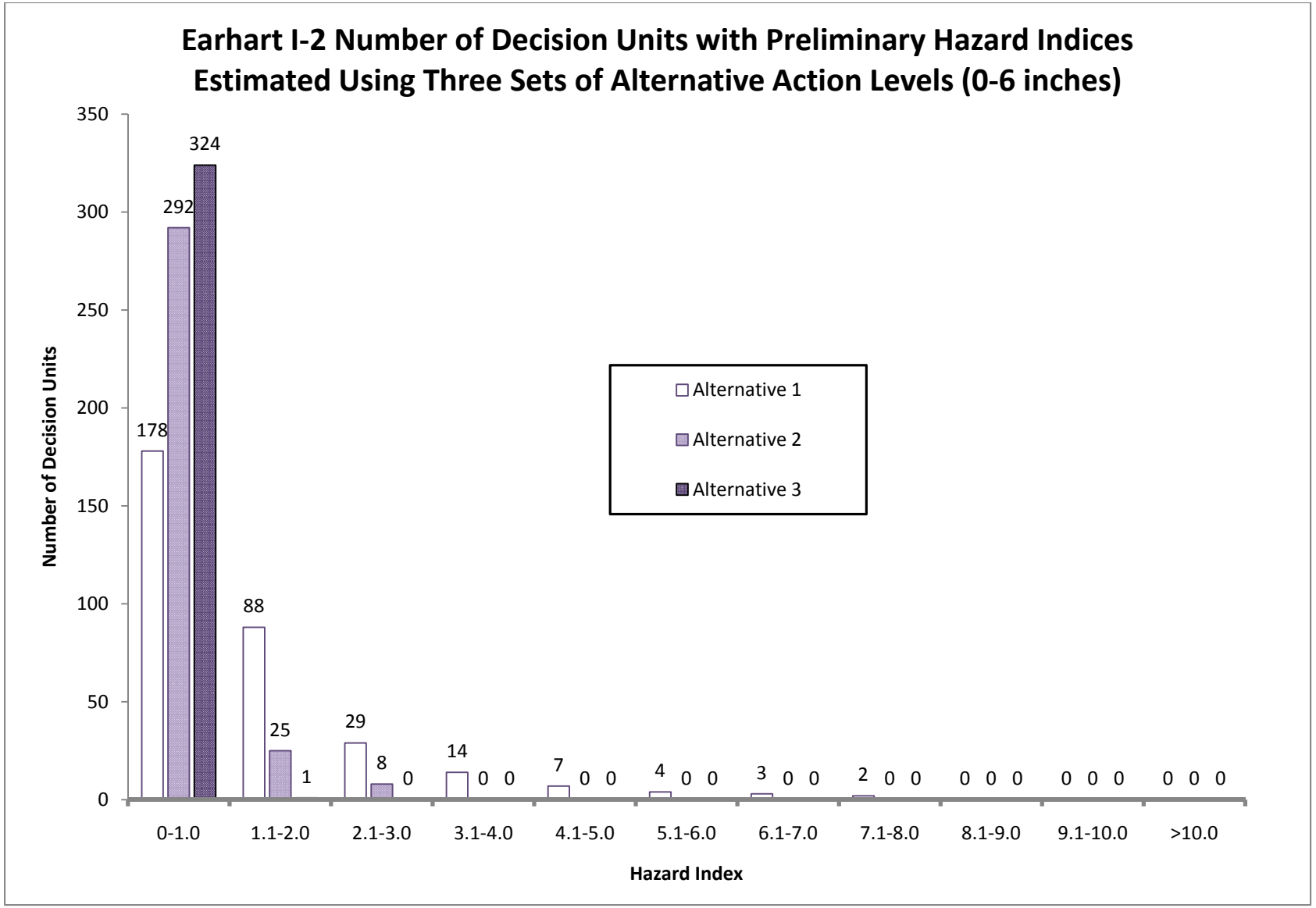


**Figure 1. Comparison of Number of Decision Units with Preliminary Hazard Indices Calculated Using Alternative Action Levels at Earhart I-2 (0-6 inches depth interval).**

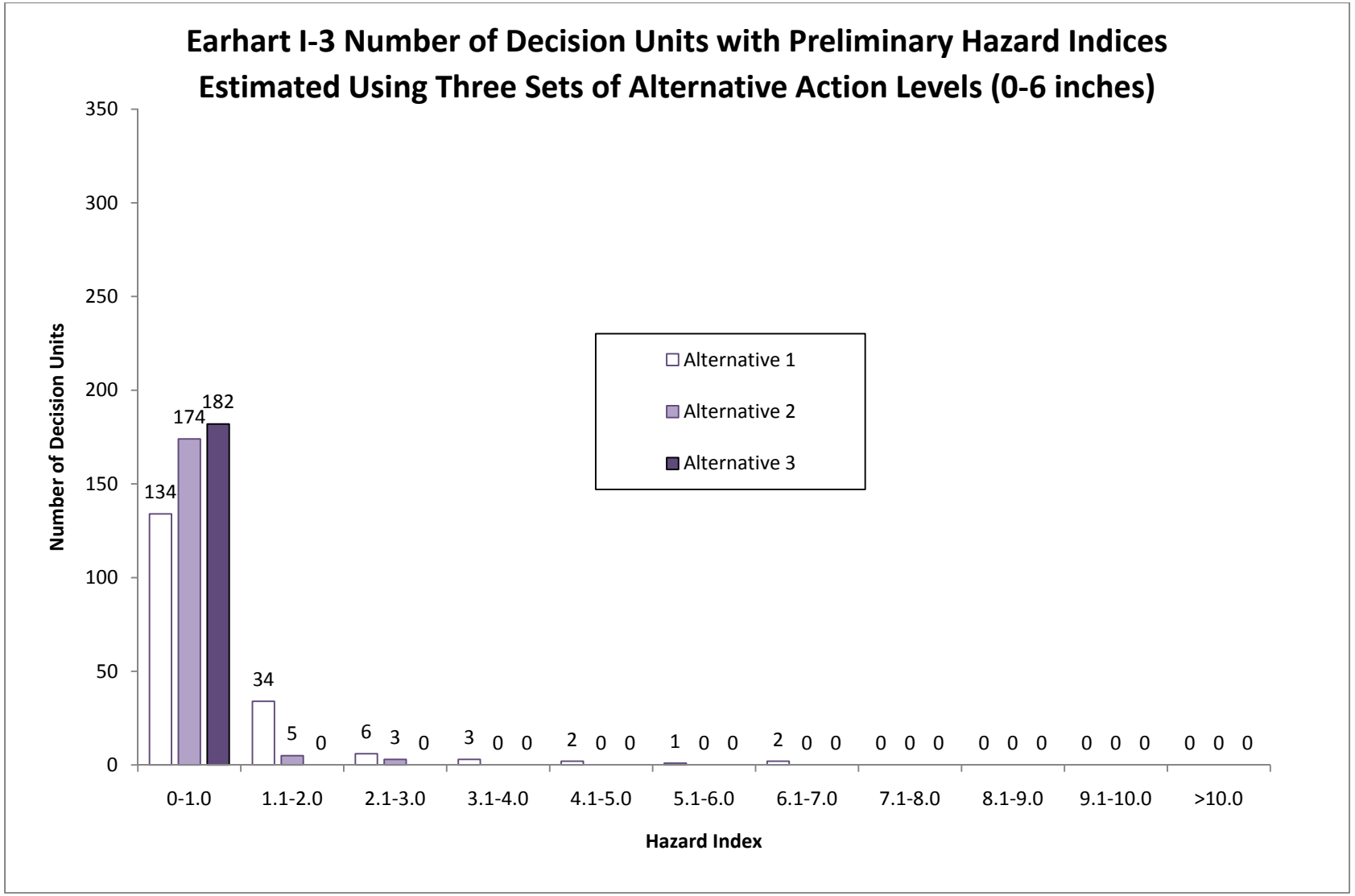


**Figure 2. Comparison of Number of Decision Units with Preliminary Hazard Indices Calculated Using Alternative Action Levels at Earhart I-3 (0-6 inches depth interval).**

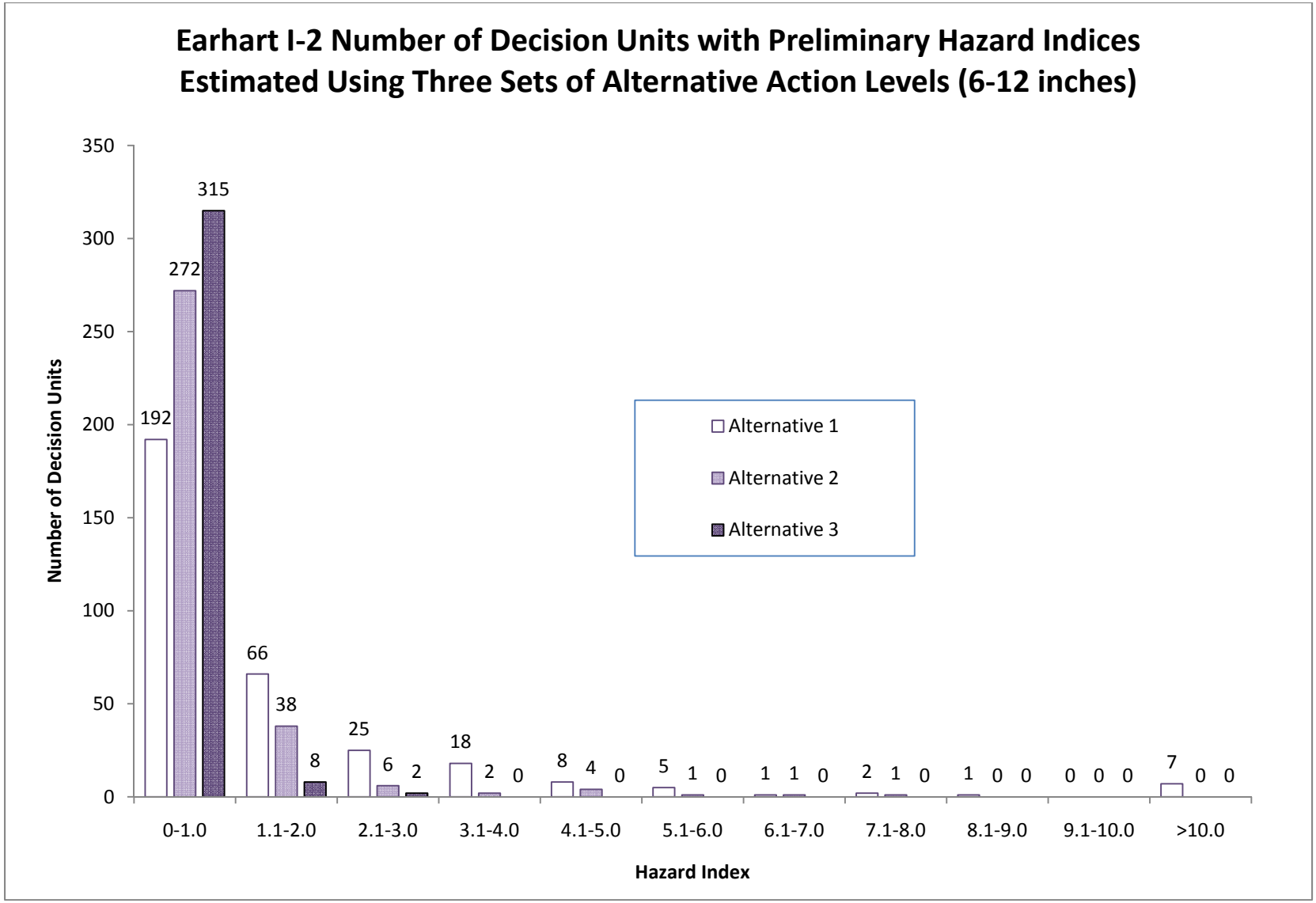


**Figure 3. Comparison of Number of Decision Units with Preliminary Hazard Indices Calculated Using Alternative ALs at Earhart I-2 (6-12 inches depth interval).**

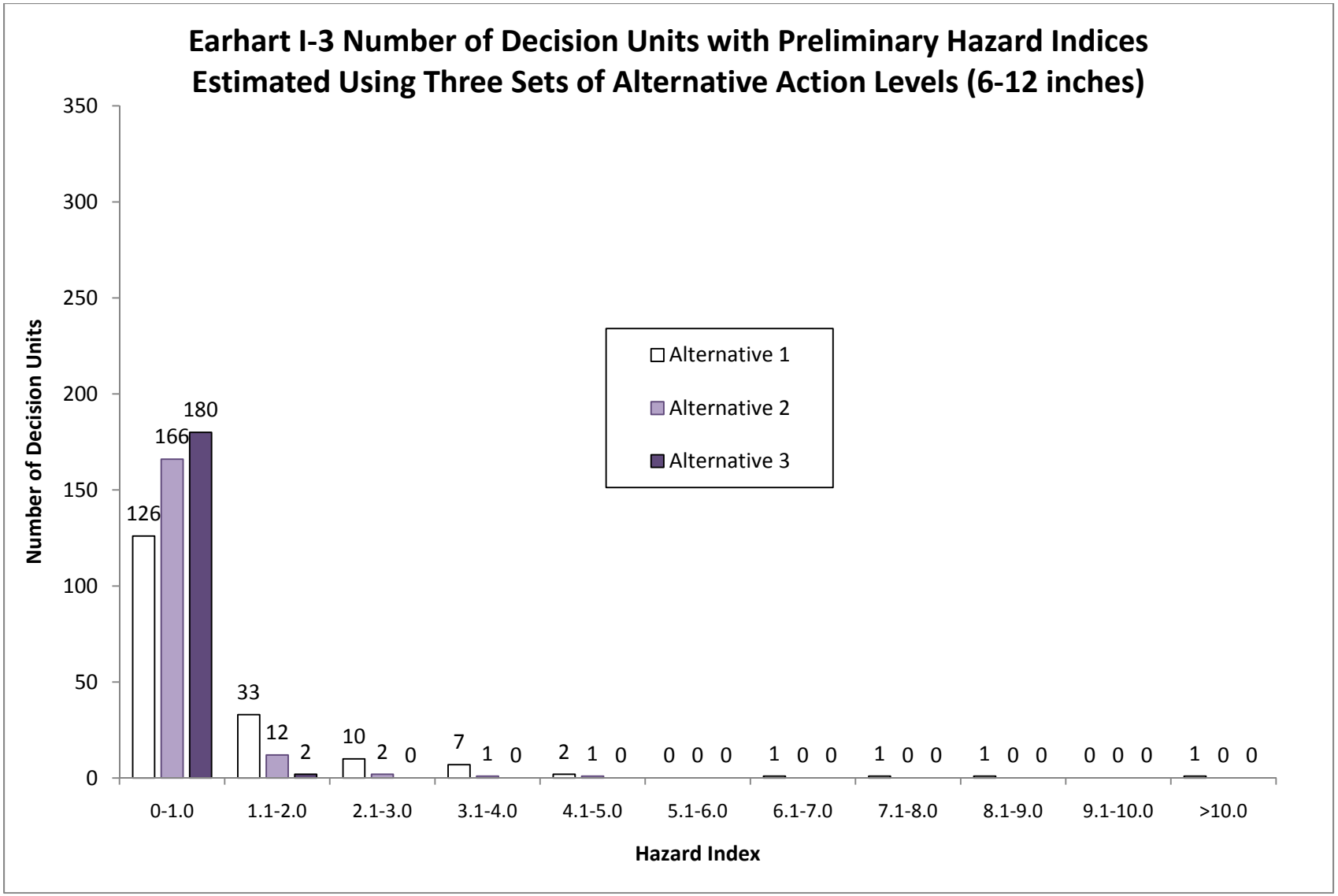


**Figure 4. Comparison of Number of Decision Units with Preliminary Hazard Indices Calculated Using Alternative Action Levels at Earhart I-3 (6-12 inches depth interval).**

# APPENDIX B3

## Human Health Risk Evaluation Work Plan

# Preliminary Human Health Risk Evaluation Work Plan for Three Hickam Neighborhoods
# Hickam Communities LLC
# Review of Draft Preliminary Human Health Risk Evaluation Work Plan for Hickam Communities (5/13/2011), Hickam Communities Sites

**DCN: 2653504.xxx.D01**

**Date: May 13, 2011**

**Reviewer: Eric Sadoyama – HDOH**

**Response to: 2011-303-ES; June 7, 2011**

| *Item #* | *Section* | *Page #* | *HDOH Comment (06/7/2011)* | *Tetra Tech Response* |
|---|---|---|---|---|
| 1 | 2.1 | 2 | Cancer slope factors. HDOH agrees to modify the cancer slope factor for aldrin from 17 $(mg/kg \cdot day)^{-1}$ to 3.4 $(mg/kg \cdot day)^{-1}$, and for dieldrin from 16 $(mg/kg \cdot day)^{-1}$ to 7 $(mg/kg \cdot day)^{-1}$, as proposed. | Comment noted. |
| 2 | 2.2 | 3 | Target risk levels. HDOH agrees to modify the target excess cancer risk (ECR) for aldrin and dieldrin, considered together, to $1.0 \times 10^{-4}$. This modification applies only to aldrin and dieldrin, as the HHRE only addresses these two chemicals. | It is understood that the target risk of $1 \times 10^{-4}$ applies only to aldrin and dieldrin. The text and tables of the Work Plan will be modified as required to indicate that this is the case. However, Tetra Tech would like to note that the child soil ingestion rate (see Comment #4 below) is a site- and receptor-specific parameter rather than a chemical-specific parameter. |
| 3 | 2.3 | 4 | Noncancer toxicity criteria. HDOH agrees to modify the oral reference dose for aldrin from $3 \times 10^{-5}$ mg/kg·day to $1 \times 10^{-4}$ mg/kg·day, and for dieldrin from $5 \times 10^{-5}$ mg/kg·day to $8 \times 10^{-5}$ mg/kg·day, as proposed. | Comment noted. |
| 4 | 2.4 | 4 | Child soil ingestion rate. HDOH agrees, for Hickam Communities sites, to modify the child soil ingestion rate from 200 mg/day to 100 mg/day as proposed, contingent on continued effective implementation of land use controls to minimize PI soil exposure. | Comment noted. As indicated above, the proposed child soil ingestion rate is a site- and receptor-specific parameter rather than a chemical-specific parameter. For this reason, it should be applied to all chemicals being evaluated at the site (see Comments 8 and 9 below). |

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| Item # | Section | Page # | HDOH Comment (06/7/2011) | Tetra Tech Response |
|---|---|---|---|---|
| 5 | 2.5 | 5 | Dermal absorption. HDOH agrees to modify the dermal absorption factors for aldrin and dieldrin from 0.10 to 0.05 as proposed. | Comment noted. |
| 6 | 3.0 | 6 | Aldrin and dieldrin action levels. HDOH agrees to Alternative 3 where the modifications in comments #1 through #5 above are used to calculate adjusted soil EALs for aldrin and dieldrin of 12 mg/kg and 9.8 mg/kg respectively, for Hickam Communities sites. Use of these adjusted EALs is contingent on continued effective implementation of land use controls for PI soil exposure. | Comment noted. |
| 7 | -- | -- | For a Decision Unit (DU) to be considered not to pose a threat to human health and the environment due to organochlorine COPCs, all of the following criteria must be met: (1) the cumulative ECR for aldrin plus dieldrin must not exceed $1.0\times10^{-4}$; (2) the cumulative ECR for all other organochlorine COPCs (chlordane, endrin, DDT, etc.) must not exceed $1.0\times10^{-5}$; (3) the cumulative ECR for all COPCs must not exceed $1.0\times10^{-4}$; and (4) the Hazard Index for all COPCs must not exceed 1.0. If any of these criteria are not met, then that DU is considered to pose a threat to human health and the environment and must be managed accordingly. | Comment noted. |
| 8 | 4.0 | 8 | Chlordane action level. HDOH does not agree to the chlordane action level adjustment proposed in Tables 3 and 4. HDOH agreed in 2006 to HC's proposal for a site-specific chlordane action level of 23.4 mg/kg; this is the action level for the project. | As noted above for Comment #2, the target risk level of $1 \times 10^{-4}$ only applies to aldrin and dieldrin. However, as indicated in Comment #4, the child soil ingestion rate is a site-specific parameter rather than a chemical-specific parameter and should be applied to all chemicals being evaluated at the site including chlordane. Similarly, the HDOH-accepted adjustments from the 2006 site-specific evaluation (i.e., target risk of $1 \times 10^{-5}$ and assumed exposure duration of six years) are also site- and receptor-specific adjustments rather than chemical-specific adjustments and it is appropriate to apply them to all chemicals being evaluated. Thus, for this evaluation, it is appropriate to derive site-specific EALs using the HDOH-accepted adjustments from the 2006 site-specific evaluation (i.e., target risk of $1 \times 10^{-5}$ and assumed exposure duration of six years) as well as the child soil ingestion rate of 100 mg/day accepted by HDOH in |

<table>
<tr><th>Item #</th><th>Section</th><th>Page #</th><th>HDOH Comment (06/7/2011)</th><th>Tetra Tech Response</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Comment #4. As described in Section 2.4 of the Work Plan, the child soil ingestion rate of 100 mg/day is considered to be health protective and likely represents an upper-bound estimate based on site-specific conditions that are applicable to all chemicals. This is due to the fact that there is a restriction on digging associated with the residential leases at the site and because engineering controls, such as maintaining good lawn cover, will likely be instituted as part of long-term management of the site. Thus, assuming a child soil ingestion rate of 100 mg/day, target risk of 1 x $10^{-5}$, an exposure duration of 6 years, and HDOH recommended defaults for the remaining parameters used to derive EALS (see Table 2), the child resident carcinogenic EAL for chlordane would be 42.6 mg/kg. Tetra Tech proposes that a carcinogenic EAL of 42.6 mg/kg for chlordane is appropriate for the project.</td></tr>
<tr><td>9</td><td>4.0</td><td>8</td><td>DDD, DDE, DDT, and endrin. HDOH does not agree to the DDD, DDE, DDT, and endrin action level adjustments proposed in Tables 3 and 4. Such adjustments would require supporting evidence comparable to that presented for aldrin and dieldrin. Note that even if direct exposure EALs were set at the proposed levels, final EALs may still be constrained by ecotoxicity hazards.
<table>
<tr><th></th><th>HDOH Tier 1 EAL (all hazards)</th><th>HDOH Tier 1 EAL (ecotoxicity hazard only)</th><th>HC proposed EAL (Table 3, lowest levels)</th></tr>
<tr><td>DDD</td><td>2</td><td>82</td><td>487</td></tr>
<tr><td>DDE</td><td>1.4</td><td>4</td><td>344</td></tr>
<tr><td>DDT</td><td>1.7</td><td>4</td><td>67</td></tr>
<tr><td>Endrin</td><td>0.06</td><td>0.06</td><td>30</td></tr>
</table>
Units: mg/kg</td><td>For DDD, DDE, DDT, and endrin, it is appropriate to use the same site- and receptor-specific adjustments/parameters used for chlordane (i.e., child soil ingestion rate of 100 mg/day, target risk of 1 x$10^{-5}$, and exposure duration of 6 years). Revised versions of Tables 3 and 4 from the HHRE work plan are provided with these responses to summarize the resulting EALs, which Tetra Tech is proposing to use for the project.<br><br>It is understood that ecotoxicity hazards should be considered in the EHE.</td></tr>
</table>

TETRA TECH

**DRAFT**

100-SFO-T26535-04

# Revised Preliminary Human Health Risk Evaluation Work Plan for Hickam Communities

**Joint Base Pearl Harbor-Hickam**

**Oʻahu, Hawaiʻi**

**DCN: 2653504.021.D02**

**June 13, 2011**

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**DRAFT**

# Revised Preliminary Human Health Risk Evaluation Work Plan for Hickam Communities

## Joint Base Pearl Harbor-Hickam
## Oʻahu, Hawaiʻi

*Prepared for*

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Tetra Tech Project No. 100-SFO-T26535-04

DCN: 2653504.021.D02

June 13, 2011

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Appendix A. Report for the Hawai‘i Department of Health on Aldrin/Dieldrin Concentrations in Soil at the Joint Base Pearl Harbor-Hickam

# ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

| | |
|---|---|
| ADI | acceptable daily intake |
| APRA | Analysis of Potential Removal Alternatives |
| Cal/EPA | California Environmental Protection Agency |
| $cm^2$/day | square centimeters per day |
| CPSC | Consumer Products Safety Commission |
| CSF | cancer slope factor |
| CHHSL | California Human Health Screening Level |
| DDD | Dichlorodiphenyldichchloroethane |
| DDE | Dichlorodiphenyltrichloroethylene |
| DDT | Dichlorodiphenyltrichloroethane |
| EAL | Environmental Action Level |
| FDA | Food and Drug Administration |
| HC | Hickam Communities LLC |
| HDOH | Hawai'i Department of Health |
| HQ | hazard quotient |
| IARC | International Agency for Research on Cancer |
| IRIS | Integrated Risk Information System |
| JBPPH | Joint Base Pearl Harbor-Hickam |
| kg | kilogram |
| LOAEL | lowest observed adverse effect level |
| $m^3$/day | cubic meter per day |
| MAC | maximum acceptable concentration |
| ME | Ministry for the Environment |
| Memo | memorandum |
| mg | milligram |
| $mg/cm^2$ | milligrams per square centimeter |
| mg/day | milligrams per day |
| mg/kg | milligrams per kilogram |
| NOAEL | no observed adverse effect level |
| RfD | Reference dose |
| USEPA | United States Environmental Protection Agency |
| WHO | World Health Organization |

# 1.0 INTRODUCTION

On behalf of Hickam Communities (HC), Tetra Tech is submitting a Preliminary Human Health Risk Evaluation Work Plan (the "Work Plan") for the Earhart I-2, Earhart I-3, and Onizuka II-1 neighborhoods located at Joint Base Pearl Harbor-Hickam (JBPHH), Oʻahu, Hawaiʻi. Tetra Tech has evaluated alternative environmental action levels (EALs) and corresponding support documentation to support soil management and cleanup activities at HC. The intent of this Work Plan is to recommend and document proposed alternative EALs and corresponding support materials for Hickam Communities. The proposed alternative EALs were derived using the most up-to-date scientific research and risk assessment guidelines to be protective of human health. Pending HDOH concurrence, the proposed alternative EALs, will be used to evaluate potential human health risks within the three Hickam Communities neighborhoods in accordance with HDOH risk assessment guidelines.

This document provides a summary of five proposed adjustments to the residential EALs developed for the Earhart I-2, Earhart I-3, and Onizuka II-1 neighborhoods in 2006 (referred to as "2006 Hickam EALs") (Tetra Tech 2006) This report also evaluates the significance of the various adjustments on the resulting alternative residential EALs in comparison to the 2006 Hickam EALs. This is important because the residential EALs selected will be used to evaluate potential exposures to residential receptors and to evaluate the need for, or scope of, potential future remediation/mitigation efforts within the Hickam neighborhoods.

The five proposed adjustments evaluated are as follows:

- Cancer slope factors
- Target risk levels
- Noncancer toxicity criteria
- Child soil ingestion rates
- Dermal absorption factors

Brief descriptions of each of these potential types of adjustments to the 2006 Hickam EALs are provided below in Section 2.

The remainder of this document is organized as follows. Section 2 provides background information for each of the proposed modifications to the 2006 Hickam EALs. Section 3 summarizes the resulting screening levels for aldrin and dieldrin associated with various adjustments to the 2006 Hickam EALs (i.e., alternative EALs). Section 4 provides a brief summary and recommendation for site-specific residential EALs. References are provided in Section 5. Appendix A provides a toxicity evaluation for aldrin and dieldrin conducted by Tetra Tech that evaluates available toxicity information and provides supporting information for the proposed toxicological adjustments described below in Section 2.

# 2.0 SUMMARY OF POTENTIAL ADJUSTMENTS TO RESIDENTIAL EALs

## 2.1 Cancer Slope Factors (Aldrin and Dieldrin)

USEPA released its quantitative risk assessment of the carcinogenicity of aldrin and dieldrin in 1987 (USEPA 1987), which was conducted in accordance with USEPA's guidelines for carcinogen risk assessments published in 1986 (USEPA 1986). The current cancer slope factors (CSFs) for aldrin and dieldrin listed in USEPA's Integrated Risk Information System (IRIS), which were used to derive the 2006 Hickam EALs (Tetra Tech 2006) for these compounds, are still based on the 1987 risk assessment. In 1996, USEPA published a draft document of proposed guidelines for carcinogen risk assessment, which incorporated revisions to the 1986 guidelines (USEPA 1996). In 2005, USEPA published the final version of the updated guidelines for carcinogen risk assessment (USEPA 2005). The 2005 guidelines for carcinogen risk assessment indicate that the USEPA recommended rationale and methods for developing cancer risk assessments have evolved substantially since 1986. USEPA's 2005 guidelines provide the most scientifically appropriate options for evaluating the carcinogenic potential of chemicals to reflect what is currently known about the mechanisms by which chemicals cause cancer. This fact is also noted in HDOH's 2009 document, *Rationale for the Proposed Revisions to Department of Health Water Quality Standards* (HDOH 2009, pages 1 and 4), which is a document that was produced to provide support for revisions to water quality standards that were being proposed for various reasons, one of which was "..to incorporate over 20 years of new nationwide scientific research to update standards that have been in effect since 1990 and are based on outdated USEPA recommendations."

Application of USEPA's 2005 guidelines would result in CSFs for aldrin and dieldrin that are lower than the current aldrin and dieldrin CSFs obtained from the 1987 carcinogen risk assessment conducted for these compounds. Thus, the 2006 Hickam EALs calculated based on the current aldrin and dieldrin CSFs obtained from USEPA's 1987 carcinogen risk assessment are lower (i.e., more conservative) than those that would be estimated if the 1987 slope factors were updated to be consistent with current USEPA (2005) guidelines. This means that the 2006 Hickam EALs are likely lower than required to be protective of public health.

For the purpose of developing alternative residential EALs, the aldrin and dieldrin CSFs incorporate two proposed modifications/updates that are consistent with USEPA's 2005 guidelines for carcinogen risk assessment. One modification entails updating the mathematical approach used by USEPA for scaling experimental doses from rodents to humans and the other is the use of a benchmark dose to evaluate the cancer dose response assessment. Each of these modifications is described briefly below. The use of the updated CSFs for aldrin and dieldrin are supported by a recent review conducted by Tetra Tech, which is included as Appendix A.

### *2.1.1 Inter-Species Scaling*

Inter-species scaling factors are used to account for differences in body size between laboratory test species (mice in the cases of aldrin and dieldrin) and potential receptor species (e.g., humans) (USEPA 1992) and is common practice in human health risk assessment (USEPA 2005). The current aldrin and dieldrin CSFs used by USEPA, which were developed in 1987, are based on human equivalent doses calculated using a body weight ratio (rodent to human) to the 1/3 power (USEPA 1987). However, in 1992 an updated methodology for calculating inter-

species scaling factors was adopted by USEPA, the Food and Drug Administration (FDA), and the Consumer Products Safety Commission (CPSC) as a consensus approach for risk assessment of carcinogens (USEPA 1992). The updated scaling factor is based on a rodent to human body weight ratio to the 1/4 power and is the default approach for inter-species scaling as per USEPA's 2005 Guidelines for Carcinogen Risk Assessment (USEPA 2005).

It is noteworthy that USEPA applied this same modification to chlordane, which is another structurally similar pesticide detected at the site, when chlordane was re-evaluated in 1997.

### *2.1.2 Benchmark Dose*

The USEPA (1987) cancer dose response assessment for aldrin and dieldrin used a linearized multistage model to estimate risk, which the Agency described as leading to an upper limit on risk. The current USEPA approach to a cancer dose response assessment would be to use a benchmark dose (USEPA 2000b).

Cancer slope factors for aldrin and dieldrin based on a benchmark dose were developed using the same data used by USEPA in its 1987 cancer risk estimates. The only exception to this was that only data sets comprised of two or more dose groups were used since the benchmark dose approach requires at least two dose groups and a control. When the benchmark dose approach was combined with the update to the inter-species scaling factor described above, the resulting CSFs for aldrin and dieldrin are 3.4 $(mg/kg\text{-}day)^{-1}$ and 7 $(mg/kg\text{-}day)^{-1}$, respectively.

It is important to note that the modifications to the CSFs presented in this document do not represent a departure from default procedures; but rather an update to the toxicity criteria for aldrin and dieldrin to reflect current risk assessment guidelines.

## 2.2 Target Risk Levels

The 2006 Hickam EALs (Tetra Tech 2006) were developed based on a target risk level of $1 \times 10^{-5}$. As noted in the 2006 EAL document, the target risk level of $1 \times 10^{-5}$ is within the USEPA (1990) acceptable risk range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$. Additionally, the Hawai'i State Contingency Plan, Chapter 11-451, Hawai'i Administrative Rules (1995) states, "For known or suspected carcinogens acceptable cleanup levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between $10^{-4}$ and $10^{-6}$ using information on the relationship between dose and response." For this reason, alternative EALs based on a target risk of $1 \times 10^{-4}$ are also evaluated.

As noted in USEPA (1991) guidance, USEPA uses the general $10^{-4}$ to $10^{-6}$ range as a target range within which the Agency strives to manage risks. It is also noted that the upper boundary of the risk range is not a discrete line at $1 \times 10^{-4}$, although USEPA generally uses $1 \times 10^{-4}$ in making risk management decisions. Additionally, it is noted that in certain cases USEPA may consider risk estimates slightly greater than $1 \times 10^{-4}$ to be protective if justified based on site-specific conditions.

In addition to the fact that $1 \times 10^{-4}$ represents the upper end of the USEPA target risk range, there is also uncertainty in regard to whether or not aldrin and dieldrin should even be classified as human carcinogens. For example, USEPA (1987) considered aldrin and dieldrin to be probable human carcinogens based on liver tumors in mice, but the mode of action for liver tumors in mice may not be applicable to humans. Additionally, the National Toxicology Program

(2010) does not consider aldrin or dieldrin to be human carcinogens or to be reasonably anticipated to be human carcinogens. The International Agency for Research on Cancer (IARC 1987) concluded that aldrin and dieldrin could not be classified as to their carcinogenicity in humans. Studies published since the USEPA (1987) and IARC (1987) reports provide no evidence of a causal association between aldrin and dieldrin and an excess risk of cancer in humans. The World Health Agency (WHO 2008) accepted the IARC classification of aldrin and dieldrin and went on to state that, "It is considered that all available information on aldrin and dieldrin taken together, including studies on humans, supports the view that, for practical purposes, these chemicals make very little contribution, if any, to the incidence of cancer in humans."

## 2.3 Noncancer Toxicity Criteria

The current USEPA oral reference doses (RfDs) for aldrin and dieldrin were derived using a lowest observed adverse effect level (LOAEL) and no observed adverse effect level (NOAEL), respectively. The current USEPA approach would be to use a benchmark dose methodology. Tetra Tech derived updated RfDs of $1 \times 10^{-4}$ mg/kg per day for aldrin and $8 \times 10^{-5}$ mg/kg per day for dieldrin using the benchmark dose methodology (see Appendix A). The updated toxicity criterion for dieldrin is 1.6-fold higher than the oral RfD for dieldrin (i.e., $5 \times 10^{-5}$ mg/kg-day) and the updated toxicity criterion for aldrin is roughly 3-fold higher than the oral RfD for aldrin (i.e., $3 \times 10^{-5}$ mg/kg-day) listed in USEPA's IRIS, which were used to develop the 2006 Hickam EALs for aldrin and dieldrin. The use of the updated RfDs for aldrin and dieldrin are supported by a recent review conducted by Tetra Tech, which is included as Appendix A.

The updated RfDs for aldrin and dieldrin are quite similar to the RfD that was selected for these compounds as part of the analysis of potential interim removal alternatives. As indicated in the *Revised Analysis of Potential Removal Alternatives* memorandum (the "Revised APRA memo") dated November 10, 2010 (Tetra Tech 2010), an alternative oral reference dose (RfD) of $1 \times 10^{-4}$ mg/kg per day (mg/kg-day) was used for aldrin and dieldrin. This noncancer toxicity criterion was originally developed by the WHO and the New Zealand Ministry for the Environment (ME) recently identified the same dose as its chronic tolerable daily intake. Similarly, Health Canada has also identified this dose as the chronic acceptable daily intake (ADI) to derive the Canadian maximum acceptable concentration (MAC) for aldrin and dieldrin in drinking water.

As with the modifications to the CSFs described above, the modifications to the reference doses presented in this document do not represent a departure from default procedures; but rather an update to the toxicity criteria for aldrin and dieldrin to reflect current risk assessment guidelines.

## 2.4 Child Soil Ingestion Rate

The USEPA recommended default soil ingestion rate of 200 mg/day for a child resident was used to derive the 2006 Hickam EALs. For the three Hickam Communities neighborhoods, two alternative child soil ingestion rates are also evaluated (45 mg/day and 100 mg/day). Due to the fact there is a restriction on digging associated with the residential leases at JBPPH and because engineering controls, such as maintaining good lawn cover, will likely be instituted as part of the long-term management of the site, the alternative soil ingestion rates listed above are considered to be more representative of site-specific conditions than the recommended default ingestion rate.

As described in the Revised APRA Memo, the New Zealand ME conducted an extensive review of available literature regarding child soil ingestion rates and identified a median soil ingestion rate ranging from 20 to 30 mg/day and a mean ingestion rate of 60 mg/day. Based on their review, the New Zealand ME opted to use a child soil ingestion rate representing the midpoint between the median and mean values (i.e., 45 mg/day) for the development of their long-term dieldrin soil action level. A child soil ingestion rate of 100 mg/day is also evaluated because it is the mean soil ingestion rate for children listed in USEPA's *Exposure Factors Handbook* (USEPA 1997) and likely represents an upper bound estimate based on site-specific conditions.

As described in a memorandum from Bureau Veritas (2010), one of the leading investigators in the field of soil ingestion, Edward Calabrese, recently re-evaluated much of the earlier data from which the USEPA default of 200 mg/day was developed and noted that a central tendency value is likely 20 mg/day with an upper bound (95$^{th}$ percentile) rate of 100 mg/day (Calabrese 2003).

## 2.5 Dermal Absorption Factors for Aldrin and Dieldrin

The recommended default dermal absorption factor for both aldrin and dieldrin noted in HDOH guidance is 0.1. However, this is the generic default value recommended by USEPA for organic compounds for which chemical-specific dermal absorption studies are not available. For chlorinated pesticides such as aldrin and dieldrin, a dermal absorption factor 0.05 is commonly used as a default value. For example, it is the recommended default value used by the California Environmental Protection Agency (Cal/EPA 1999 and 2005) for chlorinated pesticides. Additionally, it is noteworthy that USEPA (2004) and HDOH (2008) recommend a default absorption factor of 0.04 for chlordane, which is a structurally similar pesticide detected at the site. As noted in USEPA guidance (2004), the default value for chlordane was derived based on a chemical-specific dermal absorption study.

# 3.0 SUMMARY OF ALTERNATIVE EALs

Table 1 summarizes the potential alternative EALs for aldrin and dieldrin associated with various adjustments to the 2006 Hickam EALs. As indicated in Table 1, the 2006 Hickam EALs represent the current site-specific EALs developed for the three neighborhoods. The specific adjustments made for each alternative are briefly summarized in the footnotes and the "Additional Adjustments…." column specifies the corresponding child soil ingestion rate. As described in the table, the 2006 Hickam EALs for the child resident are the primary values used for screening purposes because they are the lowest screening values developed for the site and are protective of other potentially exposed receptors (e.g., adult residents).

The specific modifications to the 2006 Hickam EALs associated with Alternatives 1 through 4 are described below.

## 3.1 Alternative 1

Alternative 1 represents residential EALs developed using the following adjustments to the 2006 Hickam EALs:

- Aldrin and dieldrin not classified as carcinogens
- Updated oral RfDs used for aldrin and dieldrin (RfD for aldrin = 1 x $10^{-4}$ mg/kg-day and RfD for dieldrin = 8 x $10^{-5}$ mg/kg-day)
- Dermal absorption factor – Cal/EPA default for chlorinated pesticides used for aldrin and dieldrin (i.e. 0.05)
- Child soil ingestion rate of 45 mg/day assumed

As shown in Table 1, the noncancer EALs developed for aldrin and dieldrin (target hazard =1) based on the modifications described above are 21 mg/kg and 17 mg/kg, respectively.

## 3.2 Alternative 2

Alternative 2 represents residential EALs developed using the following adjustments to the 2006 Hickam EALs:

- Updated body weight scaling factor and benchmark dose approach used to derive CSFs for aldrin and dieldrin (CSF for aldrin = 3.4 $(mg/kg\text{-}day)^{-1}$ and CSF for diedrin = 7 $(mg/kg\text{-}day)^{-1}$)
- Updated oral RfDs used for aldrin and dieldrin (RfD for aldrin = 1 x $10^{-4}$ mg/kg-day and RfD for dieldrin = 8 x $10^{-5}$ mg/kg-day)
- Dermal absorption factor – Cal/EPA default for chlorinated pesticides used for aldrin and dieldrin (i.e. 0.05)
- Child soil ingestion rate of 45 mg/day assumed

As shown in Table 1, the residential child cancer EALs (target risk = 1 x $10^{-5}$) developed for aldrin and dieldrin based on the modifications described above are 7.4 mg/kg and 3.6 mg/kg, respectively. Based on a target risk of 1 x $10^{-4}$ the cancer EALs are 74 mg/kg and 36 mg/kg,

respectively). The noncancer EALs developed for aldrin and dieldrin (target hazard =1) based on the modifications described above are 21 mg/kg and 17 mg/kg, respectively.

## 3.3 Alternative 3

Alternative 3 represents residential child EALs developed using the following adjustments to the 2006 Hickam EALs:

- Updated body weight scaling factor and benchmark dose approach used to derive CSFs for aldrin and dieldrin (CSF for aldrin = 3.4 $(mg/kg\text{-}day)^{-1}$ and CSF for diedrin = 7 $(mg/kg\text{-}day)^{-1}$)
- Updated oral RfDs used for aldrin and dieldrin (RfD for aldrin = 1 x $10^{-4}$ mg/kg-day and RfD for dieldrin = 8 x $10^{-5}$ mg/kg-day)
- Dermal absorption factor – Cal/EPA default for chlorinated pesticides used for aldrin and dieldrin (i.e. 0.05)
- Child soil ingestion rate of 100 mg/day assumed

As shown in Table 1, the residential child cancer EALs (target risk = 1 x $10^{-5}$) developed for aldrin and dieldrin based on the modifications described above are 4.2 mg/kg and 2.0 mg/kg, respectively. Based on a target risk of 1 x $10^{-4}$ the cancer EALs are 42 mg/kg and 20 mg/kg, respectively. The noncancer EALs developed for aldrin and dieldrin (target hazard =1) based on the modifications described above are 12 mg/kg and 9.8 mg/kg, respectively.

## 3.4 Alternative 4

Alternative 4 represents residential child EALs developed using the following adjustments to the 2006 Hickam EALs:

- Updated body weight scaling factor and benchmark dose approach used to derive CSFs for aldrin and dieldrin (CSF for aldrin = 3.4 $(mg/kg\text{-}day)^{-1}$ and CSF for diedrin = 7 $(mg/kg\text{-}day)^{-1}$)
- Updated oral RfDs used for aldrin and dieldrin (RfD for aldrin = 1 x $10^{-4}$ mg/kg-day and RfD for dieldrin = 8 x $10^{-5}$ mg/kg-day)
- Dermal absorption factor – Cal/EPA default for chlorinated pesticides used for aldrin and dieldrin (i.e. 0.05)
- Child soil ingestion rate of 200 mg/day assumed

As shown in Table 1, the residential child cancer EALs (target risk = 1 x $10^{-5}$) developed for aldrin and dieldrin based on the modifications described above are 2.4 mg/kg and 1.1 mg/kg, respectively. Based on a target risk of 1 x $10^{-4}$ the cancer EALs are 24 mg/kg and 11 mg/kg, respectively. The noncancer EALs developed for aldrin and dieldrin (target hazard =1) based on the modifications described above are 6.9 mg/kg and 5.5 mg/kg, respectively.

# 4.0 RECOMMENDATION FOR SITE-SPECIFIC EALs

As described above, the 2006 Hickam EALs are based on some outdated USEPA recommendations and are likely lower than required to be protective of public health. For this reason, alternative residential EALs were derived to incorporate current scientific practices and to reflect current recommended risk assessment guidelines. All of the alternative residential EALs included in this evaluation are considered to be protective of human health, particularly when coupled with strict soil management and engineering controls such as restrictions on digging associated with the residential leases at JBPHH, maintaining good lawn cover, and other restrictions to be instituted within the long-term management of the site.

Alternative 3 (assuming a target risk of $1 \times 10^{-4}$ for cancer EALs) is recommended for evaluating potential hazards to residents because they were derived based on the most up-to-date scientific research/risk assessment guidance and are considered to be protective of human health for site conditions.

Although aldrin and dieldrin are the primary chemicals of concern at the site, recommended Alternative 3 EALs are also provided for both child and adult residents for all organochlorine pesticides detected in soil during the 2010 site investigation activities for reference purposes. A summary of the variables used to derive the Alternative 3 EALs are provided in Tables 2 and 5. Table 2 also summarizes the variables used to derive the 2006 Hickam EALs. The full list of Alternative 3 EALs being recommended for the site is summarized in Table 3 (child resident) and Table 4 (adult resident). Table 5 provides the toxicity criteria and dermal absorption factors used to derive the recommended alternative EALs summarized in Tables 3 and 4.

Pending HDOH concurrence and issuance of a final work plan, Alternative 3 EALs will be used to evaluate potential environmental hazards to residents with the Hickam neighborhoods in accordance with HDOH Guidelines (HDOH 2008).

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# APPENDIX A

## Report for the Hawai‘i Department of Health on Aldrin/Dieldrin Concentrations in Soil at the Joint Base Pearl Harbor-Hickam

# TABLE 1

## Summary of Alternative EALs for Earhart I-2, Earhart I-3, and Onizuka II-1

| Basis | Chemical | Potential Site-Specific Alternative Action Levels (mg/kg)[a] | | | |
|---|---|---|---|---|---|
| | | Residential-Child[b] | | | |
| | | Cancer[c] | | Noncancer[d] | Additional Adjustments to 2006 Hickam EALs[f] |
| | | Target Risk = 1E-05 | Target Risk = 1E-04 | HQ = 1 | |
| Hickam EALs (2006)[a] | Aldrin | 0.42 | 4.2 | 1.8 | 2006 Hickam EALs (Current Screening Levels) |
| | Dieldrin | 0.45 | 4.5 | 3.1 | |
| Alternative 1 | Aldrin | - | - | 21 | Child soil ingestion rate = 45 mg/day |
| | Dieldrin | - | - | 17 | |
| Alternative 2 | Aldrin | 7.4 | 74 | 21 | Child soil ingestion rate = 45 mg/day |
| | Dieldrin | 3.6 | 36 | 17 | |
| Alternative 3 | Aldrin | 4.2 | 42 | 12 | Child soil ingestion rate = 100 mg/day |
| | Dieldrin | 2.0 | 20 | 9.8 | |
| Alternative 4 | Aldrin | 2.4 | 24 | 6.9 | Child soil ingestion rate = 200 mg/day (same ingestion rate as 2006 Hickam EALs) |
| | Dieldrin | 1.1 | 11 | 5.5 | |

**Notes:**

EAL = Environmental Action Level  mg/kg = milligram per kilogram

HQ = Hazard quotient

[a] Variables used for derivation of the 2006 Hickam EALs and Alternative EALs are summarized in Table 2.

[b] The Hickam residential EALs were developed for both children (assumed to be aged 0 to 6 years) and adults. However, the EALs for the child resident are the primary values used for screening purposes because they are the lowest soil screening levels developed for the site and are protective of other potentially exposed receptors (e.g., adult residents). EALs for adult residents are provided in Table 4 for reference purposes.

[c] Listed cancer EALs for aldrin and dieldrin in Alternatives 2 through 4 were developed using updated cancer slope factors [aldrin = 3.4 $(mg/kg\text{-}day)^{-1}$, dieldrin = 7 $(mg/kg\text{-}day)^{-1}$] and a dermal absorption factor of 0.05. For Alternative 1 , aldrin and dieldrin are not assumed to be carcinogens.

[d] The noncancer EALs for aldrin and dieldrin in Alternatives 1 to 4 were developed using updated oral reference doses [aldrin = $1 \times 10^{-4}$ mg/kg-day, dieldrin = $8 \times 10^{-5}$ mg/kg-day] and a dermal absorption factor of 0.05.

[e] Listed values are the site-specific action levels developed previously for Hickam neighborhoods (Tetra Tech 2006).

[f] Descriptions in this column identify additional adjustments applied to the 2006 Hickam EALs (i.e., additional adjustments to those identified in footnotes c and d) to derive the Alternative-specific EALs for aldrin and dieldrin. The 2006 Hickam EALs were developed using a child soil ingestion rate of 200 mg/day.

**Sources:**

Tetra Tech. 2006. Summary of Human Health Risk Assessment of Chlordane (including Heptachlor and Heptachlor Epoxide), Dieldrin, and Aldrin in Soil, Hickam Community Housing Areas, Hickam Air Force Base, Hawaii. June 30th.

**TABLE 2**
**Summary of Variables Used to Derive EALs for Hickam Neighborhoods**

| Parameter | Potentially Exposed Population | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2006 Hickam EALs | | | | Alternative EALs | | | |
| | Child Resident | | Adult Resident | | Child Resident | | Adult Resident | |
| Target Risk | 1.0E-05 | | 1.0E-05 | | 1.0E-04 | | 1.0E-04 | |
| Target Hazard Quotient | 1 | | 1 | | 1 | | 1 | |
| **Inhalation of Particulates** | | | | | | | | |
| Inhalation Rate ($m^3$/day) | 10 | a | 20 | | 10 | a | 20 | a |
| Particulate Emission Factor (mg/kg)/($mg/m^3$) | 1.32E+09 | a | 1.32E+09 | a | 1.32E+09 | a | 1.32E+09 | a |
| **Ingestion of Soil** | | | | | | | | |
| Ingestion Rate (mg/day) | 200 | a | 100 | a | refer to Table 1 | b | 100 | a |
| **Dermal Contact with Soil** | | | | | | | | |
| Surface Area ($cm^2$/day) | 2,800 | a | 5,700 | a | 2,800 | a | 5,700 | a |
| Adherence Factor ($mg/cm^2$) | 0.2 | a | 0.07 | a | 0.2 | a | 0.07 | a |
| Absorption Factor - aldrin and dieldrin (unitless) | 0.1 | a | 0.1 | a | 0.05 | b | 0.05 | b |
| **Population-Specific Assumptions** | | | | | | | | |
| Exposure Frequency (days/year) | 350 | a | 350 | a | 350 | a | 350 | a |
| Exposure Duration (years) | 6 | a | 6 | a | 6 | a | 6 | a |
| Body Weight (kg) | 15 | a | 70 | a | 15 | a | 70 | a |
| Averaging Time for Carcinogens (days) | 25,550 | a | 25,550 | a | 25,550 | a | 25,550 | a |
| Averaging Time for Noncarcinogens (days) | 2,190 | a | 2,190 | a | 2,190 | a | 2,190 | a |
| **Toxicity Criteria** | | | | | | | | |
| Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$ | | | | | | | | |
| Aldrin | 17 | | | a,c | 3.4 | | | b |
| Dieldrin | 16 | | | a,c | 7 | | | b |
| Reference Dose (mg/kg-day) | | | | | | | | |
| Aldrin | 3.00E-05 | | | a,c | 1.00E-04 | | | b |
| Dieldrin | 5.00E-05 | | | a,c | 8.00E-05 | | | b |

**Notes:**

- variables used to derive Alternative EALs that are different from those used to derive the 2006 Hickam EALs

[a] HDOH 2008

[b] Tetra Tech 2011

[c] USEPA 2011

**Sources:**


Hawai'i Department of Health (HDOH). 2008. Screening for Environmental Hazards at Sites With Contaminated Soil and Groundwater. Summer (updated March 2009).

Tetra Tech. 2011. *Summary of Potential Adjustments to Residential Environmental Action Levels for Three Hickam Neighborhoods (Earhart I-2, Earhart I-3, and Onizuka II-1), Hickam Air Force Base, O`ahu, Hawai`i. Attachment 1: Report for the Hawai`i department of Health on Aldrin/Dieldrin Concentrations in Soil at the Hickam Air Force Base*. April 5.

United States Environmental Protection Agency (USEPA). 2011. *Integrated Risk Information System (IRIS)*. Online database Maintained by the USEPA. Cincinnati, OH. Accessed April 2011.

# TABLE 3

## Recommended Alternative Environmental Action Levels (EALs) - Child Resident[a]

| Chemical[b] | HC Site-Specific Soil Screening Levels (mg/kg) | |
|---|---|---|
| | Residential-Child | |
| | Cancer | Noncancer |
| | Target Risk = 1E-05/1E-04[c] | Target HQ = 1 |
| Aldrin | 42 | 12 |
| Chlordane[d] | 43 | 64 |
| Dieldrin | 20 | 9.8 |
| DDD | 49 | - |
| DDE | 34 | - |
| DDT | 46 | 67 |
| Endrin | - | 30 |

**Notes:**

HC = Hickam Communities
mg/kg = milligram per kilogram
HQ = Hazard quotient

[a] EALs listed in this table were derived based on the EAL equations listed in HDOH Guidance (HDOH 2008) using the alternative child parameters listed in Table 2 (assuming child soil ingestion rate of 100 mg/day) and the toxicity/dermal criteria summarized in Table 5.

[b] All organochlorine pesticides detected in soil as part of site investigation activities conducted at the site in 2010 are included in this table.

[c] The target risk of 1E-04 applies only to aldrin and dieldrin.

[d] Chlordane is representative of technical chlordane which consists of chlordane isomers, heptachlor, and heptachlor epoxide. For this reason, other chlordane isomers, heptachlor, and heptachlor epoxide are evaluated as chlordane and are not listed individually in this table.

# TABLE 4

## Recommended Alternative Environmental Action Levels (EALs) - Adult Resident[a]

| Chemical[b] | HC Site-Specific Soil Screening Levels (mg/kg) | |
|---|---|---|
| | Residential-Child | |
| | Cancer | Noncancer |
| | Target Risk = 1E-05/1E-04[c] | Target HQ = 1 |
| Aldrin | 209 | 61 |
| Chlordane[d] | 210 | 315 |
| Dieldrin | 101 | 49 |
| DDD | 254 | - |
| DDE | 179 | - |
| DDT | 224 | 326 |
| Endrin | - | 157 |

**Notes:**

HC = Hickam Communities
mg/kg = milligram per kilogram
HQ = Hazard quotient

[a] EALs listed in this table were derived based on the EAL equations listed in HDOH Guidance (HDOH 2008) using the alternative child parameters listed in Table 2 and the toxicity/dermal criteria summarized in Table 5.

[b] All organochlorine pesticides detected in soil as part of site investigation activities conducted at the site in 2010 are included in this table.

[c] The target risk of 1E-04 applies only to aldrin and dieldrin.

[d] Chlordane is representative of technical chlordane which consists of chlordane isomers, heptachlor, and heptachlor epoxide. For this reason, other chlordane isomers, heptachlor, and heptachlor epoxide are evaluated as chlordane and are not listed individually in this table.

**TABLE 5**
**Toxicity Criteria and Dermal Absorption Factors Used to Derive Recommended EALs for Hickam Neighborhoods**

| | Toxicity Criteria | | | | | | Dermal Criteria | |
|---|---|---|---|---|---|---|---|---|
| | Cancer Slope Factor (mg/kg-day)-1 | | Noncancer Reference Dose (mg/kg-day) | | | | | |
| Chemical | Oral | Inhalation | Oral | Inhalation | | Source | Dermal Absorption Factor (Unitless) | Source |
| Aldrin | 3.4 | 3.4 | 1E-04 | 1E-04 | (a) | Tetra Tech 2011 | 0.05 | Cal/EPA 2005 |
| Chlordane | 0.35 | 0.35 | 5E-04 | 2E-04 | | IRIS; HDOH 2008 | 0.04 | USEPA 2004; HDOH 2008 |
| Dieldrin | 7 | 7 | 8E-05 | 8E-05 | (a) | Tetra Tech 2011 | 0.05 | Cal/EPA 2005 |
| DDD | 0.24 | 0.24 | ---- | ---- | | IRIS; HDOH 2008 | 0.1 | USEPA 2004; HDOH 2008 |
| DDE | 0.34 | 0.34 | ---- | ---- | | IRIS; HDOH 2008 | 0.1 | USEPA 2004; HDOH 2008 |
| DDT | 0.34 | 0.34 | 5E-04 | - | | IRIS; HDOH 2008 | 0.03 | USEPA 2004; HDOH 2008 |
| Endrin | ---- | ---- | 3E-04 | 3E-04 | (a) | IRIS; HDOH 2008 | 0.1 | USEPA 2004; HDOH 2008 |

**Notes:**

---- = No cancer slope factor or noncancer reference dose available
DDD = Dichlorodiphenyldichchloroethane
DDE = Dichlorodiphenyltrichloroethylene
DDT = Dichlorodiphenyltrichloroethane
IRIS = Integrated Risk Information System (USEPA 2011)
mg/kg = milligram per kilogram
[a] Route-to-route extrapolation from oral reference dose.

**Sources:**


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

Hawai'i Department of Health (HDOH). 2008. Screening for Environmental Hazards at Sites With Contaminated Soil and Groundwater. Summer (updated March 2009).

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United States Environmental Protection Agency (USEPA). 2011. *Integrated Risk Information System (IRIS)*. Online database maintained by the USEPA.

# Report for the Hawaii Department of Health on Aldrin/Dieldrin Concentrations in Soil at the Hickam Air Force Base

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TETRA TECH

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# EXECUTIVE SUMMARY

U.S. EPA (1987) considered aldrin and dieldrin to be probable human carcinogens based on liver tumors in mice, but the mode of action for liver tumors in mice may not be applicable to humans. The National Toxicology Program (2010) does not consider aldrin or dieldrin to be human carcinogens or to be reasonably anticipated to be human carcinogens. The International Agency for Research on Cancer (1987) concluded that aldrin and dieldrin could not be classified as to their carcinogenicity in humans. Studies published since the U.S. EPA (1987) and IARC (1987) reports provide no evidence of a causal association between aldrin and dieldrin and an excess risk of cancer in humans.

U.S. EPA (1987) estimated Cancer Slope Factors for aldrin and dieldrin of 17 and 16 $(mg/kg\text{-}day)^{-1}$, respectively. The current EPA approach to deriving Cancer Slope Factors is different than it was when the U.S. EPA (1987) document was published. U.S. EPA would currently use a benchmark dose approach to estimate the cancer risk and would derive the human equivalent dose differently than it did in 1987. These differences would cause the cancer slope factors for aldrin and dieldrin to be estimated at 3.4 and 7.0 $(mg/kg\text{-}day)^{-1}$, respectively (i.e., about 5 and 2.3 fold lower risk). From knowledge of the soil concentrations of aldrin and dieldrin, the duration of exposure, and the cancer slope factors, one can estimate the excess cancer risks that one might incur from living at Hickam. To detect a risk of $10^{-5}$ or even $10^{-4}$ would require a larger population than currently exists in Hawaii.

U.S. EPA (1988, 1990) derived Reference Doses (RfDs) for noncancer endpoints (liver lesions) for aldrin and dieldrin of 0.00003 and 0.00005 mg/kg-day. Again, the method that EPA would currently use to derive the RfDs is different than that which was used in 1988 and 1990. The current approach would estimate RfDs of 0.0001 and 0.00008 mg/kg-day for aldrin and dieldrin, respectively. These are higher (i.e., less risk) than the RfDs estimated by EPA (1988, 1990) and close to the Allowable Daily Intake (ADI) of 0.0001 mg/kg-day, developed by the Joint Meeting on Pesticide Residues (JMPR) (1967). The ADI is similar to the RfD as a guidance value for noncancer risk. The JMPR is an international expert scientific group jointly administered by the Food and Agricultural Organization of the United Nations and the World Health Organization. The JMPR ADI for aldrin and dieldrin has been cited by Health Canada (1994), the World Health Organization (WHO) (1989), WHO (2008) and New Zealand (2010). Studies published since 1987 provide no evidence that would change the updated Reference Dose or ADI estimates described above.



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# INTRODUCTION

This report is organized into two sections – cancer and noncancer. The cancer and noncancer sections include descriptions of hazard evaluations and dose response assessments on aldrin and dieldrin. The sections also include a review of the scientific literature that has been published since 1987 and that was not described in either the U.S. EPA (1987) or the ATSDR (2002b). 1987 was selected as the beginning date of the search since that was the year of the U.S. EPA and IARC assessments on aldrin and dieldrin. Each section concludes with a summary and discussion.

# CANCER

## *HAZARD EVALUATIONS*

### *U.S. EPA (1987)*

U.S. EPA concluded that the evidence of a cancer risk in humans from exposure to aldrin and dieldrin was inadequate but that the animal evidence was sufficient leading to the overall evaluation that both aldrin and dieldrin were probable human carcinogens.

### *IARC (1987)*

IARC (1987) concluded that the evidence of carcinogenicity in humans was inadequate and that the evidence of carcinogenicity in animals was limited for both aldrin and dieldrin. Aldrin and dieldrin were thus classified in Group 3 (cannot be classified as to its carcinogenicity in humans).

### *ATSDR (2002)*

ATSDR does not classify substances as to their carcinogenic potential in the manner of U.S. EPA, IARC, or NTP but does state in its ToxFAQs (ATSDR 2002a) that, "There is no conclusive evidence that aldrin or dieldrin cause cancer in humans."

### *NTP (2005, 2010)*

The NTP 11$^{th}$ Report on Carcinogens does not list aldrin or dieldrin as either "known to be human carcinogens" or "reasonably anticipated to be human carcinogens." Neither aldrin or dieldrin have been nominated as candidate substances for the 12$^{th}$ Report on Carcinogens.



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*WHO (2008)*

The 3rd edition of the World Health Organization Drinking Water Guidelines stated that while dieldrin produced tumors in mice, it did not produce tumors in rats and does not appear to be genotoxic. The document quoted the IARC (1987) classification of aldrin and dieldrin in Group 3 (cannot be classified as to its carcinogenicity in humans). The document stated, "It is considered that all the available information on aldrin and dieldrin taken together, including studies on humans, supports the view that, for practical purposes, these chemicals make very little contribution, if any, to the incidence of cancer in humans."

**DOSE RESPONSE ASSESSMENT**

The only cancer dose response assessment is that of the U.S. EPA (1987). The U.S. EPA (1987) assessment used a linearized multistage model to estimate risk which the Agency described as leading to an upper limit on risk. The current U.S. EPA approach to a cancer dose response assessment (assuming that the low dose response is linear) would be to use a benchmark dose (U.S. EPA 2000b). If mode of action data were available, the Agency would consider the effect of mode of action on the dose response.

The benchmark dose approach requires at least two dose groups and a control. The U.S. EPA (1987) dose response for aldrin was a geometric mean of three slope factors. Two slope factors were derived from male and female mice data from Davis (1965); the third slope factor was derived from an NCI study. The study by Davis (1965) had only one dose group. The benchmark dose approach requires at least two dose groups and a control. To arrive at a human equivalent dose from the animal studies, U.S. EPA (1987) multiplied the doses administered to the animals by the ratio of the animal to human weight to the 1/3 power. The current approach by U.S. EPA would be to multiply the doses administered to the animals by the ratio of animal to human weight to the ¼ power (U.S. EPA 1992, 2005).

Cancer slope factors for aldrin and dieldrin were developed using the same data used by U.S. EPA (1987) in its cancer risk estimates. Exceptions were that only data sets that had two or more dose groups were used and human equivalent doses were derived from animal doses by the ratio of the animal to human weight to the ¼ power. See Appendices A-1 and A-2 for explanations of how the benchmark dose results were derived. A comparison of the U.S. EPA (1987) cancer risk estimates for aldrin and dieldrin with the estimates for these substances derived from the benchmark dose approach are provided in Tables 1 and 2.



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**Table 1. Comparison of U.S. EPA 1987 cancer slope factors for Aldrin with the Cancer Slope Factors Derived by Benchmark Dose and Human Equivalent Doses Derived by Scaling to the ¼ power.**

| Reference for Data Set (Subjects) | Dose levels in Human Equivalent Dose (mg/kg-day) | BMD | BMDL | BMD-Based CSF (mg/kg-day)$^{-1}$ | U.S. EPA 1987 CSF[a] (mg/kg-day)$^{-1}$ | U.S. EPA 1987 CSF[a] ¾ power BW scaling[b] (mg/kg-day)$^{-1}$ |
|---|---|---|---|---|---|---|
| NCI 1978 (male B6C3F1 mice) | 0<br>0.12273<br>0.24546 | 0.0426138 | 0.0294365 | 3.39715 | 17 | 5.54 |

a. Geometric mean of 3 slope factors
b. Scaling based on ratio of modern (¾ power) and historic Human Equivalent Dose methods

**Table 2. Comparison of U.S. EPA 1987 cancer slope factors for Dieldrin with the Cancer Slope Factors Derived by Benchmark Dose and Human Equivalent Doses Derived by Scaling to the ¾ power.**

| Reference for Data Set (Subjects) | Dose levels in Human Equivalent Dose (mg/kg-day) | BMD | BMDL | BMD-Based CSF (mg/kg-day)$^{-1}$ | U.S. EPA 1987 CSF[a] (mg/kg-day)$^{-1}$ | U.S. EPA 1987 CSF[a] ¾ power BW scaling[b] (mg/kg-day)$^{-1}$ |
|---|---|---|---|---|---|---|
| NCI 1978 (male B6C3F1 mice) | 0<br>0.07674<br>0.1535 | 0.027485 | 0.0188779 | 5.29719 | 9.8 | 3.19 |
| Walker et al. 1972 (male CF1 mice) | 0<br>0.002607<br>0.02607<br>0.2607 | 0.0201651 | 0.0104576 | 9.56246 | 25 | 8.15 |
| Walker et al. 1972 (male CF1 mice) | 0<br>0.02579<br>0.065158<br>0.13032 | 0.0317161 | 0.0168577 | 5.932 | 15 | 4.89 |
| Walker et al. 1972 (female CF1 mice) | 0<br>0.03238<br>0.06476<br>0.12952 | 0.0218267 | 0.0125613 | 7.96094 | 26 | 8.47 |
| **Geometric mean of four BMD-based cancer slope factors** | | | | **6.99351** | | |
| **Geometric mean of 13 cancer slope factors reported by EPA 1987** | | | | | **16** | |
| **Geometric mean of 13 cancer slope factors reported by EPA 1987 with ¾ power BW scaling** | | | | | | **5.41** |

a. Geometric mean of 3 slope factors
b. Scaling based on ratio of modern (¾ power) and historic Human Equivalent Dose methods



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The scientific literature since 1987 was searched utilizing PubMed for any articles related to exposure, cancer, mortality and disease and aldrin/dieldrin in humans. The following search terms were used: ((aldrin) OR dieldrin) AND ((epidemiological studies) OR cancer OR neoplasm OR carcinogenic OR tumor OR maternal OR diabetes). Two-hundred twenty five (225) potentially relevant references were identified. These references were further screened to identify studies of carcinogenicity related to exposure to aldrin and/or dieldrin in humans or animals. *In vitro* studies, environmental and wildlife monitoring reports, and studies of mixtures with other compounds in animals were excluded. Studies that have been reviewed by ATSDR (2002b) were also excluded. Of the remaining studies, thirty-seven references considered useful for further evaluation of both carcinogenic and non-cancer evidence for aldrin and dieldrin were identified.

***Human Data***

Twenty-three of the studies identified in the literature search were epidemiologic studies that assessed various cancer outcomes including any cancer, Non-Hodgkin's Lymphoma, pancreatic cancer, breast cancer, childhood cancers, prostate cancer, and carcinoma of the gallbladder. The cancer epidemiologic studies are described in more detail in Appendix B.

Two studies assessed cancer mortality among a cohort of 570 male employees at aldrin and dieldrin formulation and production plants at Pernis in the Netherlands (Swaen et al. 2002 and van Amelsvoort et al. 2009). Both studies were updates of de Jong et al. (1997) which is described in the ATSDR (2002b) review. Exposure assessment of aldrin and dieldrin among the Pernis workers included air and blood measurements that allowed for the calculation of chemical intake for each individual. These studies provide for the best assessment of exposure among the epidemiologic studies that have been conducted on aldrin and dieldrin. When stratified by job title, "operators" had significantly increased risks of both rectal and skin cancer mortality in the Swaen (2002) update, but only skin cancer mortality was significantly elevated in van Amelsvoort et al. (2009). In both Swaen et al. (2002) and van Amelsvoort et al. (2009), the rectal and skin cancer Standardized Mortality Ratios (SMRs) were based on only 4 and 3 deaths, respectively. When the cohort in both Swaen et al. (2002) and van Amelsvoort et al. (2009) was divided into low, moderate, and high intake, there was no evidence of a dose response for either skin or rectal cancer mortality. Sielken (1999), in an analysis of the de Jong et al. (1997) data, reported that there was no evidence of an increased cancer risk for a dose considerably above the dose for which the U.S. EPA dose response analysis would have predicted a $10^{-4}$ risk.

Three analyses of the Agricultural Health Study examined cancer outcomes and exposure to a variety of pesticides including aldrin and dieldrin (Engel et al. 2005; Flower et al. 2004; Purdue et al. 2007). Exposures were self reported. Engel et al. (2005) found an increased risk of breast cancer among wives of pesticide applicators who used aldrin and dieldrin, but the results were not consistent when stratified by state (Iowa vs. North Carolina), menopausal status at enrollment, and cumulative dose groups. No increase in breast cancer risk was found among



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female pesticide applicators that used aldrin and dieldrin. Flower et al. (2003) studied cancer risk among children of pesticide applicators who applied various pesticides including aldrin and dieldrin. A statistically significant increase in childhood cancer risk was associated with paternal application of aldrin prior to conception based on six cases which varied in site and morphology. Purdue et al. (2007) reported an increased risk of lung cancer following exposure to dieldrin and a decreased relative risk of rectal cancer following exposure to aldrin. The authors concluded that overall there was no clear relationship between organochlorine pesticide use and an increased risk of cancer.

Five case-control studies examined Non-Hodgkin's Lymphoma (NHL) and exposure to various pesticides including aldrin and dieldrin (Cantor et al. 2003; Cocco et al. 2008; McDuffie et al. 2001; Quintana et al. 2004; Schroeder et al. 2001). Exposure data were provided either by questionnaire, adipose or serum/plasma sample. Cantor et al. (2003) found no evidence of an association between NHL and serum levels of any of the chemicals that were evaluated. Cocco et al. (2008) found similar results and reported no increased risk of NHL or its subtypes was associated with any of the compounds examined, including aldrin and dieldrin. McDuffie et al. (2001) found a significant association of aldrin exposure and NHL, but exposure information was based on questionnaires and phone interviews. Quintana et al. (2004) found an association of organochlorine pesticide residue in adipose tissue and NHL. The authors also found that the highest quartile level of dieldrin exposure was significantly associated with NHL, and found a significant dose response trend for dieldrin. The exposure information was collected after diagnosis, however, and there was a lack of information on variables that could affect organochlorine levels in the body such as diet, occupation and BMI. Schroeder et al. (2001) examined t(14,18)-positive NHL and found that aldrin was not associated with this subtype or the negative subtype of NHL. Dieldrin was associated with t(14,18)-positive NHL when compared to controls. Exposure, however, was self-reported. Based on these five studies and their varying outcomes and limitations, there is inadequate evidence of a causal association between Non-Hodgkin's Lymphoma and either aldrin or dieldrin exposure.

Five case-control studies investigated the association between breast cancer and aldrin/dieldrin exposure (Gammon et al. 2002; Høyer et al. 2001; Høyer et al. 2002; Ibarluzea et al. 2004; Ward et al. 2000). Exposure status was ascertained through blood, serum or adipose samples. Gammon et al. (2002), conducted a study on Long Island, NY, and found no significant increased risk in breast cancer in association with the highest quintile of lipid-adjusted serum levels of dieldrin. A dose-response relationship was not apparent either. Regarding their results, the authors stated, "These findings, based on the largest number of samples analyzed to date among primarily white women, do not support the hypothesis that organochlorines increase breast cancer risk among Long Island women." Høyer et al. (2001 and 2002) conducted two studies on women who participated in the Copenhagen City Heart Study. In the first study, Høyer et al. (2001) found an increased breast cancer risk linked to exposure to dieldrin for women who developed estrogen receptor negative (ERN) breast tumors. Women with the highest dieldrin levels in their serum generally had tumors that were larger and more often spread at diagnosis when compared to estrogen receptor positive (ERP) tumors. The study,



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however, had limited statistical power and the authors state, "The results do not suggest that exposure to potential estrogenic organochlorines leads to development of an ERP breast cancer." Høyer et al. (2002) examined exposure to various organochlorine pesticides and breast cancer with respect to p53 mutation. A non-significant but slightly elevated risk was found in the highest level of exposure for dieldrin among women who developed a tumor with mutant p53. A significant dose response relationship was present for dieldrin in 'wild-type' p53 tumors. Ibarluzea et al. (2004) found that the geometric mean of aldrin in adipose tissue was higher (but not significantly) in breast cancer cases compared to controls. Ward et al. (2000) found no association between breast cancer and aldrin and dieldrin in serum. The breast cancer case-control studies have mixed results and provide unconvincing evidence of a causal association between breast cancer and aldrin/dieldrin exposure.

Additional studies including an ecologic study of pancreatic cancer, a cross-sectional study of prostate cancer, a study examining risk assessment of daily pesticide intake from drinking water and cancer risk, and a case-control study of carcinoma of the gallbladder did not yield any results indicating significantly increased risks associated with aldrin or dieldrin (Clary & Ritz 2003; Ritchie et al. 2003; Buczyńska & Szadkowska-Stanczyk 2005; Shukla et al. 2001). A cross-sectional study in India found increased blood levels of aldrin (and several other organochlorine pesticides) among breast cancer patients compared to women without breast cancer (Mathur et al. 2002). An ecological study examined the association between pesticide use and concentration in adipose tissue and prostate cancer (Belpomme et al. 2009). Ecological studies, however, are generally used to generate hypotheses and are subject to the ecological fallacy (an incorrect inference based on aggregate data). A cross-sectional study by Xu et al. (2010) examined serum concentrations of dieldrin and self-reported physician diagnosed breast and prostate cancer. The authors found a marginally significant trend in the odds ratios for prostate cancer when compared by tertiles of serum concentration. Due to the nature of the cross-sectional design of this study, causality between OC pesticide exposure and cancer risk cannot be concluded.

Collectively, these studies do not provide evidence of a causal association between aldrin and dieldrin and an increased risk of cancer. The results are inconsistent. There is no evidence of a dose response or specificity of cancer site. The study designs of several of the studies are limited (cross-sectional, ecological). The self-reported exposure and self-reported disease diagnosis of several of the studies limit their interpretation. The study with the best exposure data and the best design (and likely the greatest exposure to the study population) (Swaen et al. 2002; van Amelsvoort 2009) found no evidence of an increased risk of cancer.

***Animal Data***

One animal study related to the carcinogenicity of dieldrin was identified (Cameron et al. 2009). The authors found that perinatal exposure to dieldrin promotes tumors in genetically predisposed mice (i.e., mice that were genetically modified to be susceptible to the type of tumor expressed). The results are summarized in Table 3. No animal studies examining tumorigenic response to aldrin published since 1987 were identified.



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**Table 3. Animal studies on Dieldrin published since 1987 that examined tumorigenic response.**

| Study | Type of study | Results | Comment |
|---|---|---|---|
| Cameron et al. 2009 | Oral gavage of dieldrin to FVB-MMTV/neu female mice; 0.45, 2.25, and 4.5 µg/g daily for 5 days prior to mating and once weekly through gestation and lactation; pregnancy outcome with focus on mammary tumors in offspring. | No effect on litter size, birth weight or the number of pups surviving to weaning; significantly increased number and volume of total tumors of thoracic mammary glands at the 4.5 µg/g dose level but not at the lower dose levels; numbers of liver tumors increased dose-dependently in mice treated with 2.25, and 4.5 µg/g. | Dieldrin increased tumor burden in genetically predisposed mice. |

## DISCUSSION

There is a significant level of uncertainty in regard to whether aldrin and dieldrin should be classified as human carcinogens. IARC (1987) states that the evidence of carcinogenicity for aldrin and dieldrin cannot be classified (Group 3), and the National Toxicology Program did not include either aldrin or dieldrin in its 11$^{th}$ Report on Carcinogens or nominate these chemicals as candidate substances for the 12$^{th}$ Report on Carcinogens. Health Canada (1994) and WHO (2008) accepted the IARC classification of aldrin and dieldrin as Group 3. WHO (2008) went on to state that, "It is considered that all the available information on aldrin and dieldrin taken together, including studies on humans, supports the view that, for practical purposes, these chemicals make very little contribution, if any, to the incidence of cancer in humans."

Human studies on aldrin and dieldrin including studies conducted prior to and since 1987 do not provide evidence that either aldrin or dieldrin are causally associated with an increased risk of cancer. There is no new evidence from animal studies conducted since 1987 of an increased tumorigenic risk from exposure to aldrin and dieldrin. While the Cameron (2009) study showed an increase in mammary tumors in dieldrin exposed mice, the strain used, FVB-MMTV/neu, was genetically modified to be predisposed to express this type of tumor, and dieldrin was already known to be a tumor promoter in mice (ATSDR 2002b).

Furthermore, whether the tumorigenic response seen in mice is applicable to humans is questionable. Several assessments have concluded that aldrin and dieldrin are nongenotoxic (U.S. EPA 1987; WHO 1989; ATSDR 2002b; WHO 2008). The carcinogenic response has only been seen in mice and not in other laboratory species. Stevenson et al. (1999) theorized that dieldrin-induced oxidative stress or its sequelae result in modulation of gene expression that favors expansion of initiated mouse, but not rat liver cells.

Assuming that aldrin and dieldrin are carcinogens, the methods currently used by U.S. EPA to estimate cancer dose response would decrease the cancer slope factor for aldrin by 5-fold and



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the cancer slope factor for dieldrin by 2.3-fold. These decreases in potency are consistent with those observed when the U.S. EPA updated the toxicological review of chlordane in 1997 (U.S. EPA 1997a). Chlordane is an organochlorine pesticide chemically and toxicologically similar to aldrin and dieldrin that has also been detected in soil at Hickam. The updated CSFs for chlordane derived by U.S. EPA in 1997 are roughly 4-fold lower (i.e., less potent) than the previous CSFs, which were not derived based on current U.S. EPA guidelines for carcinogen risk assessment.

Finally, it is important for the reader to have a perspective on the meaning of a $10^{-5}$ or a $10^{-4}$ theoretical excess lifetime cancer risk. Theoretical excess lifetime risks are estimated from a high dose exposure and assume a lifetime of exposure. The theoretical relative risk can be expressed as the (excess lifetime risk + background risk) ÷ background risk. For argument's sake, we will assume that aldrin and dieldrin are associated with an increased risk of liver cancer in humans because they were found in some studies to increase liver tumors in the mouse. The lifetime (background) risk of liver cancer in the U.S. population (through age 85) is $6.6 \times 10^{-3}$ (NCI 2010). If the theoretical excess lifetime risk is $10^{-4}$, the relative risk is approximately 1.02 ($6.6 \times 10^{-3} + 1 \times 10^{-4} / 6.6 \times 10^{-3}$). The population needed to detect such a risk would be 5,244,721. The population of Hawaii is only about 1.3 million. Thus it would take several times the population of Hawaii to even detect a theoretical excess lifetime cancer risk of $1 \times 10^{-4}$ (if one actually exists).

## NONCANCER

### EXISTING GUIDANCE VALUES

*U.S. EPA (1988, 1990)*

An RfD for aldrin of 0.00003 mg/kg-day was derived based on a LOAEL (0.025 mg/kg/day) for liver toxicity in rats and an uncertainty factor of 1000. The study from which the RfD was derived is Fitzhugh et al. (1964).

An RfD for dieldrin of 0.00005 mg/kg-day was derived based on a NOAEL for liver toxicity in rats and an uncertainty factor of 100. The study from which the RfD was derived is Walker et al. (1969).



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**Table 4. Oral MRLs derived by ATSDR (2002b) for aldrin and dieldrin**

| | Type of MRL | Study | Effect | Point of Departure | Uncertainty Factor | MRL (mg/kg/day) |
|---|---|---|---|---|---|---|
| **Aldrin** | Acute | Al Hachim (1971) | Decreased body weight and electroconvulsive shock threshold in offspring | LOAEL (2 mg/kg/day) | 1000 | 0.002 |
| | Chronic | Fitzhugh et al. (1964) | Enlarged hepatocyte, increase in cytplasmic eosinophia with peripheral migration of basophilic granules, and possible increases in vacuolation and bile duct proliferation | LOAEL (0.025 mg/kg/day) | 1000 | 0.00003 |
| **Dieldrin** | Intermediate | Smith et al. (1976) | Impaired learning of a successive discrimination task | NOAEL (0.01 mg/kg/day) | 100 | 0.0001 |
| | Chronic | Walker et al. (1969) | Liver weight was increased at the LOAEL with progression to parenchymal cell changes with progression to parenchymal cell changes including focal hyperplasia at 0.5 mg/kg/day | NOAEL (0.005 mg/kg/day) | 100 | 0.00005 |

*ATSDR (2002b)*

ATSDR developed acute and chronic MRLs for aldrin and intermediate and chronic MRLs for dieldrin. These are described in Table 4.

*JMPR (1967, 1971, 1977)*

The Joint Meeting on Pesticide Residues (JMPR 1967) concluded that the Acceptable Daily Intake (ADI) for aldrin or dieldrin or the sum of both was 0.0001 mg/kg based on a NOAEL of 0.025 mg/kg-day and an uncertainty factor of 250. It is not clear on what factors JMPR based its uncertainty factor.

The NOAEL of 0.025 mg/kg-day was derived from NOAELs of 0.5 ppm in rats and 1 ppm in dogs. In the rat study (Fitzhugh et al. 1964), rats were given feed containing 0.5, 2, 10, 50, 100 and 150 ppm aldrin or dieldrin for up to 2 years. The liver weights and degree of microscopic lesions increased dose-dependently in all dose levels. The authors did not identify a NOAEL, because increased liver weight to body weight ratios were elevated and a minimal degree of microscopic lesions were reported at the lowest dose of 0.5 ppm. However, JMPR identified 0.5 ppm as the level causing no toxicological effect in rats.



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In the dog study (Treon and Cleveland 1955), groups of 4 dogs (2/sex) were given 1 or 3 ppm dieldrin in their diet for 68 weeks. The dogs in the 3 ppm group had increased liver/body-weight ratio, and one female in this group had renal damage. In the 1 ppm group, livers were enlarged but no histopathological changes were reported. JMPR identified 1 ppm as the level causing no toxicological effect in dogs.

JMPR re-evaluated the toxicity data for aldrin and dieldrin in 1970 and 1977, and the 1967 ADI of 0.0001 mg/kg-day was endorsed (JMPR 1971, 1977).

*Health Canada (1994)*

Health Canada adopted the JMPR (1967, 1971, 1977) ADI of 0.0001 mg/kg-day for both aldrin and dieldrin and has used it as the basis for deriving allowable levels of these compounds in drinking water.

*New Zealand Ministry for the Environment (2010)*

The New Zealand Ministry for the Environment adopted the JMPR (1977) ADI of 0.0001 mg/kg-day for dieldrin. The New Zealand assessment of dieldrin questioned the U.S. EPA and ATSDR description of the critical toxic effects of dieldrin. The U.S. EPA (1990) and ATSDR (2002) both state that they used liver cell changes "characteristic of exposure to organochlorine insecticides" reported by Walker et al. 1969 as the toxicological endpoint for defining the LOAEL of 1 ppm. However, the authors of Walker et al. (1969) state that "no changes in liver cell morphology that could be attributed specifically to chlorinated hydrocarbons occurred in rats receiving 1 ppm dieldrin." Therefore the New Zealand reviewers endorsed the Fitzhugh et al. (1964) study as providing the more sensitive endpoint.

**DATA PUBLISHED SINCE 1987**

As described earlier for cancer outcomes, the scientific literature since 1987 was searched utilizing PubMed for any articles related to exposure, cancer, mortality and disease and aldrin/dieldrin in humans. The following search terms were used: ((aldrin) OR dieldrin) AND ((epidemiological studies) OR cancer OR neoplasm OR carcinogenic OR tumor OR maternal OR diabetes). Two-hundred twenty five (225) potentially relevant references were identified. These references were further screened to identify studies of carcinogenicity related to exposure to aldrin and/or dieldrin in humans or animals. *In vitro* studies, environmental and wildlife monitoring reports, and studies of mixtures with other compounds in animals were excluded. Studies that have been reviewed by ATSDR (2002b) were also excluded. Of the remaining studies, thirty seven references considered useful for further evaluation of both carcinogenic and non-cancer evidence for aldrin and dieldrin were identified.

***Human Data***

Fourteen noncancer epidemiologic studies of aldrin and/or dieldrin were identified from the PubMed search of epidemiologic literature published since 1987 and not included in the ATSDR (2002b) review. The noncancer epidemiologic studies are described in more detail in Appendix B.



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Two studies (Weisskopf et al. 2010; Louis et al. 2006) and one review (Li et al. 2005) assessed the risk of Parkinson's Disease associated with exposure to pesticides. Weisskopf et al. (2010) found increased serum levels of dieldrin among cases compared to controls (serum levels of many other pesticides including aldrin were not significantly increased). This study relied on serum samples collected between 1968 and 1972 and analyzed in 2005-2007. The study also relies on a questionnaire administered to study participants at the time the serum samples were collected. The questionnaire included questions on smoking status, cholesterol, hypertension, etc. Both the samples and the baseline characteristics (e.g., smoking, hypertension, etc.) could have changed considerably over the 35-year period between collection and analysis. Furthermore the study did not control for risk factors known to be associated with Parkinson's Disease (e.g., family history, genetic factors, head trauma). Li et al. (2005), in a review of the literature on pesticides and Parkinson's Disease including 27 case-control studies, concluded that the epidemiologic data do not provide sufficient evidence to support a causal association. In a study of essential tremor and serum concentrations of six pesticides including dieldrin, the authors were unable to detect any increased risk from dieldrin exposure (Louis et al. 2006).

Risk of diabetes was assessed by two publications. Montgomery et al. (2008) found an increased risk of diagnosed diabetes among participants of the Agricultural Health Study. The odds ratios were elevated but were not statistically significant when stratified by age, state (North Carolina or Iowa), or weight group. The authors do not specify or delineate between type I and II diabetes, which are known to have different etiologies (CDC 2010). A cross sectional analysis using the National Health and Nutrition Examination Survey did not find an association between dieldrin in serum and diagnosed, undiagnosed, or pre-diabetes; aldrin was not evaluated (Everett & Matheson 2010).

A cohort study by Landgren et al. (2009) examined monoclonal gammopathy of undetermined significance (MGUS) and self-reported pesticide use and pesticide concentrations in serum. Among individuals ever reporting exposure to dieldrin, the relationship with MGUS was significant. However, excess risk of MGUS associated with dieldrin was not attenuated when adjustment was made for the use of other pesticides.

Additional studies including a cross sectional study regarding age at menopause, a cross sectional study examining levels of thyroid hormones, a case control study on cryptorchidism, a cohort study on infant's length of gestation, birth weight and crown-heel length, an experimental study on Leydig cell disruption, a cross sectional study on lymphocyte subsets and a cross sectional study on allergic immune response in women and infants all yielded insignificant results regarding aldrin/dieldrin exposure and their corresponding outcomes (Akkina et al. 2004; Asawasinsopon et al. 2006; Damgaard et al. 2006; Fenster et al. 2005; Fowler et al. 2007; Nagayama et al. 2007; Noakes et al. 2006).

The evidence is not sufficient to conclude that a causal association exists between aldrin and/or dieldrin and Parkinson's Disease, diabetes, or MGUS. The studies are not robust and what data



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exist are inconsistent. Studies examining other noncancer endpoints have not found evidence of an effect.

***Animal Data***

Five animal studies of dieldrin were identified. Three of these were oral gavage studies in mice, and two were intraperitoneal studies in rats. The results are summarized in Table 5.

Four of the five animal studies investigated the effects of dieldrin on perinatal development. Cameron et al (2009) and Foster (2008) each exposed mice to a range of dieldrin doses by oral gavage during gestation and lactation, and both studies showed no effects on birth outcomes. Although the offspring in the Cameron et al (2009) study developed mammary tumors, the strain of mice used was genetically predisposed to develop mammary tumors. The Richardson et al. (2006) study exposed mice to dieldrin perinatally and evaluated specific neurotoxic effects not measured in most developmental toxicity studies. Tarraf et al. (2003) gave rats a single intraperitoneal injection of dieldrin in late-gestation and found effects on dam mammary gland maturation and effects on litter size and pup weight gain. Neither U.S. EPA (1987) nor ATSDR (2002b) reported developmental effects of intraperitoneally-administered dieldrin.

The non-developmental study (Hallegue et al. 2010) investigated the hepatotoxic effects of dieldrin, and the results were consistent with the known hepatoxicity in studies previously reviewed by U.S. EPA (1987) and ATSDR (2002b).

Overall, none of the more recent studies are likely to impact the current hazard assessment of aldrin or dieldrin.

**Table 5. Animal studies on Dieldrin published since 1987 that examined noncancer response.**

| Study | Type of study | Results | Comment |
|---|---|---|---|
| Hallegue et al. 2010 | Single IP injection of dieldrin to male and female rats; 3 or 6 mg/kg bw; hepatic effects measured by serum enzymes and histopathological examination. | Dose-dependent increase in relative liver weight; elevated AST, ALT, bilirubin, and LDH; cytoplasmic vacuolation, focal necrosis and nuclear enlargement of hepatocytes. | Consistent with known hepatotoxic effects of dieldrin in rodents. |
| Cameron et al. 2009<br>(also described in Table 3). | Oral gavage of dieldrin to FVB-MMTV/neu female mice; 0.45, 2.25, and 4.5 µg/g daily for 5 days prior to mating and once weekly through gestation and lactation. | No effect on litter size, birth weight or the number of pups surviving to weaning. | Dieldrin caused increased tumor burden in genetically predisposed mice. |



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| | | | |
|---|---|---|---|
| Foster et al 2008 | Oral gavage of dieldrin to BALB/c mice; 0.45, 2.25, 4.5, and 22.5 µg/g bw throughout mating, pregnancy, and lactation. | Treatments had no effect on fertility parameters in dams or mammary gland morphology at sexual maturity. | |
| Richardson et al. 2006 | Oral gavage of dieldrin to C57BL/6J mice 0.3, 1, or 3 mg/kg every 3 days throughout mating, pregnancy, and lactation. | Altered dopaminergic neurochemistry in the offspring and exacerbated MPTP toxicity. | The authors suggested that perinatal exposure to dieldrin increases the risk of Parkinson's disease. |
| Tarraf et al. 2003 | IP injection of dieldrin to female rats; 2.5 or 15 µM on gestation day 14. | Impaired mammary gland development of dams; reduced litter size; reduced pup weight gain. | |

**BENCHMARK DOSE**

The U.S. EPA (1988, 1990) RfDs for aldrin and dieldrin were derived using a LOAEL and a NOAEL, respectively and uncertainty factors of 1000 and 100 for aldrin and dieldrin, respectively. The current EPA approach would be to use a Benchmark Dose model to determine point of departure. Using the U.S. EPA 's current version of the BMDS software, Tetra Tech derived BMDLs for aldrin and dieldrin of 0.0120675 and 0.00837329 mg/kg-day, respectively. See Appendices C and D for explanations of how the benchmark dose results were derived. Using uncertainty factors of 10 (human intraspecies variability) and 10 (interspecies variability), the RfDs for aldrin and dieldrin would be 0.0001 and 0.00008, respectively. A comparison of these RfDs with those of U.S. EPA (1988, 1990) is made in Table 6.

**Table 6. Comparison of U.S. EPA (1988) RfD for Aldrin and U.S. EPA (1990) for Dieldrin with RfDs for Aldrin and Dieldrin derived using a benchmark dose approach**

| | U.S. EPA (1988, 1990) (mg/kg/day) | Benchmark Dose (mg/kg/day) |
|---|---|---|
| **Aldrin** | 0.00003 | 0.0001 |
| **Dieldrin** | 0.00005 | 0.00008 |

**DISCUSSION**

The U.S. EPA (1988, 1990) RfDs for aldrin and dieldrin are 0.00003 mg/kg-day and 0.00005 mg/kg-day, respectively. The RfDs are based on liver toxicity in rats. The ATSDR chronic MRL values for aldrin and dieldrin are the same as the RfDs. The WHO Allowable Daily Intake (ADI) is roughly 3.3-fold and 2-fold higher than the RfDs for aldrin and dieldrin, respectively.



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The EPA RfD, the ATSDR chronic MRL (oral), and the JMPR ADI for aldrin are all based on the study by Fitzhugh et al. (1964). In this study, rats were fed diets containing 0.5 to 150 ppm for two years (estimated dose levels of 0.025 to 7.5 mg/kg-day). Fitzhugh et al. (1964) described the liver lesions that they observed as "characteristic of chlorinated insecticide poisoning." These lesions included enlarged centrilobular hepatic cells (hypertrophy), with increased cytoplasmic oxyphilia, and peripheral migration of basophilic granules. The U.S. EPA (1988) and ATSDR (2002) identified 0.5 ppm as a LOAEL for aldrin in rats, based on these characteristic organochlorine insecticide lesions. ATSDR (2002) noted that "the changes at 0.5 ppm are consistent with a marked hepatic adaptive response associated with induction of the hepatic mixed function oxidase system and proliferation of smooth endoplasmic reticulum. The observation of hepatocellular hypertrophy is consistent with adaption." Although ATSDR considered the changes to be "adaptive," they still considered the responses to be adverse because the enhanced metabolic activity induced by aldrin could potentiate or inhibit toxic responses to other exogenous substances. This reasoning contradicts interpretations by U.S. EPA (1997a, 1997b, 2000b) that adaptive induction of microsomal enzymes should not be considered adverse.

JMPR considered aldrin and dieldrin interchangeable, due to the rapid biotransformation of aldrin to dieldrin in mammalian systems. When JMPR (1967) reviewed the Fitzhugh et al. (1964) study, they identified 0.5 ppm dieldrin as the NOAEL, noting that the hepatic lesions reported at 0.5 ppm dieldrin were "minimal." The authors of Fitzhugh et al. (1966) classified the lesions seen at 0.5 ppm as "trace or minimal." JMPR (1967) affirmed this NOAEL with a dog study (Treon and Cleveland 1955) in which a diet including 1 ppm dieldrin produced enlarged livers with no histopathological changes. These nontoxic dose levels in the rat and dog studies were both determined by JMPR (1967) to be equivalent to 0.025 mg/kg-day, to which JMPR applied an uncertainty factor of 250 to derive an ADI of 0.0001 mg/kg-day for aldrin and dieldrin combined.

A study by Walker et al. (1969) is the basis of the EPA RfD and the ATSDR chronic MRL (oral) for dieldrin. In their reviews of Walker et al. (1969), the U.S. EPA (1990) and ATSDR (2002) identified 0.1 ppm (0.005 mg/kg-day) dieldrin as the NOAEL and 1 ppm (0.05 mg/kg-day) as the LOAEL. The critical effect was increased liver weight in female rats. The hepatic lesions observed at 1 ppm were not considered by the authors of Walker et al. (1969) to be associated with organochlorine insecticides. Therefore, the LOAEL of 1 ppm determined by U.S. EPA (1990) and ATSDR (2002) is apparently based solely on increased liver weights in female rats. However, increased liver weight without other signs of liver toxicity (e.g., histopathology or clinical chemistry) is an adaptive response to increased metabolism of the chemical and is generally not considered to be an adverse effect (Sipes and Gandolfi 1991; Amacher et al. 1998). The EPA has determined that increased liver weight and hepatoctyte hypertrophy were adaptive non-adverse effects in the IRIS toxicological reviews of chlordane, vinyl chloride, and cumene (U.S. EPA 1997a, 1997b, 2000b). Thus, the NOAEL of the Walker et al. (1969) study would more appropriately be 1 ppm (0.05 mg/kg-day), and the LOAEL should be 10 ppm (0.5 mg/kg-day) where increased liver weights were accompanied by histological changes



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(parenchymal cell changes including focal hyperplasia). Compared to the Walker et al. (1969) study, the study by Fitzhugh et al (1964) appears to provide the more sensitive endpoints for hepatic lesions associated with chronic dieldrin exposure.

Chlordane is an organochlorine pesticide chemically and toxicologically similar to aldrin and dieldrin. In its updated toxicological review of chlordane, U.S. EPA (1997a) did not consider increased liver cell volume (hypertrophy) to be an adverse effect. Hypertrophy is commonly associated with ultrastructural adaptive changes involving metabolic activity due to the presence of the toxicant (Sipes and Gandolfi 1991; Amacher et al. 1998). An adaptive increase in relative liver weight if moderate and transitory is not adverse, but if severe and sustained, leads to adverse effects (Williams and Latropoulos 2002). U.S. EPA (1997a) considered hepatic necrosis to be the most clearly adverse noncancerous lesion for chlordane. Hepatic necrosis was not reported in the chronic and intermediate studies of aldrin and dieldrin. The RfDs for chlordane based on U.S. EPA's updated toxicological review (U.S. EPA 1997), are roughly 8-fold higher (i.e., less toxic) than the previous U.S. EPA RfDs.

In considering how the U.S. EPA would calculate RfD values for aldrin and dieldrin if these compounds were reviewed today, one must take into account the complete data set available since the last reviews and changes in the hazard assessment methodology in common practice at the agency. A review of studies published since the previous U.S. EPA reviews raised no new concerns of systemic toxicity and introduced no endpoints more sensitive than those described in the Fitzhugh et al. (1964) study. In a developmental toxicity study by Richardson et al. (2006) mice exposed to dieldrin perinatally reported possible neurodevelopmental effects. While the Richardson et al. (2006) study raises concerns about potential effects in young children, the California EPA (2007) determined that liver toxicity in adult animals was a more sensitive endpoint when assessing non-cancer risk of dieldrin at school sites in California.

At the time of the previous U.S. EPA reviews of aldrin and dieldrin, the use of benchmark dose modeling to determine point of departure was not in common practice. Under the current U.S. EPA guidelines, benchmark dose modeling is preferred to the NOAEL/LOAEL approach if the data set supports appropriate use of the model. In the current review, liver lesion data for chronic dietary exposure to aldrin and dieldrin provided in the Fitzhugh et al. (1964) study were applied to benchmark dose modeling, using the current version of BMDS software provided by the U.S. EPA. The resulting BMDL values, with appropriate uncertainty factors applied, produced RfD values of 0.0001 mg/kg-day for aldrin and 0.00008 mg/kg-day for dieldrin. Interestingly, these benchmark dose-based RfD values are similar to the ADI of 0.0001 mg/kg-day endorsed by JMPR, Health Canada, and the New Zealand Ministry for the Environment.

## SUMMARY

Only the U.S. EPA has classified aldrin and dieldrin as probable human carcinogens. Other U.S. agencies in more recent assessments have not classified aldrin or dieldrin as known or probable human carcinogens. The International Agency for Research on Cancer has determined that



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aldrin and dieldrin cannot be classified as to their carcinogenicity. The World Health Organization has determined that "these chemicals make very little contribution, if any, to the incidence of cancer in humans."

The only cancer dose response for aldrin and dieldrin is that done by the U.S. EPA in 1987 based on liver tumors in mice. It is questionable whether the tumors seen in the mouse are relevant for linear low dose extrapolation to humans. It has been generally agreed that aldrin and dieldrin are nongenotoxic. Furthermore, the carcinogenic response has only been seen in mice and not in other laboratory species.

Assuming that aldrin and dieldrin are carcinogens, the methods currently used by U.S. EPA to estimate cancer dose response would decrease the cancer slope factor for aldrin by 5 fold and the cancer slope factor for dieldrin by 2.3 fold. Although a number of cancer epidemiologic studies have been conducted since the U.S. EPA assessment, there is not enough evidence from these studies to conclude that there is a causal association between exposure to aldrin/dieldrin and an increased risk of cancer in humans.

The selection of the endpoints used for the noncancer assessment by U.S. EPA is controversial. U.S. EPA and ATSDR identified the dose of 0.5 ppm in Fitzhugh et al. (1964) as a Lowest Observed Adverse Effect Level (LOAEL) whereas JMPR considered 0.5 ppm to be a No Observed Adverse Effect Level (NOAEL). ATSDR noted that "the changes at 0.5 ppm are consistent with a marked hepatic adaptive response associated with induction of the hepatic mixed function oxidase system and proliferation of smooth endoplasmic reticulum. The observation of hepatocellular hypertrophy is consistent with adaption." ATSDR considered these changes adverse. U.S. EPA has concluded, however, that adaptive induction of microsomal enzymes should not be considered adverse. U.S. EPA and ATSDR used the increased liver weight in a study on dieldrin by Walker et al. (1969) as the basis to derive the RfD and oral MRL, respectively. U.S. EPA has more recently determined that increased liver weight and hepatoctyte hypertrophy were adaptive non-adverse effects in its assessments of chlordane, vinyl chloride, and cumene (U.S. EPA 1997a, 1997b, 2000b). JMPR considered aldrin and dieldrin to be interchangeable (aldrin is rapidly metabolized to dieldrin in the body) and used Fitzhugh et al. (1964) as the basis for the ADI on aldrin and dieldrin combined. The methods currently used by U.S. EPA to estimate non-cancer dose response would produce RfD values for aldrin and dieldrin that are roughly 3.3-fold and 2-fold higher, respectively, than the current USEPA RfDs. The RfDs that would be derived by the current EPA methodology would also be comparable to the ADI determined by JMPR. Table 7 summarizes the existing EPA Cancer Slope Factors and RfDs for aldrin and dieldrin with those that would be derived using current EPA methodology.



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**Table 7. Comparison of existing U.S. EPA Cancer Slope Factors/RfDs for aldrin and dieldrin with Cancer Slope Factors/RfDs that would be derived using existing EPA methodology**

| | U.S. EPA (1987) (mg/kg-day) | Benchmark Dose (mg/kg-day) |
|---|---|---|
| | **Cancer** | |
| **Aldrin** | **17** | **3.38** |
| **Dieldrin** | **16** | **6.99** |
| | **Non-cancer** | |
| **Aldrin** | **0.00003** | **0.0001** |
| **Dieldrin** | **0.00005** | **0.00008** |



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# Appendix A-1: Benchmark Dose Derivation of a Cancer Slope Factor for Aldrin

## Introduction

In the IRIS review of aldrin (CAS No. 309-00-2), the U.S. EPA calculated an oral cancer slope factor of 17 $(mg/kg\text{-}day)^{-1}$. This oral cancer slope factor was the geometric mean of two slope factors based on data published by Davis 1965 (re-evaluated by Reuber; cited in Epstein 1975) and NCI 1978. The Davis 1965 study exposed male and female $C_3H$ mice to 0 or 10 ppm aldrin in diet for up to 104 weeks (2 years). IRIS calculated a cancer slope factor of 23 $(mg/kg\text{-}day)^{-1}$ for this study, based on increases in liver tumors in aldrin-exposed mice. The NCI 1978 study exposed male B6C3F1 mice to 0, 4, or 8 ppm aldrin in diet and female B6C3F1 mice to 0, 3, or 6 ppm aldrin, each sex for 80 weeks followed by 10 to 13 weeks of post-exposure observation. IRIS calculated a cancer slope factor of 12 $(mg/kg\text{-}day)^{-1}$ for this study, based on dose-dependent increases in liver tumors in aldrin-exposed male mice. Aldrin-exposed female mice did not show any increase in liver tumor incidence.

## Methods

A benchmark dose (BMD) approach was used to derive a new cancer slope factor for aldrin. The US EPA's BMDS 2.1.2 software package was used. BMDS 2.1.2 is the latest version of the BMDS series, released by EPA in June 2010. Benchmark dose analysis requires a control and at least two treatment dose levels. Because the Davis 1965 study only used one treatment dose level, this data set is not appropriate for benchmark dose analysis. The NCI 1978 data set includes a control group and two treatment dose levels and can be applied to a benchmark dose model. The NCI 1978 data as presented in IRIS 1993 were as follows:

| Dose (ppm in mouse diet) | Human Equivalent Dose (mg/kg-day) | Tumor Incidence |
|---|---|---|
| 0 | 0 | 3/20 |
| 4 | 0.04 | 16/49 |
| 8 | 0.08 | 25/45 |

*Recalculation of Human Equivalent Dose*

To arrive at a human equivalent dose from the animal studies, U.S. EPA historically multiplied the doses administered to the animals by the ratio of the animal to human weight to the 1/3 power. The current approach by U.S. EPA is to apply the "3/4 power" assumption in which the human equivalent dose, in units of mg/kg-day, is equal to the animal dose × (animal weight in kg/70 kg) $^{1/4}$ (U.S. EPA 1992, 2005).

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Assumptions:

- Mouse BW = 0.03 kg (IRIS page for Aldrin)
- Food consumption rate = 6400 mg/day (based on EPA reference values, B6C3F1 mouse, male, chronic; EPA 1982)
- Human Equivalent Dose = Mouse Dose x $(0.03 \text{ kg}/70 \text{ kg})^{1/4}$ = mouse dose x 0.143882

Calculations:

Mouse dose for 4 ppm = (4/1,000,000) x (6400 mg/0.03 kg-day) = 0.853 mg/kg-day

Human Equivalent Dose for 4 ppm = 0.853 mg/kg-day x 0.143882 = 0.12273 mg/kg-day

Mouse dose for 8 ppm = (8/1,000,000) x (6400 mg/0.03 kg-day) = 1.706 mg/kg-day

Human Equivalent Dose for 8 ppm = 1.706 mg/kg-day x 0.143882 = 0.24546 mg/kg-day

**NCI 1978 data with Revised HED**

| Dose (ppm in mouse diet) | Human Equivalent Dose (mg/kg-day) | Tumor Incidence |
|---|---|---|
| 0 | 0 | 3/20 |
| 4 | 0.12273 | 16/49 |
| 8 | 0.24546 | 25/45 |

*Benchmark Dose Models*

Tumor incidence data are quantal data that the EPA (2000a) recommends for use in a Dichotomous Multistage-Cancer Model. In the analyses for aldrin, dose levels in Human Equivalent Dose were entered with the sample size (N) and tumor incidence data were entered into the BMDS 2.1.2 spreadsheet. The Dichotomous Model Multistage-Cancer Model allows for variation of the Degree of Polynomial to find the best curve fit. In a data set containing two treatment dose levels, the Degree of Polynomial can be set to either 1 or 2. In the first run of the model, Degree of Polynomial was set to 1, and in the second run, this value was changed to 2.

## Results

A summary of the BMD analyses of the liver tumor incidence data is presented in the table below, and the BMDS input data, model parameters, and output are presented in subsequent pages. The first run (Degree of Polynomial =1) produced a curve with a good visual fit, and the mathematical tests for a good fit produced values within the acceptable ranges (see table footnotes). The second run, while providing a visually perfect for to the data points, the P-value of "NA" is difficult to interpret. Based on these factors, the first run is deemed to have the better curve fit, and the cancer slope factor for the NCI 1978 male mouse liver tumor incidence data is **3.39715 (mg/kg-day)$^{-1}$**.

**Summary of Dichotomous Model Multistage-Cancer Model for Aldrin (NCI 1978 male liver tumor data)**

| Run | Degree of Polynomial | P-value[1] | Highest Scaled Residual[2] | AIC[2] | Visual Assessment of Curve to Data Points[4] | BMD | BMDL[5] | Cancer Slope Factor |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0.5127 | -0.501 | 145.072 | Good | **0.0426138** | **0.0294365** | **3.39715** |
| 2 | 2 | NA | 0.000 | 146.641 | Excellent | 0.0674753 | 0.0302286 | 3.30812 |

1 For the model to be acceptable, P-value must be > 0.1.
2 Scaled residuals report the gap between the curve line and the actual data points; for the model to be acceptable, all scaled residuals must have an absolute value of < 2.
3 The Akaike Information Coefficient (AIC) is used for comparison between models; generally, a lower AIC value indicates a better curve fit to the data.
4 Even when the numbers indicate a good curve fit, a visual inspection of the graph is important to ensure the curve is not wavy or contains other aberrations.
5 BMDL = Lower one-sided confidence limit on the BMD.

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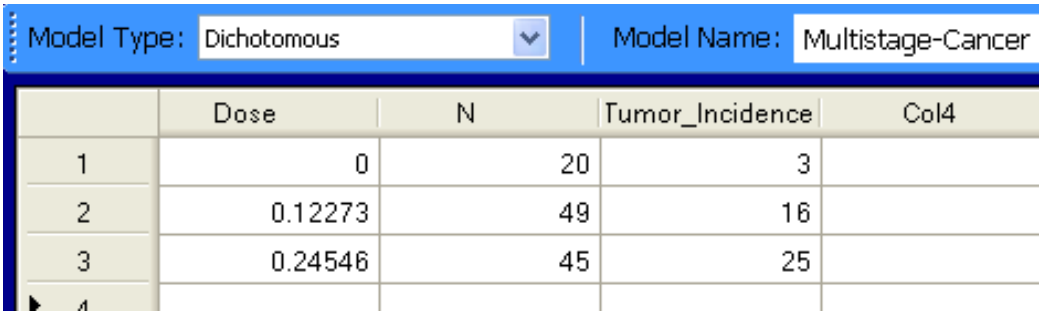
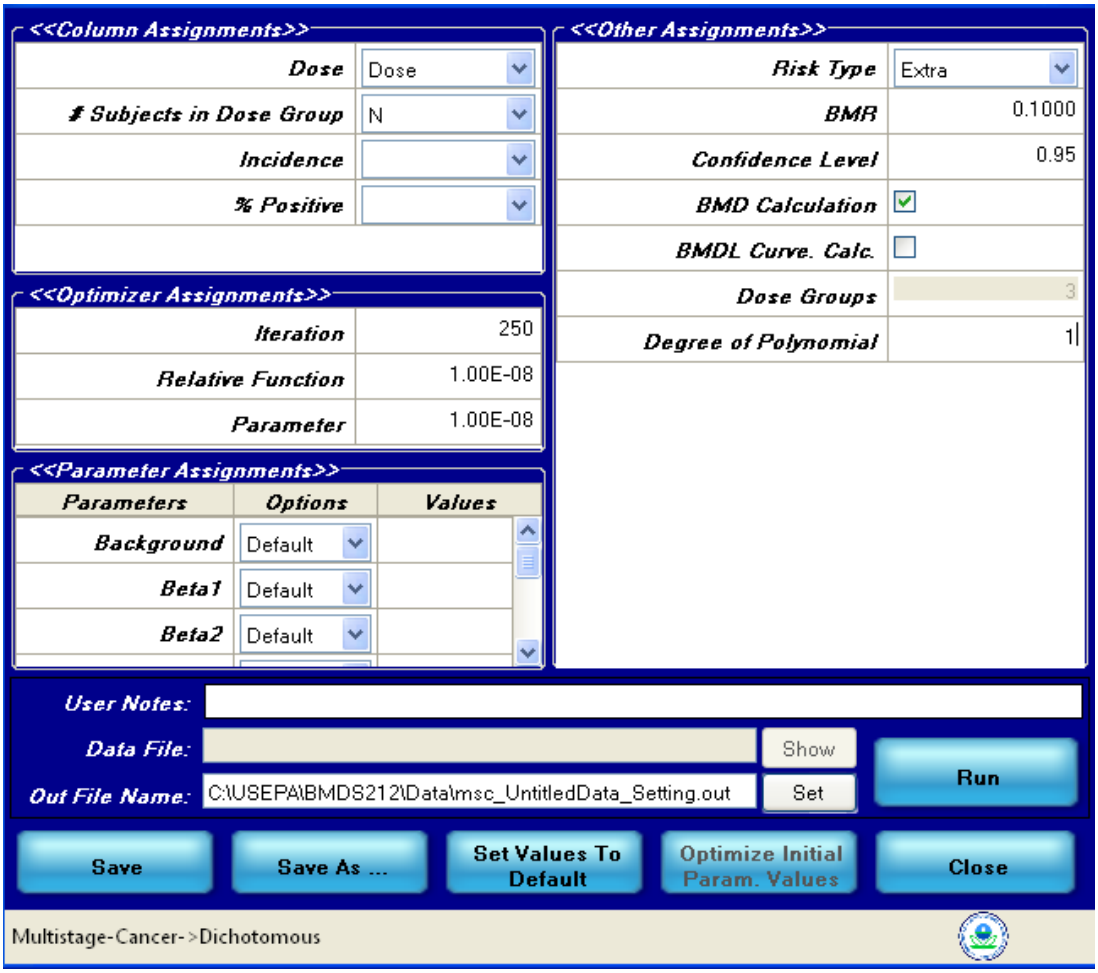
**BMDS Input Data:**




| | Dose | N | Tumor_Incidence | Col4 |
|---|---|---|---|---|
| 1 | 0 | 20 | 3 | |
| 2 | 0.12273 | 49 | 16 | |
| 3 | 0.24546 | 45 | 25 | |

**BMDS Model Parameters – First Run**:

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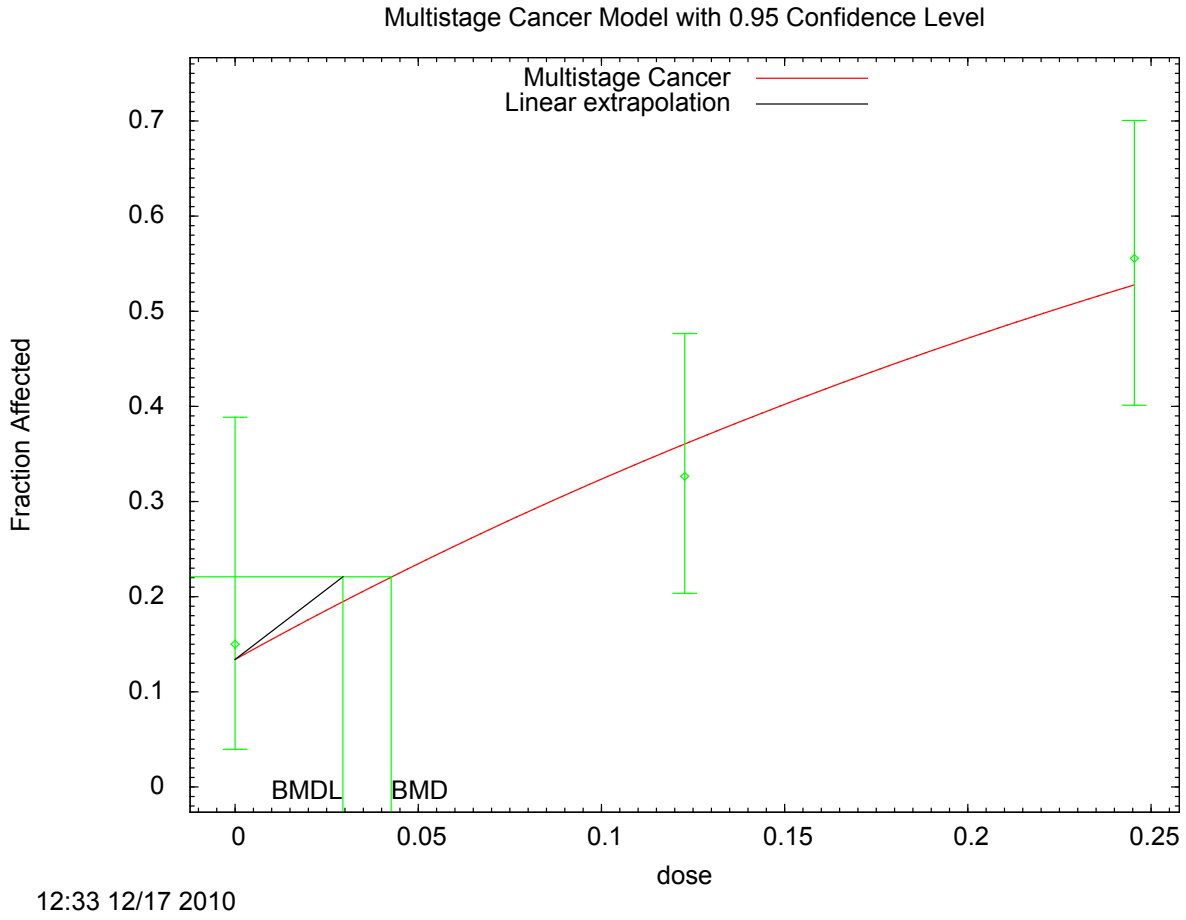
**First Run Output (Degree of Polynomial = 1)**




```
=================================================================
        Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                              Fri Dec 17 12:33:28 2010
=================================================================

BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1)]

   The parameter betas are restricted to be positive


   Dependent variable = Tumor_Incidence
   Independent variable = Dose

 Total number of observations = 3
 Total number of records with missing values = 0
```

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Total number of parameters in model = 2
Total number of specified parameters = 0
Degree of polynomial = 1

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.123701
Beta(1) = 2.64162

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.8 |
| Beta(1) | -0.8 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.134329 | * | * | * |
| Beta(1) | 2.47245 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -70.3205 | 3 | | | |
| Fitted model | -70.5362 | 2 | 0.431408 | 1 | 0.5113 |
| Reduced model | -76.0276 | 1 | 11.4143 | 2 | 0.003322 |

AIC: 145.072

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1343 | 2.687 | 3.000 | 20 | 0.206 |
| 0.1227 | 0.3609 | 17.684 | 16.000 | 49 | -0.501 |
| 0.2455 | 0.5282 | 23.768 | 25.000 | 45 | 0.368 |

Chi^2 = 0.43 d.f. = 1 P-value = 0.5127

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0426138

BMDL = 0.0294365

BMDU = 0.0797552

Taken together, (0.0294365, 0.0797552) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 3.39715

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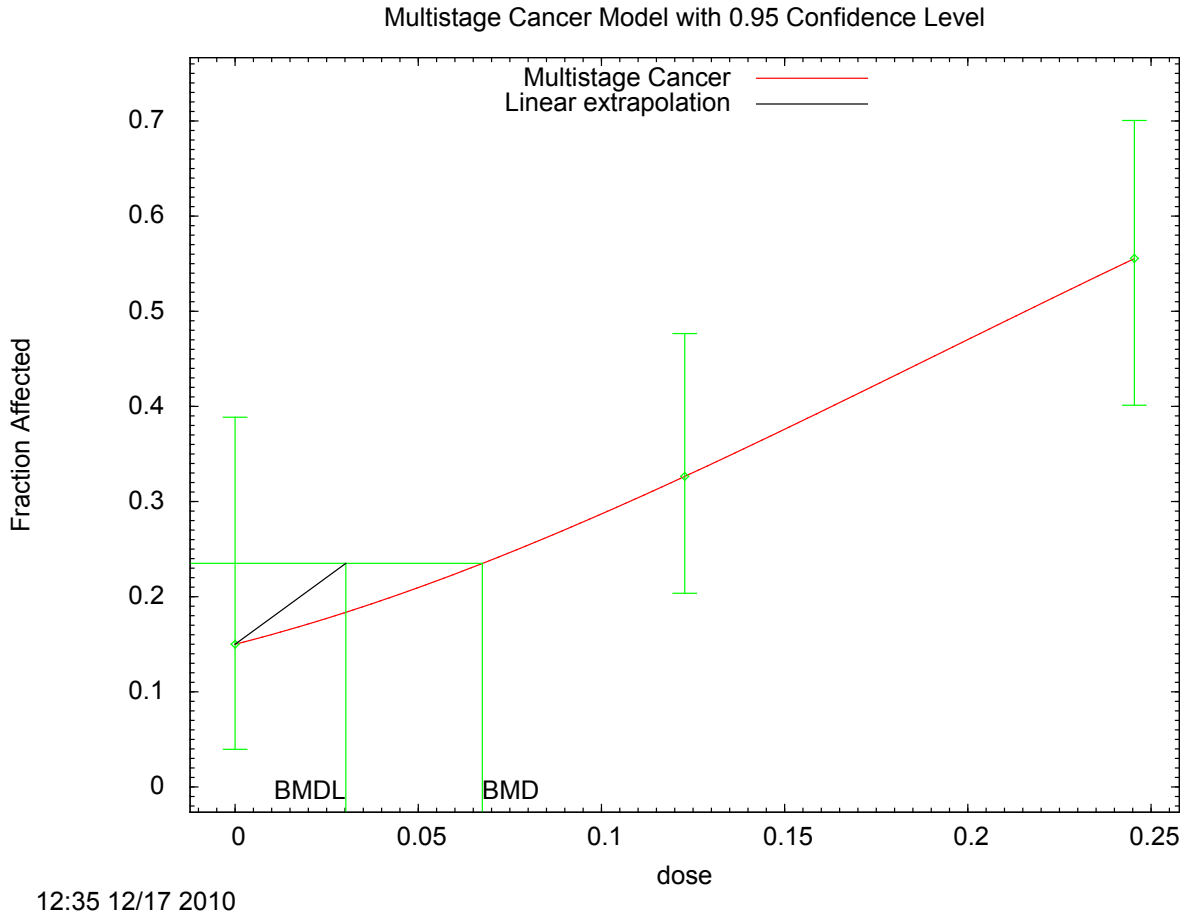
## Second Run Output (Degree of Polynomial = 2)




```
 ================================================================
        Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                              Fri Dec 17 12:35:12 2010
 ================================================================

 BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1-beta2*dose^2)]

   The parameter betas are restricted to be positive


   Dependent variable = Tumor_Incidence
   Independent variable = Dose

 Total number of observations = 3
 Total number of records with missing values = 0
 Total number of parameters in model = 3
```

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Total number of specified parameters = 0
Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.15
Beta(1) = 1.15198
Beta(2) = 6.06877

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) | Beta(2) |
|---|---|---|---|
| Background | 1 | -0.71 | 0.51 |
| Beta(1) | -0.71 | 1 | -0.95 |
| Beta(2) | 0.51 | -0.95 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.15 | * | * | * |
| Beta(1) | 1.15198 | * | * | * |
| Beta(2) | 6.06877 | * | * | * |

* - Indicates that this value is not calculated.

Error in computing chi-square; returning 2

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -70.3205 | 3 | | | |
| Fitted model | -70.3205 | 3 | 0 | 0 | NA |
| Reduced model | -76.0276 | 1 | 11.4143 | 2 | 0.003322 |

AIC: 146.641

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1500 | 3.000 | 3.000 | 20 | -0.000 |
| 0.1227 | 0.3265 | 16.000 | 16.000 | 49 | 0.000 |
| 0.2455 | 0.5556 | 25.000 | 25.000 | 45 | 0.000 |

Chi^2 = 0.00 d.f. = 0 P-value = NA

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0674753

BMDL = 0.0302286

BMDU = 0.137475

Taken together, (0.0302286, 0.137475) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 3.30812

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# Appendix A-2: Benchmark Dose Derivation of a Cancer Slope Factor for Dieldrin

## Introduction

In the IRIS 1993 review of dieldrin (CAS No. 60-57-1), the U.S. EPA calculated an oral cancer slope factor of 16 $(mg/kg\text{-}day)^{-1}$. This oral cancer slope factor was the geometric mean of 13 slope factors derived from studies of chronic oral (dietary) exposure to dieldrin in mice with dose-related increases in incidence of liver tumors. The table below lists the data sets that IRIS used to calculate its slope factor value. The data sets in bolded type within the table (Walker et al. 1972 and NCI 1978) had adequate study designs for analysis to recalculate slope factors based on benchmark dose modeling.

| Sex, Strain | Dose Levels (ppm) | IRIS-calculated Slope Factor | Reference |
|---|---|---|---|
| Male, C3H | 0, 10 | 22 | Davis (1965), reevaluated by Reuber 1974 (cited in Epstein 1975) |
| Female, C3H | 0, 10 | 25 | Davis (1965), reevaluated by Reuber 1974 (cited in Epstein 1975) |
| **Male, CF1** | **0, 0.1, 1, 10** | **25** | **Walker et al 1972** |
| **Female, CF1** | **0, 0.1, 1, 10** | **28** | **Walker et al 1972** |
| **Male, CF1** | **0, 1.25, 2.5, 5, 10, 20** | **15** | **Walker et al 1972** |
| **Female, CF1** | **0, 1.25, 2.5, 5, 10, 20** | **7.1** | **Walker et al 1972** |
| Male, CF1 | 0, 10 | 55 | Thorpe and Walker 1973 |
| Female, CF1 | 0, 10 | 26 | Thorpe and Walker 1973 |
| **Male, B6C3F1** | **0, 2.5, 5** | **9.8** | **NCI (1978)** |
| Male, CF1 | 0, 10 | 18 | Tennekes et al. 1981 |
| Male, C57B1/6J | 0, 10 | 7.4 | Meierhenry et al. 1983 |
| Male, C3H/He | 0, 10 | 8.5 | Meierhenry et al. 1983 |
| Male, B6C3F1 | 0, 10 | 11 | Meierhenry et al. 1983 |

## Methods

A benchmark dose (BMD) approach was used to derive new cancer slope factor for dieldrin. The US EPA's BMDS 2.1.2 software package was used. BMDS 2.1.2 is the latest version of the BMDS series, released by EPA in June 2010. Benchmark dose analysis requires a control and at least two treatment dose levels. Because the studies by Davis 1965, Thorpe and Walker 1973, Tennekes et al 1981, and Meierhenry et al. 1983 each only used one treatment dose level, these data sets are not appropriate for benchmark dose analysis. Each of the Walker et al 1972 and NCI 1978 data sets includes a control group and two or more treatment dose levels and can be applied to a benchmark dose model.

Walker et al. 1972 presented results of two chronic dieldrin experiments in mice: in one experiment, mice of both sexes were exposed to dietary dieldrin for 132 weeks; in the other mice of both sexes were exposed for 128 weeks.

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## 132-Week Male Mouse Tumor Incidence Data from Walker 1973

| Dose (ppm in mouse diet) | Human Equivalent Dose[1] (mg/kg-day) | N | % Mice with Tumors |
|---|---|---|---|
| 0 | 0 | 288 | 20 |
| 0.1 | 0.002607 | 124 | 26 |
| 1.0 | 0.02607 | 111 | 31 |
| 10.0 | 0.2607 | 94 | 94 |

1 See *Calculation of Human Equivalent Dose* section below.

## 132-Week Female Mouse Tumor Incidence Data from Walker 1973

| Dose (ppm in mouse diet) | Human Equivalent Dose[1] (mg/kg-day) | N | % Mice with Tumors |
|---|---|---|---|
| 0 | 0 | 297 | 13 |
| 0.1 | 0.0025895 | 90 | 27 |
| 1.0 | 0.025895 | 87 | 37 |
| 10.0 | 0.25895 | 148 | 92 |

1 See *Calculation of Human Equivalent Dose* section below.

## 128-Week Male Mouse Tumor Incidence Data from Walker 1973

| Dose (ppm in mouse diet) | Human Equivalent Dose[1] (mg/kg-day) | N | % Mice with Tumors |
|---|---|---|---|
| 0 | 0 | 78 | 12 |
| 1.25 | 0.032579 | 30 | 20 |
| 2.5 | 0.065158 | 30 | 43 |
| 5.0 | 0.13032 | 30 | 87 |
| 10.0 | 0.26063 | 11 | 45 |
| 20.0 | 0.52127 | 17 | 71 |

1 See *Calculation of Human Equivalent Dose* section below.

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**128-Week Female Mouse Tumor Incidence Data from Walker 1973**

| Dose (ppm in mouse diet) | Human Equivalent Dose[1] (mg/kg-day) | N | % Mice with Tumors |
|---|---|---|---|
| 0 | 0 | 78 | 10 |
| 1.25 | 0.03238 | 30 | 17 |
| 2.5 | 0.06476 | 28 | 43 |
| 5.0 | 0.12952 | 30 | 60 |
| 10.0 | 0.25903 | 17 | 53 |
| 20.0 | 0.51807 | 21 | 38 |

1 See *Calculation of Human Equivalent Dose* section below.

The NCI 1978 study exposed male and female mice for 80 weeks. The female mice did not show a dose-related increase in liver tumor incidences, so only the data from exposure to male mice were analysed.

**80-Week Male Mouse Tumor Incidence Data from NCI 1978**

| Dose (ppm in mouse diet) | Human Equivalent Dose[1] (mg/kg-day) | N | Number of Mice with Tumors |
|---|---|---|---|
| 0 | 0 | 20 | 3 |
| 6.1 | 0.07674 | 49 | 16 |
| 13.8 | 0.1535 | 46 | 25 |

1 See *Calculation of Human Equivalent Dose* section below.

*Calculation of Human Equivalent Dose*

To arrive at a human equivalent dose from the animal studies, U.S. EPA historically multiplied the doses administered to the animals by the ratio of the animal to human weight to the 1/3 power. The current approach by U.S. EPA is to apply the "3/4 power" assumption in which the human equivalent dose, in units of mg/kg-day, is equal to the animal dose × (animal weight in kg/70 kg) $^{1/4}$ (US EPA 1992, 2005).

Assumptions:

- Male Mouse BW = 0.0373 kg (based on EPA reference values, B6C3F1 mouse, male, chronic; EPA 1982)
- Female mouse BW = 0.0353 kg (based on EPA reference values, B6C3F1 mouse, female, chronic; EPA 1982)

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- Food consumption rate = 6400 mg/day (based on EPA reference values, B6C3F1 mouse, male, chronic; EPA 1982)

*Benchmark Dose Models*

Tumor incidence data are quantal data that the EPA (2000) recommends for use in a Dichotomous Multistage-Cancer Model. Each data set in the above tables was run separately. In the analyses for each data set, dose levels in Human Equivalent Dose were entered with the sample size (N) and tumor incidence data were entered into a BMDS 2.1.2 spreadsheet. The Dichotomous Model Multistage-Cancer Model allows for variation of the Degree of Polynomial to find the best curve fit. If an adequate curve fit cannot be created by manipulation of the Degrees of Polynomial, this may be because the program is trying to fit the curve to the higher dose groups, however the focus in BMDS modeling should be in the range of the lower dose levels. It is therefore sometimes appropriate to exclude data at the higher dose level(s) in order to get a better curve fit at the lower dose levels. However, at least two dose levels above control must remain in the data set.

**Results**

The BMDS output of the benchmark dose analyses for each of the data sets is presented after the References section. Below are summaries of the output used for comparison of output results to determine the best-fit curve and thus the best benchmark dose-derived cancer slope value for each data set. Explanations of the curve-fit evaluation criteria are in the table footnotes below. Within the tables, P-value and scaled residual values which are acceptable are identified in green text, and those which are not acceptable are identified in red text.

***132-Week Male Mouse Tumor Incidence Data from Walker 1973***

The 132-week male mouse tumor incidence data from Walker 1973 was analysed in the BMDS 2.1.2 program in two runs, with Degree of Polynomial respectively set to 2 or 3. Both runs produced acceptable curve-fit evaluation results. Based on the comparison of Akaike Information Coefficient (AIC) values, Run 2 indicated the better curve-fit. BMD-derived cancer slope factor is **9.56246** $(mg/kg\text{-}d)^{-1}$.

| Run # | Data Set | Degree of Polynomial | Curve-Fit Acceptance | | | BMD | BMD-derived CSF |
|---|---|---|---|---|---|---|---|
| | | | P-value[1] | Highest Scaled Residual[2] | AIC[3] | | |
| 1 | All | 2 | 0.2477 | 1.040 | 648.896 | 0.0204274 | 9.60453 |
| 2 | All | 3 | 0.2557 | 1.022 | 648.85 | 0.0201651 | **9.56246** |

1 For the model to be acceptable, P-value must be > 0.1.
2 Scaled residuals report the gap between the curve line and the actual data points; for the model to be acceptable, all scaled residuals must have an absolute value of < 2.
3 The Akaike Information Coefficient (AIC) is used for comparison between models; a lower AIC value indicates a better curve fit to the data.

### *132-Week Female Mouse Tumor Incidence Data from Walker 1973*

The 132-week female mouse tumor incidence data from Walker 1973 was analysed in the BMDS 2.1.2 program in five runs, with Degree of Polynomial set to 1, 2, or 3 with the full data set and 1 or 2 with the highest dose excluded. None of the runs produced a curve with an acceptable fit to the data set. A benchmark dose-derived cancer slope factor was not calculable for this data set.

| Run | Data Set | Degree of Polynomial | Curve - Fit Acceptance | | | BMD | BMD-derived CSF |
|---|---|---|---|---|---|---|---|
| | | | P-value[1] | Highest Scaled Residual[2] | AIC[3] | | |
| 1 | all | 1 | 0.0235 | 2.333 | 534.514 | 0.0108277 | 11.1299 |
| 2 | all | 2 | 0.0235 | 2.333 | 534.514 | 0.0108277 | 11.1299 |
| 3 | all | 3 | 0.0235 | 2.333 | 534.514 | 0.0108277 | 11.1299 |
| 4 | without top dose | 1 | 0.0117 | 2.319 | 455.422 | 0.00826961 | 18.0876 |
| 5 | without top dose | 2 | 0.0117 | 2.319 | 455.422 | 0.00826961 | 18.0876 |

1 For the model to be acceptable, P-value must be > 0.1.
2 Scaled residuals report the gap between the curve line and the actual data points; for the model to be acceptable, all scaled residuals must have an absolute value of < 2.
3 The Akaike Information Coefficient (AIC) is used for comparison between models; a lower AIC value indicates a better curve fit to the data.

### *128-Week Male Mouse Tumor Incidence Data from Walker 1973*

The 128-week male mouse tumor incidence data from Walker 1973 was analysed in the BMDS 2.1.2 program in 10 runs. Using the complete data set with Degree of Polynomial respectively set to 1, 2, 3, or 4 each produced the exact same curve, and the curve-fit acceptance criteria were not met. Removal of the highest dose level did not improve the curve fit with the full range of Degree of Polynomial (1-4). In order to improve the curve fit in the lower dose level range, the data set was run again with the top two dose levels excluded. Removal of the top two dose levels produced a curve with acceptable curve-fit results, and Degree of Polynomial values of 2 or 3 produced identical results. Removal of the highest dose levels is justifiable, because the tumor incidence dose-dependently increased up to 5 ppm and then decreased at 10 and 20 ppm. This decrease in tumor incidence at the higher dose levels is likely due to the higher mortality rates at these dose levels, thus the dose-response curve for tumor incidence had an irregular shape. Removal of these top two dose levels produced a more normal dose-response curve and a better curve fit. BMD-derived cancer slope factor is **5.932 (mg/kg-d)$^{-1}$**.

| Run | Data Set | Degree of Polynomial | Curve-Fit Acceptance | | | BMD | BMD-derived CSF |
|---|---|---|---|---|---|---|---|
| | | | P-value[1] | Highest Scaled Residual[2] | AIC[3] | | |
| 1 | All | 1/2/3/4 | 0.0000 | -2.407 | 218.672 | 0.0265497 | 5.11612 |
| 2 | Without top dose | 1/2/3/4 | 0.0002 | -3.050 | 190.494 | 0.0178307 | 7.55696 |
| 3 | Without top 2 doses | 2/3 | 0.9282 | 0.306 | 153.953 | 0.0317161 | **5.932** |

1 For the model to be acceptable, P-value must be > 0.1.
2 Scaled residuals report the gap between the curve line and the actual data points; for the model to be acceptable, all scaled residuals must have an absolute value of < 2.
3 The Akaike Information Coefficient (AIC) is used for comparison between models; a lower AIC value indicates a better curve fit to the data.

### *128-Week Female Mouse Tumor Incidence Data from Walker 1973*

The 128-week female mouse tumor incidence data from Walker 1973 was analysed in the BMDS 2.1.2 program in eight runs. Using the complete data set with Degree of Polynomial respectively set to 1, 2, 3, or 4 each produced the exact same curve, and the curve-fit acceptance criteria were not met. Exclusion of the highest dose level improved the curve fit with Degree of Polynomial set to 2 or 3, with identical results. Exclusion of the top two dose levels produced a curve with acceptable curve-fit results, and Degree of Polynomial values of 2 or 3 produced identical results. Removal of the highest dose levels is justifiable, because the tumor incidence dose-dependently increased up to 5 ppm and then decreased at 10 and 20 ppm. This decrease in tumor incidence at the higher dose levels is likely due to the higher mortality rates at these dose levels, thus the dose-response curve for tumor incidence had an irregular shape. Removal of these top two dose levels produced a more normal dose-response curve and a better curve fit. Because exclusion of the top dose only and the top two doses each produced acceptable curve fit results, the comparison is decided by the AIC value, which indicated that the exclusion of the top two dose levels produced the better curve fit. BMD-derived cancer slope factor is **7.96094(mg/kg-d)$^{-1}$**.

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| Run # | Data Set | Degree of Polynomial | Curve-Fit Acceptance | | | BMD | BMD-derived CSF |
|---|---|---|---|---|---|---|---|
| | | | P-value[1] | Highest Scaled Residual[2] | AIC[3] | | |
| 1 | All | 1/2/3/4 | 0.0001 | 3.243 | 233.07 | 0.063535 | 2.43635 |
| 2 | Without top dose | 2/3 | 0.1035 | 1.177 | 185.673 | 0.0231772 | 5.8833 |
| 3 | Without top 2 doses | 2/3 | 0.2667 | 0.729 | 159.398 | 0.0218267 | **7.96094** |

1 For the model to be acceptable, P-value must be > 0.1.
2 Scaled residuals report the gap between the curve line and the actual data points; for the model to be acceptable, all scaled residuals must have an absolute value of < 2.
3 The Akaike Information Coefficient (AIC) is used for comparison between models; a lower AIC value indicates a better curve fit to the data.

### *80-Week Male Mouse Tumor Incidence Data from NCI 1978*

The 80-week male mouse tumor incidence data from Walker 1973 was analysed in the BMDS 2.1.2 program in eight runs. A summary of the BMD analyses of the liver tumor incidence data is presented in the table below, and the BMDS input data, model parameters, and output are presented in subsequent pages. The first run (Degree of Polynomial =1) produced a curve with a good visual fir, and the mathematical tests for a good fit produced values within the acceptable ranges (see table footnotes). The second run, while providing a visually perfect for to the data points, the P-value of "NA" is difficult to interpret. Based on these factors, the first run is deemed to have the better curve fit, and the cancer slope factor for the NCI 1978 male mouse liver tumor incidence data is **5.29719 (mg/kg-day)$^{-1}$**.

| Run # | Data Set | Degree of Polynomial | Curve-Fit Acceptance | | | BMD | BMD-derived CSF |
|---|---|---|---|---|---|---|---|
| | | | P-value[1] | Highest Scaled Residual[2] | AIC[3] | | |
| 1 | All | 1 | 0.5714 | -0.435 | 146.558 | **0.027485** | **5.29719** |
| 2 | All | 2 | NA | 0.000 | 148.236 | 0.0411225 | 5.19367 |

1 For the model to be acceptable, P-value must be > 0.1.
2 Scaled residuals report the gap between the curve line and the actual data points; for the model to be acceptable, all scaled residuals must have an absolute value of < 2.
3 The Akaike Information Coefficient (AIC) is used for comparison between models; a lower AIC value indicates a better curve fit to the data.

TETRA TECH

**Conclusion**

Below is a comparison of the EPA-IRIS 1993 cancer slope factors for dieldrin with the cancer slope factors derived by benchmark dose and adjusted to human equivalent doses derived by scaling to the ¾ power.

| Reference for Data Set (Subjects) | Dose levels in Human Equivalent Dose (mg/kg-day) | Best Curve Fit Data | | BMD | BMDL | BMD-Based Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$ | U.S. EPA 1987 Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$ |
|---|---|---|---|---|---|---|---|
| | | P value | Highest scaled residual | | | | |
| NCI 1978 (male B6C3F1 mice) | 0<br>0.07674<br>0.1535 | 0.5714 | -0.435 | 0.027485 | 0.0188779 | 5.29719 | 9.8 |
| Walker et al. 1972 male CF1 mice) | 0<br>0.002607<br>0.02607<br>0.2607 | 0.2557 | 1.022 | 0.0201651 | 0.0104576 | 9.56246 | 25 |
| Walker et al. 1972 male CF1 mice) | 0<br>0.02579<br>0.065158<br>0.13032 | 0.9282 | 0.306 | 0.0317161 | 0.0168577 | 5.932 | 15 |
| Walker et al. 1972 female CF1 mice) | 0<br>0.03238<br>0.06476<br>0.12952 | 0.2667 | 0.729 | 0.0218267 | 0.0125613 | 7.96094 | 26 |
| **Geometric mean of four BMD-based cancer slope factors** | | | | | | **6.99351** | |
| **Geometric mean of 13 cancer slope factors reported by EPA 1987** | | | | | | | **16** |

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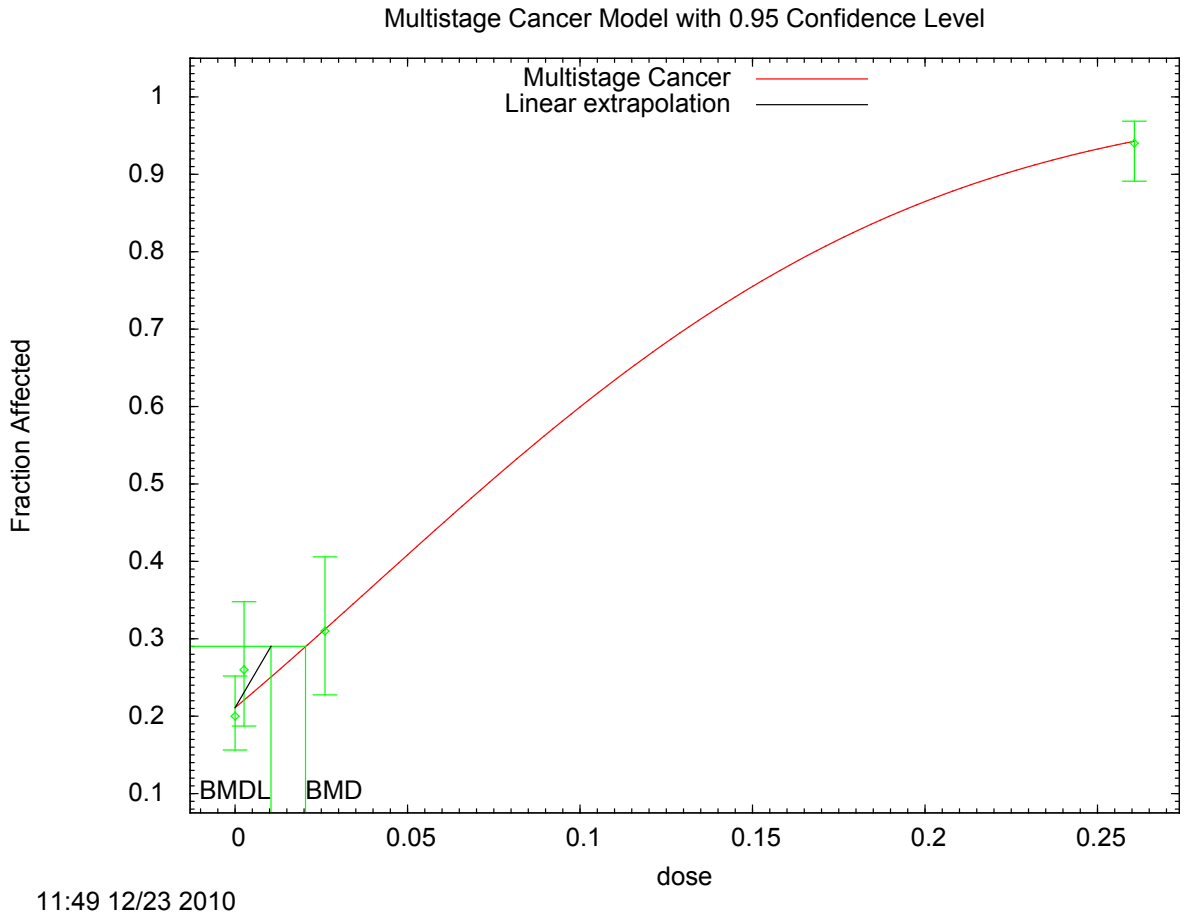
**BMDS Output**

**132-Week Male Mouse Tumor Incidence Data from Walker 197 - First Run (Degree of Polyniomial = 2):**




```
=================================================================
        Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                              Thu Dec 23 11:49:42 2010
=================================================================

BMDS_Model_Run
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   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1-beta2*dose^2)]

   The parameter betas are restricted to be positive
```

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Dependent variable = %_Tumors
Independent variable = Dose

Total number of observations = 4
Total number of records with missing values = 0
Total number of parameters in model = 3
Total number of specified parameters = 0
Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.224973
Beta(1) = 4.02918
Beta(2) = 22.1897

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) | Beta(2) |
|---|---|---|---|
| Background | 1 | -0.5 | 0.45 |
| Beta(1) | -0.5 | 1 | -0.98 |
| Beta(2) | 0.45 | -0.98 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.211425 | * | * | * |
| Beta(1) | 4.741 | * | * | * |
| Beta(2) | 20.404 | * | * | * |

* - Indicates that this value is not calculated.

Warning: Likelihood for the fitted model larger than the Likelihood for the full model.
Error in computing chi-square; returning 2

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -323.841 | 4 | | | |
| Fitted model | -321.448 | 3 | -4.78713 | 1 | 2 |
| Reduced model | -474.224 | 1 | 300.765 | 3 | <.0001 |

AIC: 648.896

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TETRA TECH

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.2114 | 60.890 | 57.600 | 288 | -0.475 |
| 0.0026 | 0.2212 | 27.431 | 32.240 | 124 | 1.040 |
| 0.0261 | 0.3127 | 34.710 | 34.410 | 111 | -0.062 |
| 0.2607 | 0.9427 | 165.923 | 165.440 | 176 | -0.157 |

Chi^2 = 1.34 d.f. = 1 P-value = 0.2477

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0204274

BMDL = 0.0104118

BMDU = 0.0518688

Taken together, (0.0104118, 0.0518688) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 9.60453

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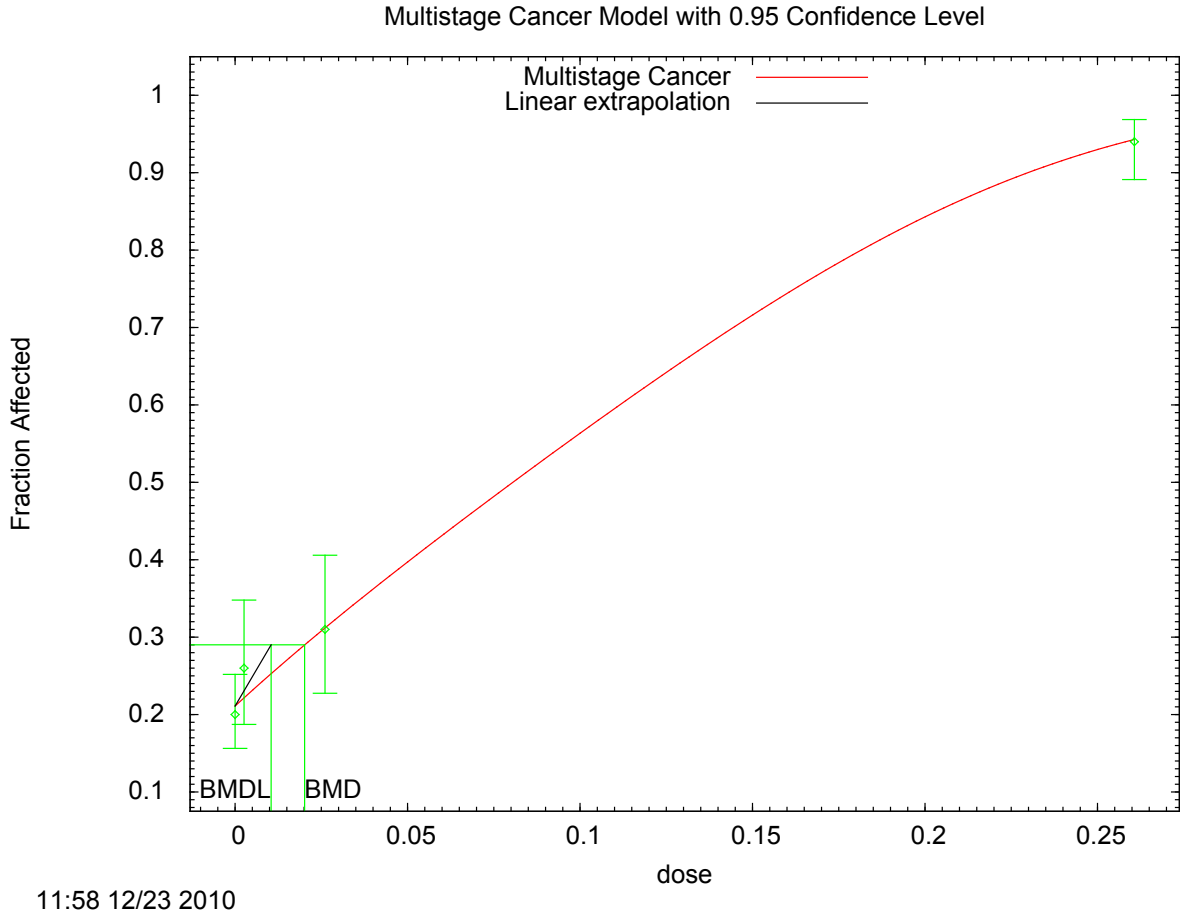
**132-Week Male Mouse Tumor Incidence Data from Walker 197 - First Run (Degree of Polyniomial = 3):**




```
=================================================================
       Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
       Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
       Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                          Thu Dec 23 11:58:36 2010
=================================================================

BMDS_Model_Run
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  The form of the probability function is:

  P[response] = background + (1-background)*[1-EXP(
               -beta1*dose^1-beta2*dose^2-beta3*dose^3)]

  The parameter betas are restricted to be positive


  Dependent variable = %_Tumors
  Independent variable = Dose

Total number of observations = 4
```

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Total number of records with missing values = 0
Total number of parameters in model = 4
Total number of specified parameters = 0
Degree of polynomial = 3

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values

| | |
|---|---|
| Background = | 0.224641 |
| Beta(1) = | 4.55611 |
| Beta(2) = | 0 |
| Beta(3) = | 77.3888 |

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(2)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(1) | Beta(3) |
|---|---|---|---|
| Background | 1 | -0.49 | 0.45 |
| Beta(1) | -0.49 | 1 | -0.97 |
| Beta(3) | 0.45 | -0.97 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.211258 | * | * | * |
| Beta(1) | 5.19575 | * | * | * |
| Beta(2) | 0 | * | * | * |
| Beta(3) | 71.6863 | * | * | * |

* - Indicates that this value is not calculated.

Warning: Likelihood for the fitted model larger than the Likelihood for the full model.
Error in computing chi-square; returning 2

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -323.841 | 4 | | | |
| Fitted model | -321.425 | 3 | -4.83323 | 1 | 2 |
| Reduced model | -474.224 | 1 | 300.765 | 3 | <.0001 |

AIC: 648.85

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.2113 | 60.842 | 57.600 | 288 | -0.468 |
| 0.0026 | 0.2219 | 27.512 | 32.240 | 124 | 1.022 |
| 0.0261 | 0.3120 | 34.638 | 34.410 | 111 | -0.047 |
| 0.2607 | 0.9428 | 165.941 | 165.440 | 176 | -0.163 |

Chi^2 = 1.29 d.f. = 1 P-value = 0.2557

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0201651

BMDL = 0.0104576

BMDU = 0.0675466

Taken together, (0.0104576, 0.0675466) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 9.56246

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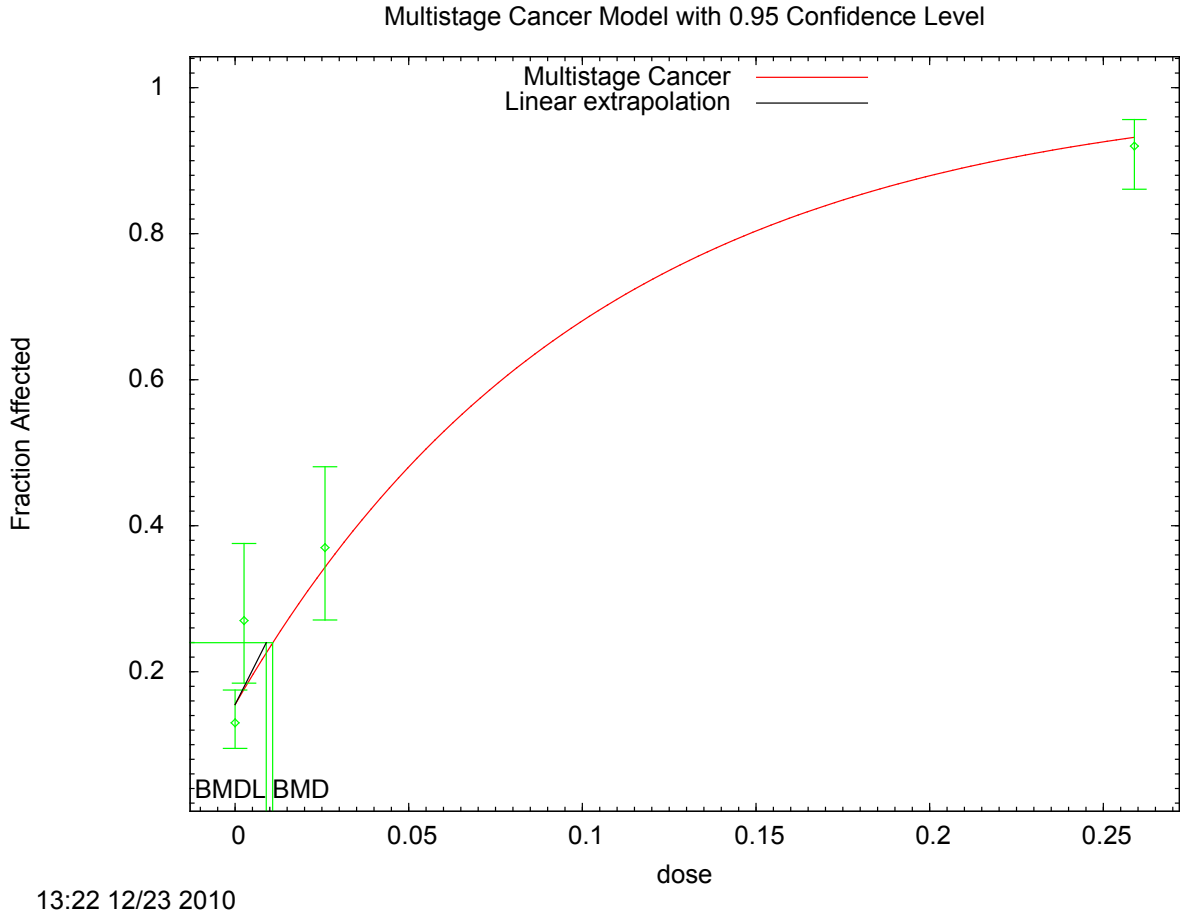
**132-Week Female Mouse Tumor Incidence Data from Walker 197 - First Run (Degree of Polyniomial = 1):**




```
=================================================================
       Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
       Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
       Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                          Thu Dec 23 13:22:33 2010
=================================================================

BMDS_Model_Run
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  The form of the probability function is:

  P[response] = background + (1-background)*[1-EXP(
               -beta1*dose^1)]

  The parameter betas are restricted to be positive


  Dependent variable = %_Tumors
  Independent variable = Dose

Total number of observations = 4
```

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Total number of records with missing values = 0
Total number of parameters in model = 2
Total number of specified parameters = 0
Degree of polynomial = 1

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.197577
Beta(1) = 8.91076

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.27 |
| Beta(1) | -0.27 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.15526 | * | * | * |
| Beta(1) | 9.73064 | * | * | * |

* - Indicates that this value is not calculated.

Warning: Likelihood for the fitted model larger than the Likelihood for the full model.
Error in computing chi-square; returning 2

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -265.837 | 4 | | | |
| Fitted model | -265.257 | 2 | -1.16053 | 2 | 2 |
| Reduced model | -410.462 | 1 | 289.25 | 3 | <.0001 |

AIC: 534.514

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1553 | 46.112 | 38.610 | 297 | -1.202 |
| 0.0026 | 0.1763 | 15.865 | 24.300 | 90 | 2.333 |
| 0.0259 | 0.3434 | 29.877 | 32.190 | 87 | 0.522 |
| 0.2590 | 0.9320 | 137.938 | 136.160 | 148 | -0.581 |

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Chi^2 = 7.50 d.f. = 2 P-value = 0.0235

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0108277

BMDL = 0.00898478

BMDU = 0.01312

Taken together, (0.00898478, 0.01312) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 11.1299

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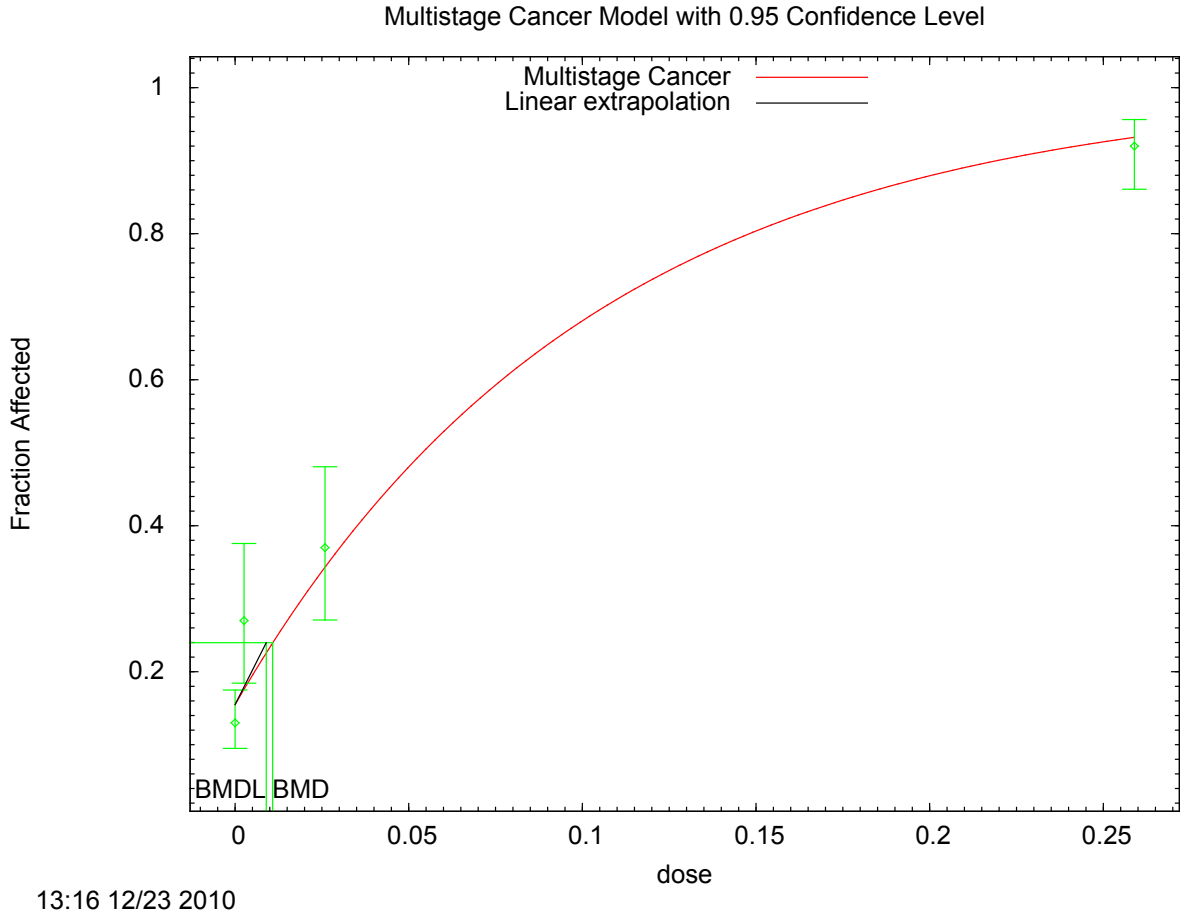
**132-Week Female Mouse Tumor Incidence Data from Walker 197 - Second Run (Degree of Polyniomial = 2):**




```
=================================================================
       Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
       Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
       Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                          Thu Dec 23 13:16:20 2010
=================================================================

BMDS_Model_Run
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  The form of the probability function is:

  P[response] = background + (1-background)*[1-EXP(
               -beta1*dose^1-beta2*dose^2)]

  The parameter betas are restricted to be positive


  Dependent variable = %_Tumors
  Independent variable = Dose

Total number of observations = 4
```

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Total number of records with missing values = 0
Total number of parameters in model = 3
Total number of specified parameters = 0
Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.197577
Beta(1) = 8.91076
Beta(2) = 0

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(2)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.27 |
| Beta(1) | -0.27 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.15526 | * | * | * |
| Beta(1) | 9.73063 | * | * | * |
| Beta(2) | 0 | * | * | * |

* - Indicates that this value is not calculated.

Warning: Likelihood for the fitted model larger than the Likelihood for the full model.
Error in computing chi-square; returning 2

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -265.837 | 4 | | | |
| Fitted model | -265.257 | 2 | -1.16053 | 2 | 2 |
| Reduced model | -410.462 | 1 | 289.25 | 3 | <.0001 |

AIC: 534.514

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1553 | 46.112 | 38.610 | 297 | -1.202 |
| 0.0026 | 0.1763 | 15.865 | 24.300 | 90 | 2.333 |
| 0.0259 | 0.3434 | 29.877 | 32.190 | 87 | 0.522 |
| 0.2590 | 0.9320 | 137.938 | 136.160 | 148 | -0.581 |

Chi^2 = 7.50 d.f. = 2 P-value = 0.0235

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0108277

BMDL = 0.00898478

BMDU = 0.0160063

Taken together, (0.00898478, 0.0160063) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 11.1299

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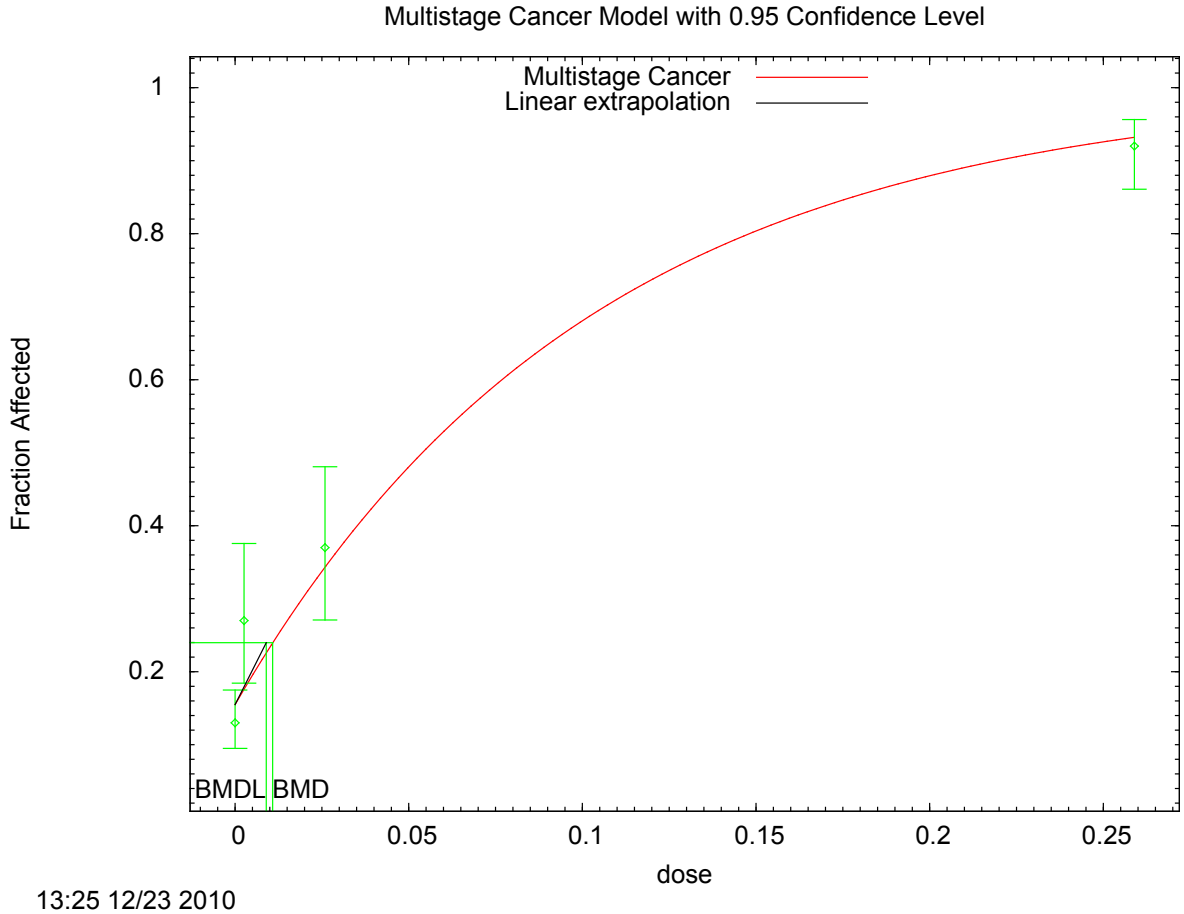
**132-Week Female Mouse Tumor Incidence Data from Walker 197 - First Run (Degree of Polyniomial = 3):**




```
=================================================================
       Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
       Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
       Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                          Thu Dec 23 13:25:10 2010
=================================================================

BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

  The form of the probability function is:

  P[response] = background + (1-background)*[1-EXP(
               -beta1*dose^1-beta2*dose^2-beta3*dose^3)]

  The parameter betas are restricted to be positive


  Dependent variable = %_Tumors
  Independent variable = Dose

Total number of observations = 4
```

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Total number of records with missing values = 0
Total number of parameters in model = 4
Total number of specified parameters = 0
Degree of polynomial = 3

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.197577
Beta(1) = 8.91076
Beta(2) = 0
Beta(3) = 0

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(2) -Beta(3)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.27 |
| Beta(1) | -0.27 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.15526 | * | * | * |
| Beta(1) | 9.73064 | * | * | * |
| Beta(2) | 0 | * | * | * |
| Beta(3) | 0 | * | * | * |

* - Indicates that this value is not calculated.

Warning: Likelihood for the fitted model larger than the Likelihood for the full model.
Error in computing chi-square; returning 2

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -265.837 | 4 | | | |
| Fitted model | -265.257 | 2 | -1.16053 | 2 | 2 |
| Reduced model | -410.462 | 1 | 289.25 | 3 | <.0001 |

AIC: 534.514

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1553 | 46.112 | 38.610 | 297 | -1.202 |
| 0.0026 | 0.1763 | 15.865 | 24.300 | 90 | 2.333 |
| 0.0259 | 0.3434 | 29.877 | 32.190 | 87 | 0.522 |
| 0.2590 | 0.9320 | 137.938 | 136.160 | 148 | -0.581 |

Chi^2 = 7.50 d.f. = 2 P-value = 0.0235

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0108277

BMDL = 0.00898478

BMDU = 0.0160063

Taken together, (0.00898478, 0.0160063) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 11.1299

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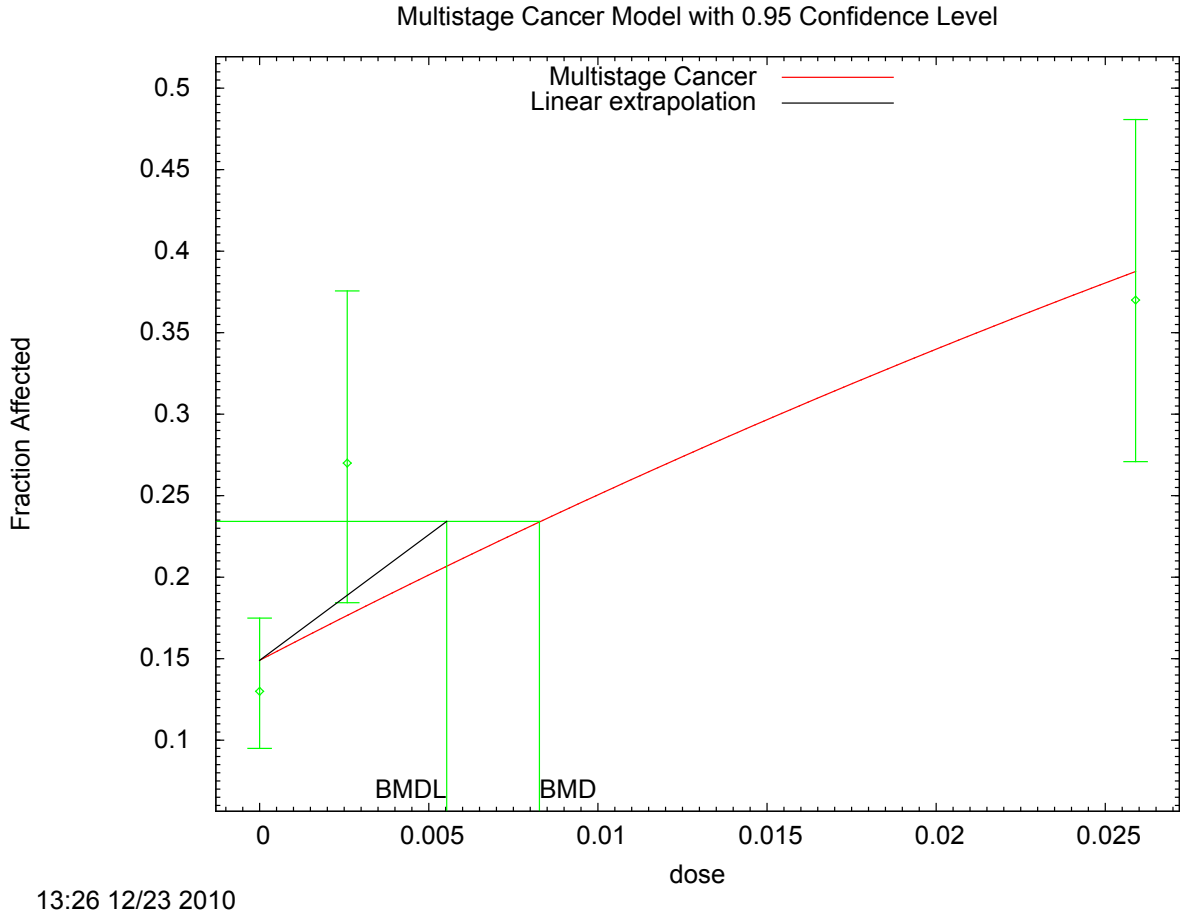
**132-Week Female Mouse Tumor Incidence Data from Walker 197 - Fourth Run (High Dose Excluded, Degree of Polyniomial = 1):**




```
=================================================================
       Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
       Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
       Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                          Thu Dec 23 13:26:16 2010
=================================================================

BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

  The form of the probability function is:

  P[response] = background + (1-background)*[1-EXP(
                -beta1*dose^1)]

  The parameter betas are restricted to be positive


  Dependent variable = %_Tumors
  Independent variable = Dose
```

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Tel: (703) 931-9301 Fax: (703) 931-9222

Total number of observations = 3
Total number of records with missing values = 0
Total number of parameters in model = 2
Total number of specified parameters = 0
Degree of polynomial = 1

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.189465
Beta(1) = 10.0344

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.44 |
| Beta(1) | -0.44 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.149139 | * | * | * |
| Beta(1) | 12.7407 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -224.579 | 3 | | | |
| Fitted model | -225.711 | 2 | 2.2636 | 1 | 0.1324 |
| Reduced model | -237.606 | 1 | 26.0535 | 2 | <.0001 |

AIC: 455.422

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1491 | 44.294 | 38.610 | 297 | -0.926 |
| 0.0026 | 0.1768 | 15.908 | 24.300 | 90 | 2.319 |
| 0.0259 | 0.3882 | 33.778 | 32.190 | 87 | -0.349 |

Chi^2 = 6.36 d.f. = 1 P-value = 0.0117

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Benchmark Dose Computation

```
Specified effect =            0.1

Risk Type        =      Extra risk

Confidence level =           0.95

             BMD =     0.00826961

            BMDL =     0.00552865

            BMDU =      0.0142487

Taken together, (0.00552865, 0.0142487) is a 90     % two-sided confidence
interval for the BMD

Multistage Cancer Slope Factor =       18.0876
```

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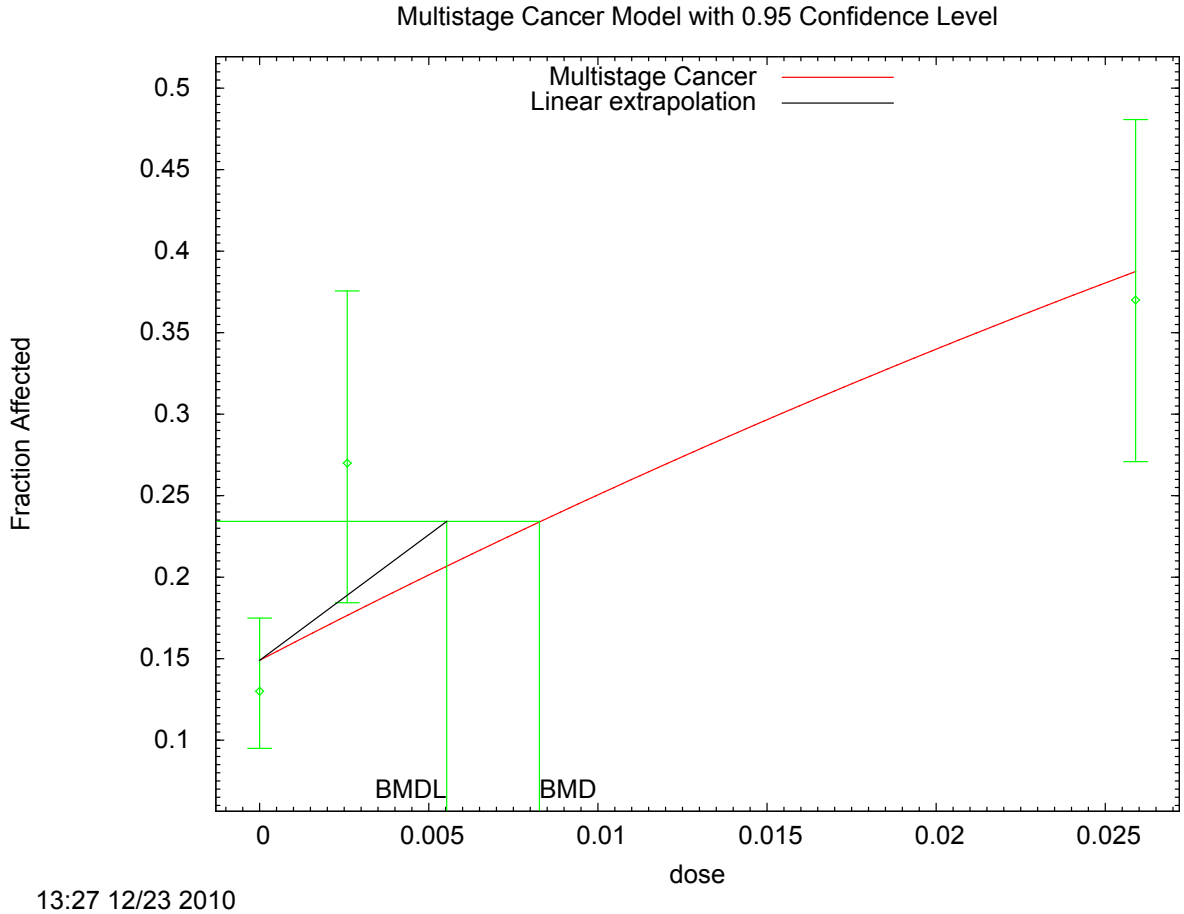
**132-Week Female Mouse Tumor Incidence Data from Walker 197 - Fifth Run (High Dose Excluded, Degree of Polyniomial = 2):**




```
=================================================================
       Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
       Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
       Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                          Thu Dec 23 13:27:01 2010
=================================================================

BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

  The form of the probability function is:

  P[response] = background + (1-background)*[1-EXP(
                -beta1*dose^1-beta2*dose^2)]

  The parameter betas are restricted to be positive


  Dependent variable = %_Tumors
  Independent variable = Dose
```

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Total number of observations = 3
Total number of records with missing values = 0
Total number of parameters in model = 3
Total number of specified parameters = 0
Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.189465
Beta(1) = 10.0344
Beta(2) = 0

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(2)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.44 |
| Beta(1) | -0.44 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.149139 | * | * | * |
| Beta(1) | 12.7407 | * | * | * |
| Beta(2) | 0 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -224.579 | 3 | | | |
| Fitted model | -225.711 | 2 | 2.2636 | 1 | 0.1324 |
| Reduced model | -237.606 | 1 | 26.0535 | 2 | <.0001 |

AIC: 455.422

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 0.0000 | 0.1491 | 44.294 | 38.610 | 297 | -0.926 |
| 0.0026 | 0.1768 | 15.908 | 24.300 | 90 | 2.319 |
| 0.0259 | 0.3882 | 33.778 | 32.190 | 87 | -0.349 |

Chi^2 = 6.36 d.f. = 1 P-value = 0.0117

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.00826961

BMDL = 0.00552865

BMDU = 0.0160351

Taken together, (0.00552865, 0.0160351) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 18.0876

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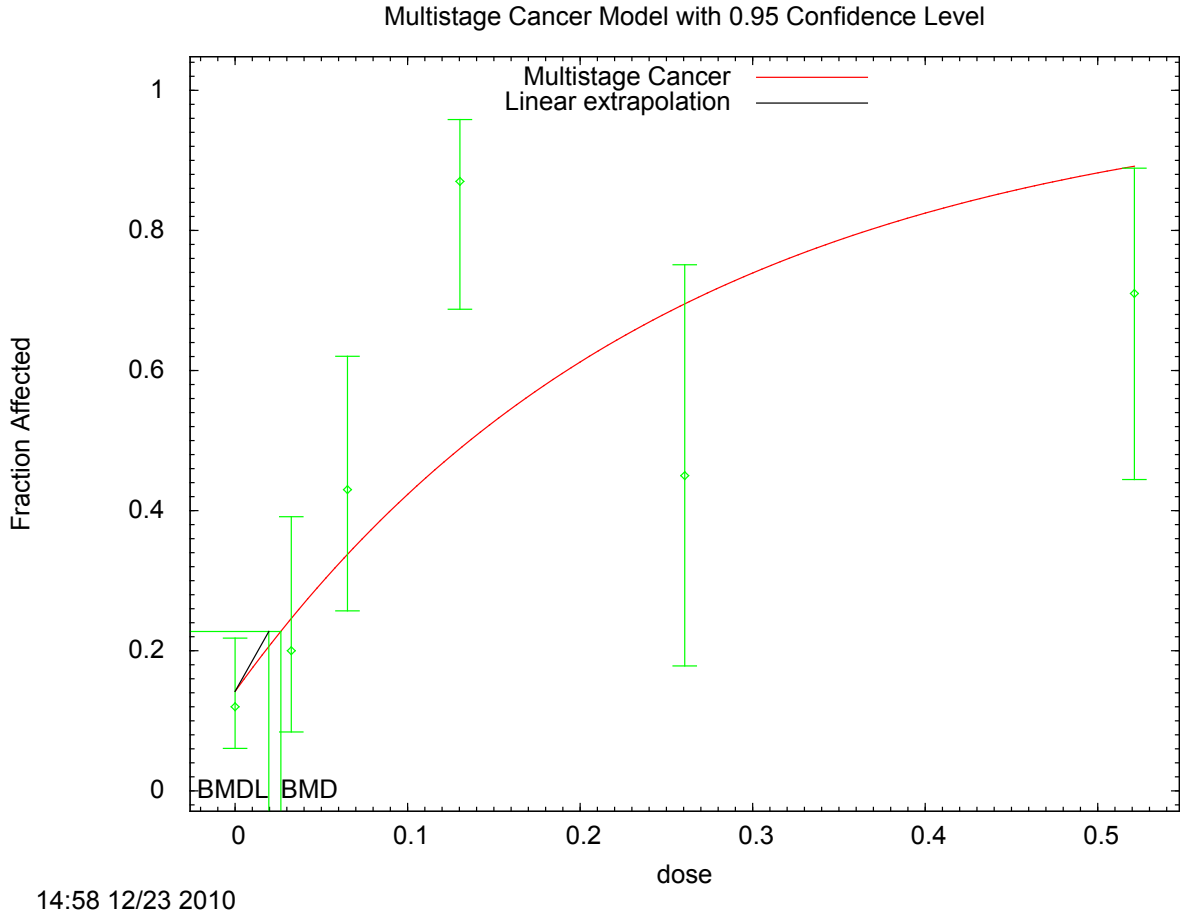
**128-Week Male Mouse Tumor Incidence Data from Walker 1972 – First set of Runs (Degree of Polyniomial = 1, 2, 3, 4 produced exactly the same results):**




```
=================================================================
       Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
       Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
       Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                          Thu Dec 23 14:58:56 2010
=================================================================

BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

  The form of the probability function is:

  P[response] = background + (1-background)*[1-EXP(
               -beta1*dose^1-beta2*dose^2)]

  The parameter betas are restricted to be positive


  Dependent variable = Percent_Tumors
  Independent variable = Dose
```

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Tel: (703) 931-9301 Fax: (703) 931-9222

Total number of observations = 6
Total number of records with missing values = 0
Total number of parameters in model = 3
Total number of specified parameters = 0
Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.411936
Beta(1) = 1.5877
Beta(2) = 0

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(2)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.6 |
| Beta(1) | -0.6 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.141657 | * | * | * |
| Beta(1) | 3.96843 | * | * | * |
| Beta(2) | 0 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -93.5294 | 6 | | | |
| Fitted model | -107.336 | 2 | 27.6131 | 4 | 1.4939647e-005 |
| Reduced model | -128.534 | 1 | 70.0099 | 5 | <.0001 |

AIC: 218.672

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 0.0000 | 0.1417 | 11.049 | 9.360 | 78 | -0.549 |
| 0.0326 | 0.2458 | 7.373 | 6.000 | 30 | -0.582 |
| 0.0652 | 0.3372 | 10.117 | 12.900 | 30 | 1.075 |
| 0.1303 | 0.4882 | 14.647 | 26.100 | 30 | 4.183 |
| 0.2606 | 0.6949 | 7.644 | 4.950 | 11 | -1.764 |
| 0.5213 | 0.8915 | 15.156 | 12.070 | 17 | -2.407 |

Chi^2 = 28.20 d.f. = 4 P-value = 0.0000

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0265497

BMDL = 0.0195461

BMDU = 0.0388455

Taken together, (0.0195461, 0.0388455) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 5.11612

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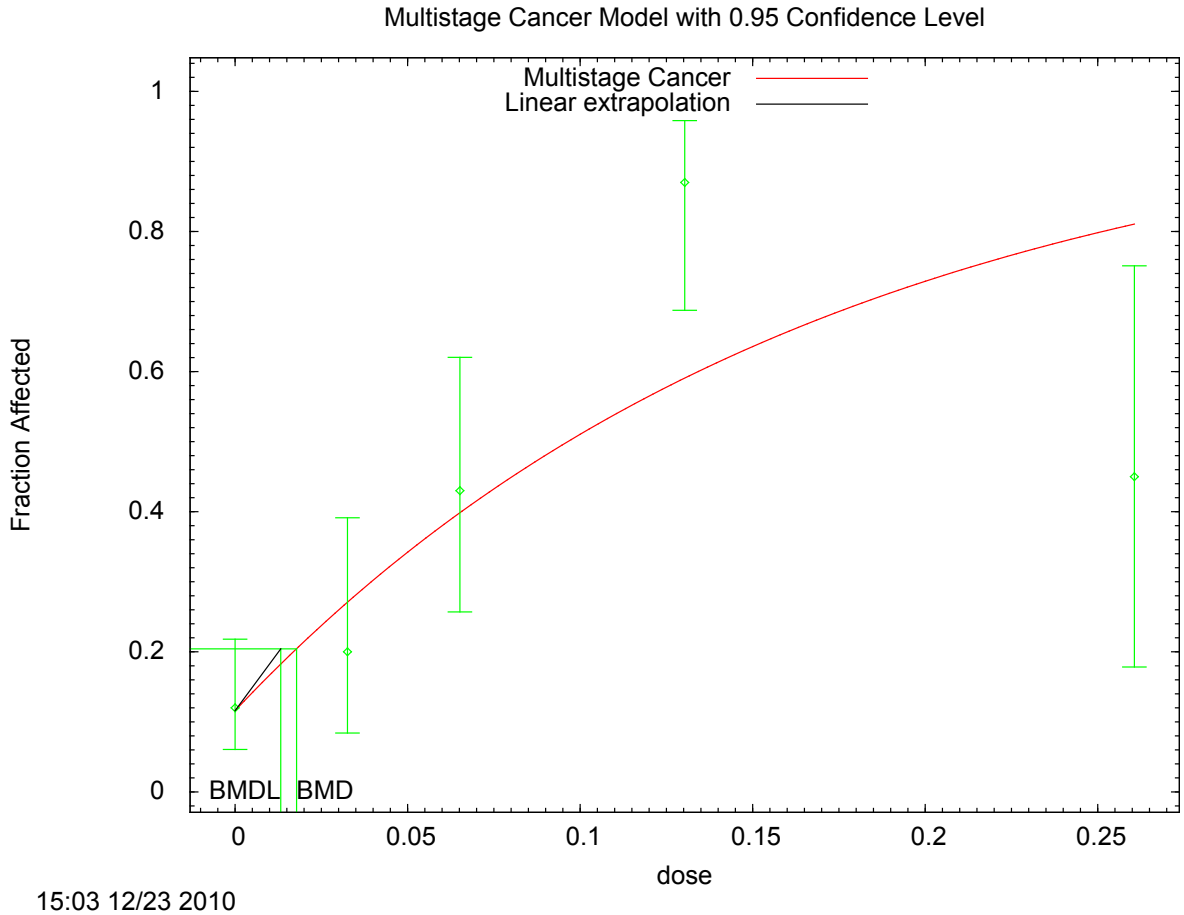
**128-Week Male Mouse Tumor Incidence Data from Walker 1972 – Second Set of Runs (Excluded top dose level; Degree of Polyniomial = 1, 2, 3, 4 produced exactly the same results):**




```
 ================================================================
        Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/msc_Dieldrin Walker 73 male T2_Opt.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_Dieldrin Walker 73 male
T2_Opt.plt
                                              Thu Dec 23 15:03:14 2010
 ================================================================

 BMDS_Model_Run
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   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1-beta2*dose^2)]

   The parameter betas are restricted to be positive


   Dependent variable = Percent_Tumors
   Independent variable = Dose
```

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```
Total number of observations = 5
Total number of records with missing values = 0
Total number of parameters in model = 3
Total number of specified parameters = 0
Degree of polynomial = 2


Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008



                 Default Initial Parameter Values
                    Background =     0.354288
                       Beta(1) =      2.79145
                       Beta(2) =            0


          Asymptotic Correlation Matrix of Parameter Estimates

          ( *** The model parameter(s)  -Beta(2)
                have been estimated at a boundary point, or have been specified by
the user,
                and do not appear in the correlation matrix )

            Background      Beta(1)

Background            1        -0.58

   Beta(1)        -0.58            1



                                Parameter Estimates

                                                          95.0% Wald Confidence
Interval
       Variable         Estimate        Std. Err.     Lower Conf. Limit   Upper Conf.
Limit
     Background         0.115765            *                *                  *
        Beta(1)          5.90894            *                *                  *
        Beta(2)                0            *                *                  *

* - Indicates that this value is not calculated.



                        Analysis of Deviance Table

       Model      Log(likelihood)  # Param's  Deviance  Test d.f.   P-value
     Full model        -83.2928         5
   Fitted model        -93.2472         2       19.9088      3       0.0001773
  Reduced model        -113.687         1       60.7888      4         <.0001

          AIC:         190.494


                                 Goodness  of  Fit
                                                                Scaled
```

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| Dose | Est._Prob. | Expected | Observed | Size | Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1158 | 9.030 | 9.360 | 78 | 0.117 |
| 0.0326 | 0.2706 | 8.118 | 6.000 | 30 | -0.870 |
| 0.0652 | 0.3983 | 11.950 | 12.900 | 30 | 0.354 |
| 0.1303 | 0.5906 | 17.718 | 26.100 | 30 | 3.112 |
| 0.2606 | 0.8104 | 8.915 | 4.950 | 11 | -3.050 |

Chi^2 = 19.88  d.f. = 3  P-value = 0.0002

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0178307

BMDL = 0.0132328

BMDU = 0.0256235

Taken together, (0.0132328, 0.0256235) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 7.55696

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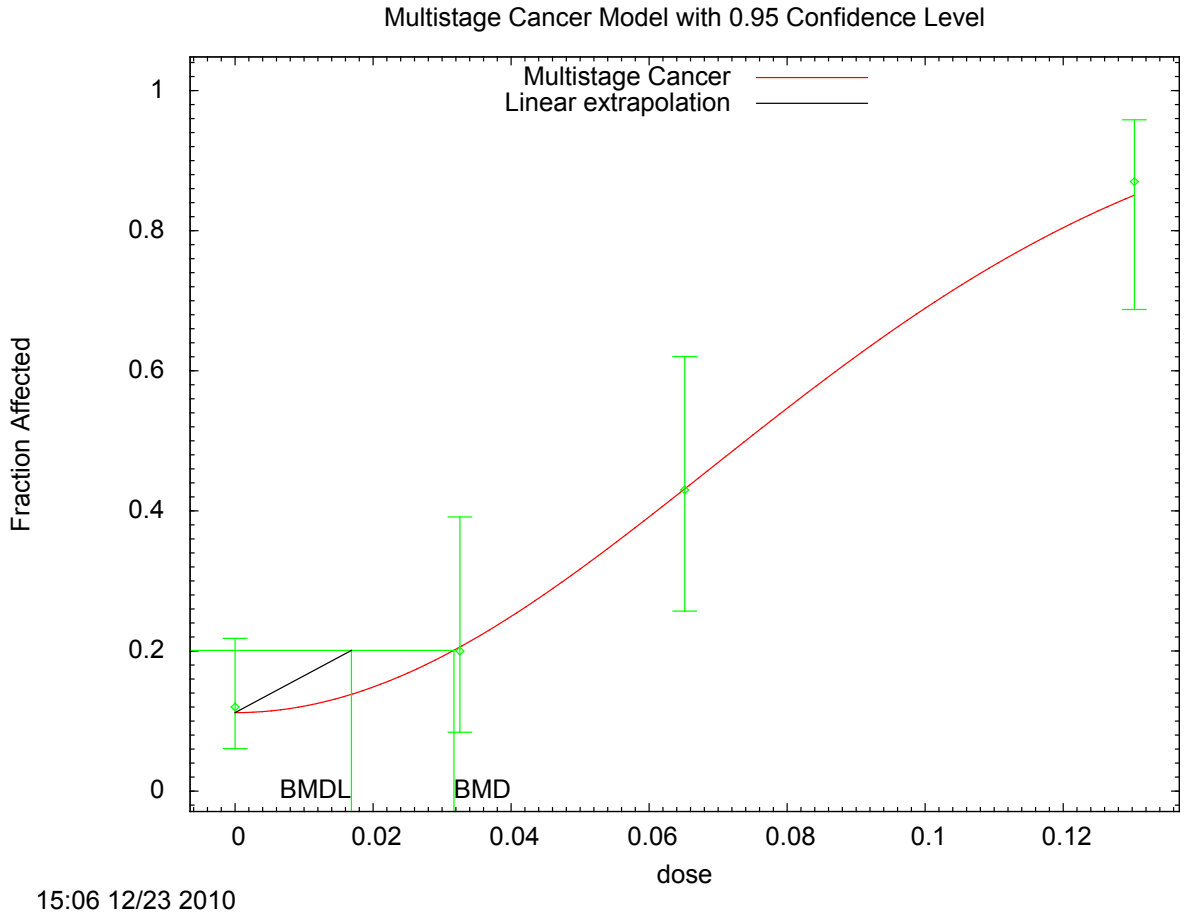
Tel: (703) 931-9301 Fax: (703) 931-9222

**128-Week Male Mouse Tumor Incidence Data from Walker 1972 – Second Set of Runs (Excluded top two dose levels; Degree of Polyniomial = 2 or 3 produced exactly the same results):**




15:06 12/23 2010

```
 ================================================================
        Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/msc_Dieldrin Walker 73 male T2_Opt.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_Dieldrin Walker 73 male
T2_Opt.plt
                                                Thu Dec 23 15:06:02 2010
 ================================================================

 BMDS_Model_Run
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   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1-beta2*dose^2)]

   The parameter betas are restricted to be positive


   Dependent variable = Percent_Tumors
```

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Tel: (703) 931-9301 Fax: (703) 931-9222

Independent variable = Dose

Total number of observations = 4
Total number of records with missing values = 0
Total number of parameters in model = 3
Total number of specified parameters = 0
Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.100352
Beta(1) = 0
Beta(2) = 113.516

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(1)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(2) |
|---|---|---|
| Background | 1 | -0.4 |
| Beta(2) | -0.4 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.112007 | * | * | * |
| Beta(1) | 0 | * | * | * |
| Beta(2) | 104.741 | * | * | * |

* - Indicates that this value is not calculated.

Warning: Likelihood for the fitted model larger than the Likelihood for the full model.
Error in computing chi-square; returning 2

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -75.7233 | 4 | | | |
| Fitted model | -74.9765 | 2 | -1.49357 | 2 | 2 |
| Reduced model | -105.761 | 1 | 60.0763 | 3 | <.0001 |

AIC: 153.953

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TETRA TECH

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1120 | 8.737 | 9.360 | 78 | 0.224 |
| 0.0326 | 0.2054 | 6.163 | 6.000 | 30 | -0.074 |
| 0.0652 | 0.4308 | 12.923 | 12.900 | 30 | -0.009 |
| 0.1303 | 0.8501 | 25.502 | 26.100 | 30 | 0.306 |

Chi^2 = 0.15 d.f. = 2 P-value = 0.9282

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0317161

BMDL = 0.0168577

BMDU = 0.0379934

Taken together, (0.0168577, 0.0379934) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 5.932

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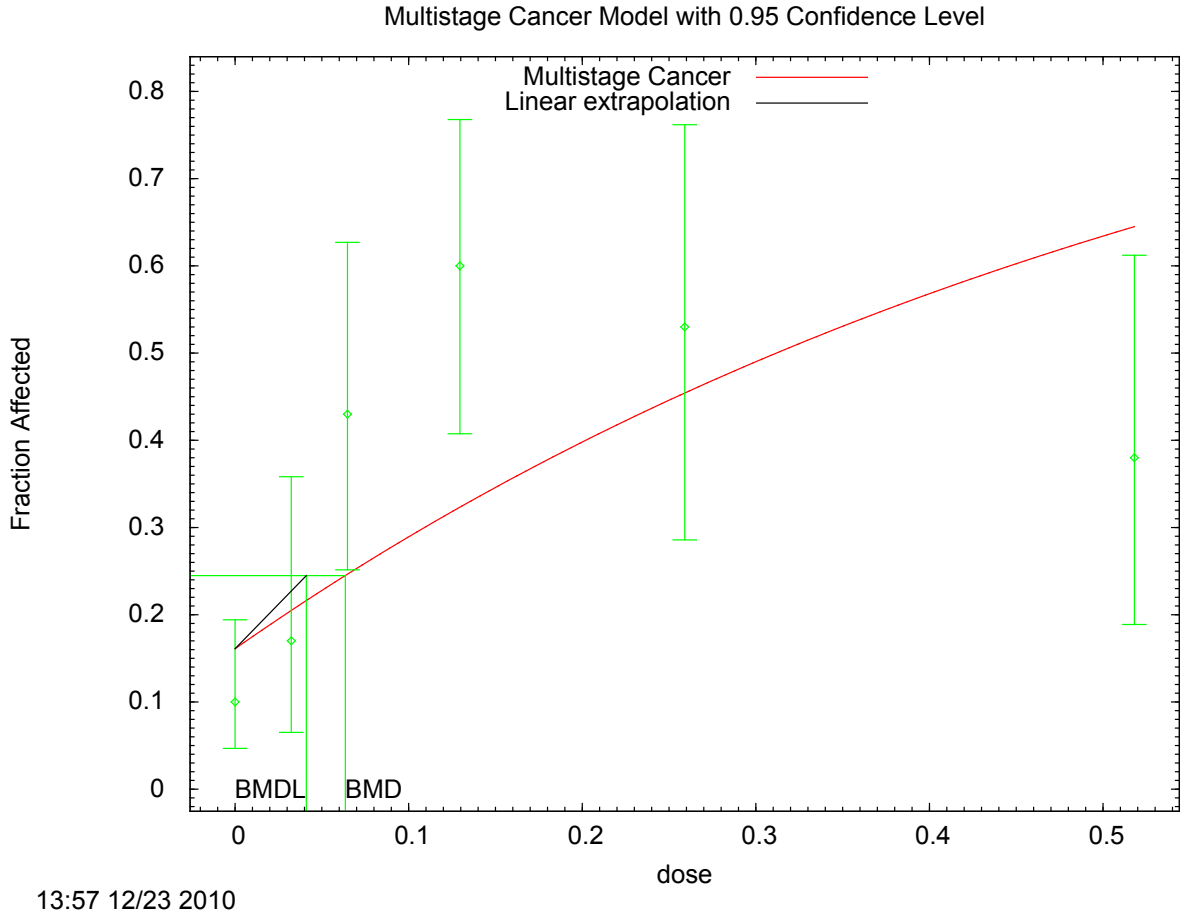
**128-Week Female Mouse Tumor Incidence Data from Walker 1972 – First set of Runs (Degree of Polyniomial = 1, 2, 3, 4 produced exactly the same results):**




```
 ======================================================================
        Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                              Thu Dec 23 13:57:47 2010
 ======================================================================

 BMDS_Model_Run
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   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1)]

   The parameter betas are restricted to be positive


   Dependent variable = %_Tumors
   Independent variable = Dose

 Total number of observations = 6
```

2200 Wilson Boulevard, Suite 400, Arlington, VA 22201
Tel: (703) 931-9301 Fax: (703) 931-9222

Total number of records with missing values = 0
Total number of parameters in model = 2
Total number of specified parameters = 0
Degree of polynomial = 1

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.336733
Beta(1) = 0.537666

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.65 |
| Beta(1) | -0.65 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.160948 | * | * | * |
| Beta(1) | 1.65831 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -104.054 | 6 | | | |
| Fitted model | -114.535 | 2 | 20.9616 | 4 | 0.0003223 |
| Reduced model | -123.521 | 1 | 38.9338 | 5 | <.0001 |

AIC: 233.07

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1609 | 12.554 | 7.800 | 78 | -1.465 |
| 0.0324 | 0.2048 | 6.144 | 5.100 | 30 | -0.472 |
| 0.0648 | 0.2464 | 6.899 | 12.040 | 28 | 2.255 |
| 0.1295 | 0.3231 | 9.694 | 18.000 | 30 | 3.243 |
| 0.2590 | 0.4539 | 7.717 | 9.010 | 17 | 0.630 |
| 0.5181 | 0.6446 | 13.537 | 7.980 | 21 | -2.534 |

```
 Chi^2 = 24.78     d.f. = 4        P-value = 0.0001


   Benchmark Dose Computation

Specified effect =            0.1

Risk Type        =      Extra risk

Confidence level =           0.95

             BMD =       0.063535

            BMDL =       0.041045

            BMDU =       0.123955

Taken together, (0.041045, 0.123955) is a 90     % two-sided confidence
interval for the BMD

Multistage Cancer Slope Factor =       2.43635
```

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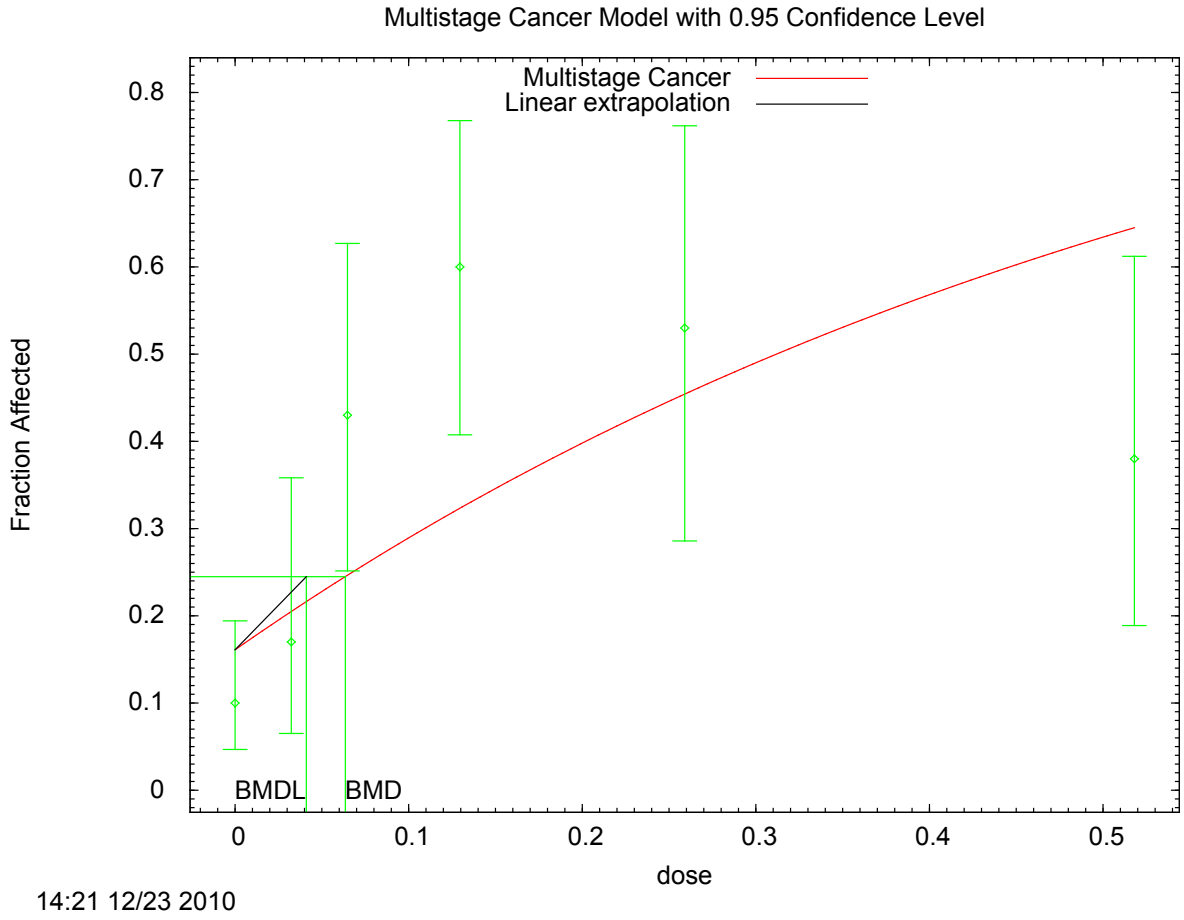
**128-Week Female Mouse Tumor Incidence Data from Walker 1972 – Second set of Runs (Highest dose level excluded; Degree of Polyniomial = 2 or 3 produced exactly the same results):**




```
 ================================================================
        Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/msc_Dieldrin Walker 73 fem T2_Opt.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_Dieldrin Walker 73 fem
T2_Opt.plt
                                              Thu Dec 23 14:15:10 2010
 ================================================================

 BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                -beta1*dose^1-beta2*dose^2-beta3*dose^3)]

   The parameter betas are restricted to be positive


   Dependent variable = Percent_Tumors
```

2200 Wilson Boulevard, Suite 400, Arlington, VA 22201
Tel: (703) 931-9301 Fax: (703) 931-9222

Independent variable = Dose

Total number of observations = 5
Total number of records with missing values = 0
Total number of parameters in model = 4
Total number of specified parameters = 0
Degree of polynomial = 3

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.21884
Beta(1) = 2.65653
Beta(2) = 0
Beta(3) = 0

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(2) -Beta(3)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.57 |
| Beta(1) | -0.57 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.0950059 | * | * | * |
| Beta(1) | 4.54588 | * | * | * |
| Beta(2) | 0 | * | * | * |
| Beta(3) | 0 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -90.1091 | 5 | | | |
| Fitted model | -90.8366 | 2 | 1.45505 | 3 | 0.6927 |
| Reduced model | -109.174 | 1 | 38.1302 | 4 | <.0001 |

AIC: 185.673

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.0950 | 7.410 | 7.800 | 78 | 0.150 |
| 0.0324 | 0.2189 | 6.566 | 5.100 | 30 | -0.647 |
| 0.0648 | 0.3258 | 9.122 | 12.040 | 28 | 1.177 |
| 0.1295 | 0.4977 | 14.932 | 18.000 | 30 | 1.120 |
| 0.2590 | 0.7212 | 12.261 | 9.010 | 17 | -1.758 |

Chi^2 = 6.17 d.f. = 3 P-value = 0.1035

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0231772

BMDL = 0.0169973

BMDU = 0.034489

Taken together, (0.0169973, 0.034489) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 5.8833

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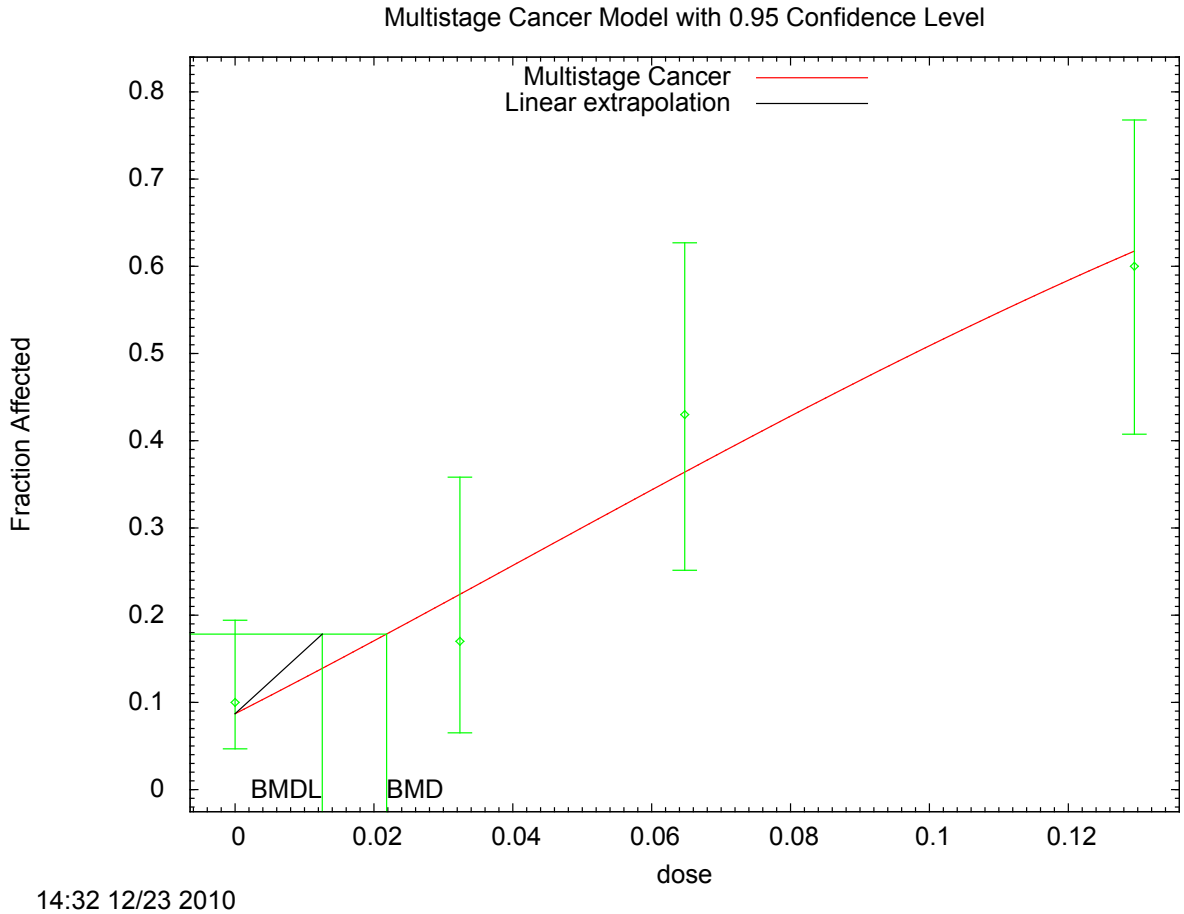
**128-Week Female Mouse Tumor Incidence Data from Walker 1972 – Third set of Runs (Highest two dose levels excluded; Degree of Polyniomial = 2 or 3 produced exactly the same results):**




14:32 12/23 2010

```
 ================================================================
        Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/msc_Dieldrin Walker 73 fem T2_Opt.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_Dieldrin Walker 73 fem
T2_Opt.plt
                                              Thu Dec 23 14:10:14 2010
 ================================================================

 BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                -beta1*dose^1-beta2*dose^2-beta3*dose^3)]

   The parameter betas are restricted to be positive
```

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Dependent variable = Percent_Tumors
Independent variable = Dose

Total number of observations = 4
Total number of records with missing values = 0
Total number of parameters in model = 4
Total number of specified parameters = 0
Degree of polynomial = 3

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.0679795
Beta(1) = 6.40557
Beta(2) = 1.66277
Beta(3) = 0

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(3)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(1) | Beta(2) |
|---|---|---|---|
| Background | 1 | -0.47 | 0.32 |
| Beta(1) | -0.47 | 1 | -0.94 |
| Beta(2) | 0.32 | -0.94 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.0869626 | * | * | * |
| Beta(1) | 4.44565 | * | * | * |
| Beta(2) | 17.4786 | * | * | * |
| Beta(3) | 0 | * | * | * |

* - Indicates that this value is not calculated.

Warning: Likelihood for the fitted model larger than the Likelihood for the full model.
Error in computing chi-square; returning 2

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Full model | -78.3562 | 4 | | | |
| Fitted model | -76.6989 | 3 | -3.31463 | 1 | 2 |
| Reduced model | -94.8966 | 1 | 33.0807 | 3 | <.0001 |

AIC: 159.398

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.0870 | 6.783 | 7.800 | 78 | 0.409 |
| 0.0324 | 0.2237 | 6.712 | 5.100 | 30 | -0.706 |
| 0.0648 | 0.3638 | 10.185 | 12.040 | 28 | 0.729 |
| 0.1295 | 0.6171 | 18.513 | 18.000 | 30 | -0.193 |

Chi^2 = 1.23 d.f. = 1 P-value = 0.2667

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0218267

BMDL = 0.0125613

BMDU = 0.0477172

Taken together, (0.0125613, 0.0477172) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 7.96094

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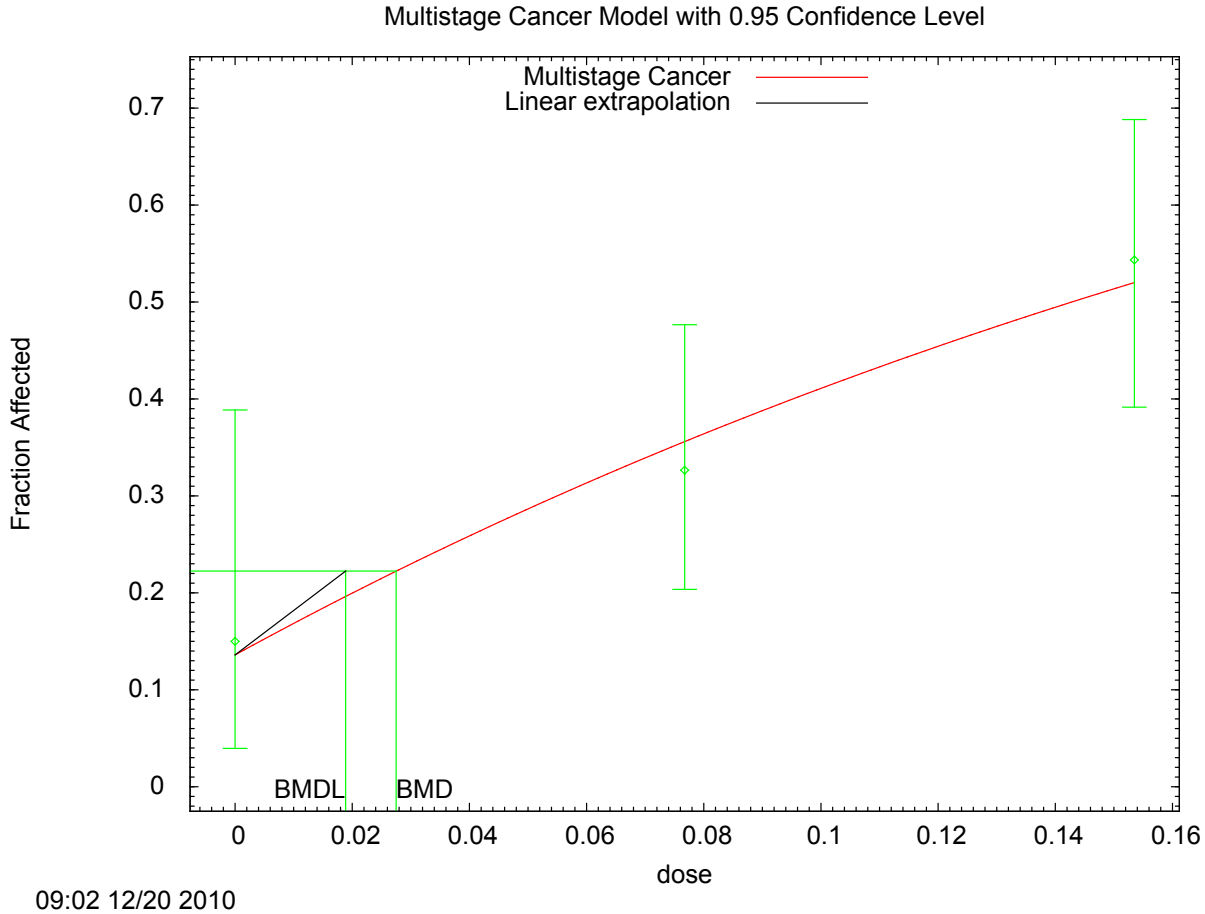
**80-Week Male Mouse Tumor Incidence Data from NCI 1978 – First Run (Degree of Polyniomial = 1):**




09:02 12/20 2010

```
=================================================================
       Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
       Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
       Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                          Mon Dec 20 09:02:20 2010
=================================================================

BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

  The form of the probability function is:

  P[response] = background + (1-background)*[1-EXP(
               -beta1*dose^1)]

  The parameter betas are restricted to be positive


  Dependent variable = Tumor_Incidence
  Independent variable = Dose

Total number of observations = 3
```

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Total number of records with missing values = 0
Total number of parameters in model = 2
Total number of specified parameters = 0
Degree of polynomial = 1

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.127617
Beta(1) = 4.04956

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.81 |
| Beta(1) | -0.81 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.136087 | * | * | * |
| Beta(1) | 3.83339 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -71.1178 | 3 | | | |
| Fitted model | -71.2789 | 2 | 0.322071 | 1 | 0.5704 |
| Reduced model | -76.5126 | 1 | 10.7895 | 2 | 0.00454 |

AIC: 146.558

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1361 | 2.722 | 3.000 | 20 | 0.181 |
| 0.0767 | 0.3563 | 17.457 | 16.000 | 49 | -0.435 |
| 0.1535 | 0.5204 | 23.936 | 25.000 | 46 | 0.314 |

Chi^2 = 0.32 d.f. = 1 P-value = 0.5714

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.027485

BMDL = 0.0188779

BMDU = 0.0526374

Taken together, (0.0188779, 0.0526374) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 5.29719

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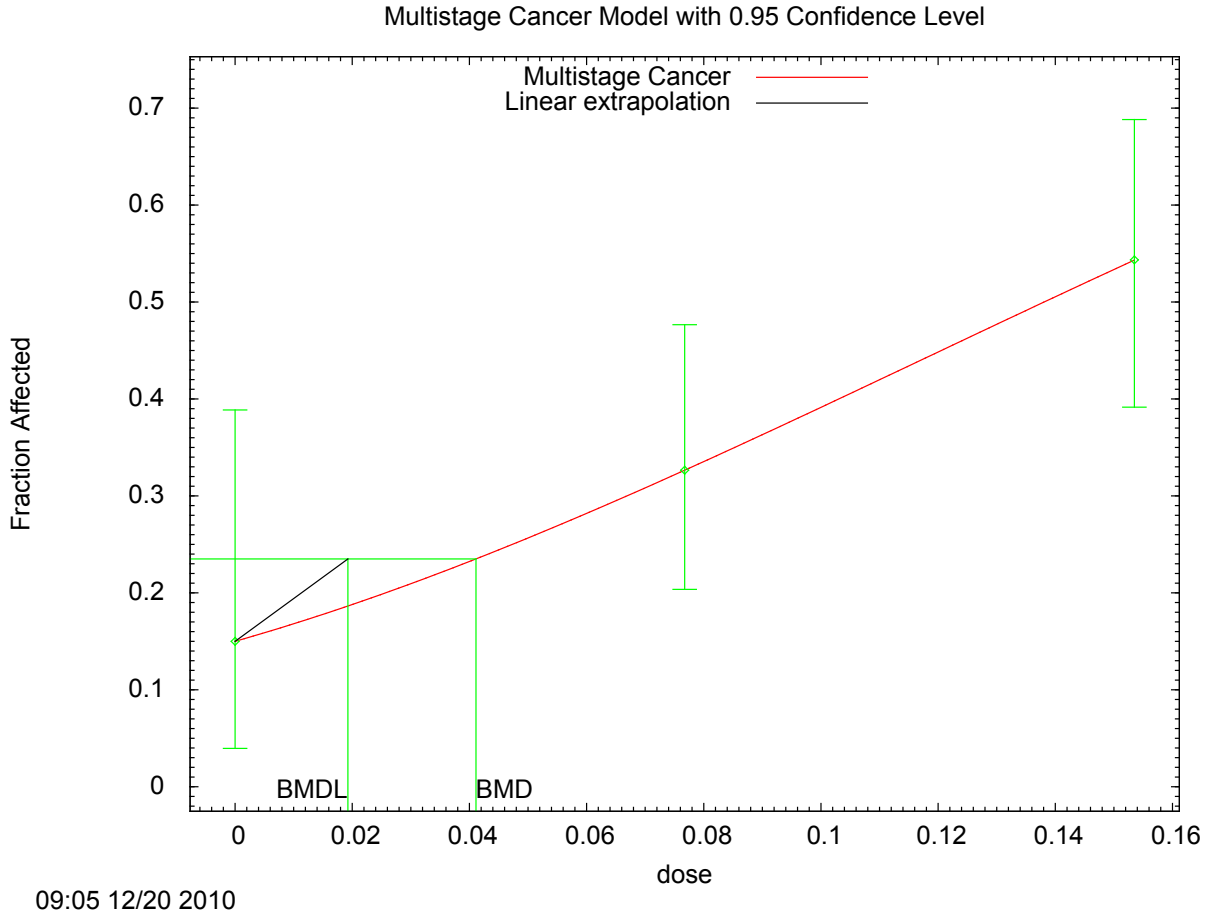
**80-Week Male Mouse Tumor Incidence Data from NCI 1978 – Second Run (Degree of Polyniomial = 2):**




```
=================================================================
       Multistage Cancer Model. (Version: 1.9;  Date: 05/26/2010)
       Input Data File: C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.(d)
       Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/msc_UntitledData_Setting.plt
                                          Mon Dec 20 09:05:48 2010
=================================================================

BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

  The form of the probability function is:

  P[response] = background + (1-background)*[1-EXP(
               -beta1*dose^1-beta2*dose^2)]

  The parameter betas are restricted to be positive


  Dependent variable = Tumor_Incidence
  Independent variable = Dose
```

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Total number of observations = 3
Total number of records with missing values = 0
Total number of parameters in model = 3
Total number of specified parameters = 0
Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 0.15
Beta(1) = 2.01783
Beta(2) = 13.2357

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) | Beta(2) |
|---|---|---|---|
| Background | 1 | -0.71 | 0.51 |
| Beta(1) | -0.71 | 1 | -0.95 |
| Beta(2) | 0.51 | -0.95 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.15 | * | * | * |
| Beta(1) | 2.01783 | * | * | * |
| Beta(2) | 13.2357 | * | * | * |

* - Indicates that this value is not calculated.

Error in computing chi-square; returning 2

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -71.1178 | 3 | | | |
| Fitted model | -71.1178 | 3 | 0 | 0 | NA |
| Reduced model | -76.5126 | 1 | 10.7895 | 2 | 0.00454 |

AIC: 148.236

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1500 | 3.000 | 3.000 | 20 | 0.000 |

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| | | | | | |
|---|---|---|---|---|---|
| 0.0767 | 0.3265 | 16.000 | 16.000 | 49 | 0.000 |
| 0.1535 | 0.5435 | 25.000 | 25.000 | 46 | 0.000 |

Chi^2 = 0.00 d.f. = 0 P-value = NA

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0411225

BMDL = 0.0192542

BMDU = 0.0887233

Taken together, (0.0192542, 0.0887233) is a 90 % two-sided confidence interval for the BMD

Multistage Cancer Slope Factor = 5.19367

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# Appendix B – Epidemiologic Studies

The following tables summarize the epidemiologic studies assessing health effects from exposure to aldrin and dieldrin. PubMed was searched for studies published after the 1987 EPA review and not included in the 2002 ATSDR review. Thirty seven studies were identified and assessed. Table 1 contains studies assessing cancer outcomes while Table 2 reviews non-cancer outcomes.

*Table 1- Cancer Studies*

| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
|---|---|---|---|---|---|---|---|
| Belpomme et al. 2009 | Ecological Study | All prostate cancer cases diagnosed between 1995 and 2002 in Guadeloupe and between 1983 and 2002 in Martinique; 2104 cases and 4613 cases, respectively. | Data was collected from the Martinique cancer registry by the Martinique Association for Epidemiological Research on Cancer (AMREC) and data published by urologists at the University Hospital of Pointe-a-Pitre in Guadeloupe. Metropolitan France was used as a comparison by employing data from the French National Cancer Registry. For international comparison, incidence rates from Globocan 2002 (IARC) were used. Mapping was used to correlate the localization of prostate cancer with banana plantations on Martinique and Guadeloupe. | Pesticide use and concentration in adipose tissue | Prostate cancer | Through mapping analysis of soil contamination, the authors found that water contamination from pesticides comes from the banana plantations. The researchers retrospectively proved that a population of individuals examined in 1972 in Martinique for the presence of OC pesticides in their adipose tissue had been contaminated by very high amounts of DDT, DDE, alpha, beta and gamma HCH and aldrin and dieldrin. | Most of the banana plantations are located in the Northern part of the islands. However, the highest prostate cancer incidence rates were in the South-Western part of the island. |



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| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
|---|---|---|---|---|---|---|---|
| Buczynska & Szadkowska -Stanczyk 2005 | Risk Assess-ment | 900 Inhabitants within 1.5km of 2 Polish dumpsites | 286 Polish dumpsites were prioritized by their potential hazard, the amount of pesticides dumped there, proximity to residential areas and drinking water intake. The two sites selected had piezometric systems to allow for ground water sampling. 31 different pesticides were detected in ground water. Mean pesticide concentrations in ground water was used to calculate daily intake. Population data was collected from local administration units. | Daily pesticide intake from drinking water | Estimated cancer and non-cancer risks | Dieldrin was detected in water samples but not above the 0.1 ug/l drinking water standard and was not included in the risk estimates. Aldrin was not detected. | |
| Cantor et al. 2003 | Case control | 74 Non-Hodgkin's Lymphoma cases and 147 matched controls | Serum samples were collected from 25,802 individuals participating in Campaign Against Cancer and Stroke in Washington County, MD in 1974. The samples were cryopreserved so they could be studied in the future. Incident cases of NHL were identified using the Washington County Cancer Registry. Two controls were matched for every one case of NHL. | Pre-diagnostic levels of chlordane, lindane, beta-hexachlorocyclo-hexane, transnonachlor, heptachlor, heptachlor epoxide, oxychlorodane, dieldrin and hexachlorobenzene in serum samples | Non-Hodgkin's Lymph-oma | Researchers found no evidence of an association between NHL and serum levels of any of the chemicals that were evaluated. | |
| Clary & Ritz 2003 | Ecological | 950 pancreatic cancer death cases and | Cases were identified from computerized California Death Tape Files living within three selected counties and deaths | Exposure to 18 organochlorine pesticides was determined from usage | Death from pancreatic cancer | A total of 20.15 tons of dieldrin was applied in 48 of 102 zip codes. The highest quartile ranged from 0.32 to 4.43 tons. | No assessment of aldrin. Analysis controlled for age, race, education, |



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| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
|---|---|---|---|---|---|---|---|
| | | 9,435 non-cancer death controls | occurring between 1989 and 1996. 10 non-cancer death controls, occurring during the same time period and in the same counties, for each case were randomly selected. Logistic regression was used to model total pesticide usage in each zip code for each chemical. To calculate MORs, the highest quartile of pesticide exposure was compared to the bottom three quartiles. | data between 1972-1989 for each zip code in the three counties. | | The highest quartile of exposure to dieldrin compared to all lesser exposures resulted in a non-significant MOR of 1.52 among subjects having resided in the county for at least 20 years before death. A dose response patter was not observed for dieldrin exposure. | year of death, years living in county, and other pesticides. Study is unable to control for smoking. The latency that is able to be assessed here is only 1 to 12 years. |
| Cocco et al. 2008 | Case Control | 174 cases, 203 controls | Cases and controls were participants of the Epilymph study in France, Germany, and Spain. Information was collected by questionnaire and blood samples were taken. Covariates included in the final model included age, gender, education, and center. | Measurements of 17 organochlorine pesticides in plasma samples | Non-Hodgkin's Lymph-oma and subtypes | No increased risk of NHL or its subtypes was found to be associated with any of the compounds examined (including aldrin and dieldrin). There were no participants from France or Germany with aldrin or dieldrin plasma concentration levels above the detection limit; among Spanish participants there were 12 controls and 14 cases with detectable aldrin and dieldrin plasma concentrations. | Differences between countries were noted. Retrospective design limits the inferences that can be made about any associations. |
| Engel et al. 2005 | Prospect-ive Cohort | 30,454 women enrolled in the Ag Health Study (309 cases of breast | Participants enrolled between 1993 and 1997 in the Ag Health Study. Cases were identified from population-based cancer registries in Iowa and North Caroline. NDI was used to determine vital status of | Use and exposure to 50 specific pesticides was determined by questionnaires administered at enrollment by the women and their | Breast cancer diagnosis | There was no significantly increased risk among women having reported using aldrin and dieldrin. Among women who did not directly use aldrin and dieldrin but their husbands did, the RR for aldrin was 1.9 (1.3- | The authors classify the relationship between breast cancer and the husband's use of dieldrin as weak. Analysis controlled |



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| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
|---|---|---|---|---|---|---|---|
| | | cancer) | participants. Participants who had moved out of state were followed up using personal contacts, motor vehicle records, pesticide registration records, and IRS records. End of follow-up was 12/31/2000. | husbands. | | 2.7) and 2.0 (1.1-3.3) for dieldrin. RRs for 7 other pesticides were also significant among women whose husbands used pesticides. Results were not consistent when stratified by state. Risks were higher in postmenopausal women compared to premenopausal women: the RR for women whose husbands worked with aldrin was 1.7 (1.1-2.6), the RR for dieldrin still wasn't significant. Comparing low and high cumulative exposure groups of women whose husbands used dieldrin to husbands that did not use it, the respective RRs for breast cancer were 1.4 (0.6-3.5) and 3.2 (1.3-8.0). | for age, race, and state of residence. |
| Flower et al. 2004 | Prospect-ive Cohort | 17,357 children of Iowa pesticide applicators enrolled in the Ag Health Study (50 incident childhood cancer cases) | Information on exposure and other variables was provided by parents responding to questionnaires between 1993 and 1997. Cancer cases among children ages 0-19 years were identified from the Iowa Cancer registry for the period 1975-1998 (retro and prospective identification of cases). Cases from North Carolina were excluded based on small numbers. 50 specific pesticides | Use and exposure to 50 specific pesticides was determined by questionnaires administered at enrollment by the parents. | Childhood cancers | Parental use of organochlorine pesticides (including aldrin, DDT, dieldrin, heptachlor, chlordane, lindane, and toxaphene) were not significantly associated with childhood cancers while aldrin was associated with childhood cancers. There were 6 cases, OR= 2.66 (1.08-6.59). | Data for NC is not available, which may be a weakness based on the inconsistencies seen by Engel et al. Numbers were too small to look at specific types of tumors. Overall, the SIR for all childhood cancers was 1.36 (1.03- |



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| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
|---|---|---|---|---|---|---|---|
| | | | were assessed. | | | | 1.79) but only lymphomas (9 cases) and more specifically, Hodgkin's lymphoma (5 cases) were significantly related to parental pesticide exposures. No dose-response relationship was detected. |
| Gammon et al. 2002 | Case control | 646 cases and 429 controls (women) | Cases included females residing in Nassau and Suffolk Counties on Long Island, NY who were 20 or older, spoke English and were recently diagnosed with in situ or invasive breast cancer between August 1, 1996 and July 31, 1997. They were identified through pathology labs in all of the hospitals in the Long Island region. Controls were residents of the same counties on Long Island and were frequency matched according to 5-year age group. Controls were identified through random digit dialing and Health Care Financing Administration rosters | Organochlorines (9 including dieldrin) in blood | Breast cancer | There was no significant increased risk in breast cancer in association with the highest quintile of lipid-adjusted serum levels of dieldrin and a dose-response relationship was not apparent either. | "These findings, based on the largest number of samples analyzed to date among primarily white women, do not support the hypothesis that organochlorines increase breast cancer risk among Long Island women." |



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| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
|---|---|---|---|---|---|---|---|
| | | | depending on age. Questionnaires were administered in person by trained interviewers and samples were obtained through nonfasting blood samples. | | | | |
| Høyer et al. 2001 | Cohort nested case control | 161 breast cancer cases and 536 controls | The breast cancer cases and matched controls participated in the Copenhagen City Heart Study (CCHS) between 1976 and 1978. Cases were identified through the Danish Cancer Registry. A random sample of 536 women matched on age and vital statistics served as controls. Information was collected on lifestyle factors, reproductive history and socioeconomic conditions using questionnaires. Serum was frozen and retrieved later for analysis. | Exposure to dieldrin | Breast cancer risk and survival according to estrogen receptor status | There was an increased breast cancer risk linked to exposure to dieldrin for women who developed estrogen receptor negative breast tumors. Women with the highest dieldrin levels in their serum generally had tumors that were larger and more often spread at diagnosis when compared to estrogen receptor positive (ERP) tumors. | "The results do not suggest that exposure to potential estrogenic organochlorines leads to development of an ERP breast cancer." This study had limited statistical power, in particular in the estrogen receptor negative tumors. |
| Høyer et al. 2002 | Cohort nested case control | 162 breast cancer cases and 316 matched controls | The breast cancer cases and matched controls participated in the Copenhagen City Heart Study (CCHS) between 1976 and 1978. Cases diagnosed between the start of the study and 1993 were found through the Danish Cancer Registry. Blood samples were taken without fasting and serum was frozen and stored. | Exposure to organochlorine pesticides | Breast Cancer and p53 mutation | A non-significant but slightly elevated risk was found in the highest level of exposure for dieldrin among women who developed a tumor with mutant p53. However, a significant dose-response relationship was present for dieldrin in 'wild-type' p53 tumors. | |



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TETRA TECH

| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
|---|---|---|---|---|---|---|---|
| Ibarluzea et al. 2004 | Case Control | 198 cases, 260 controls | Cases and controls were selected from 3 hospitals in Southern Spain from April 1996-June 1998. Cases were women ages 35-70 undergoing surgery for newly diagnosed breast cancer. Controls were women without breast cancer, matched for age and hospital who were undergoing surgery not related to cancer. Interviews were conducted to collect data on sociodemographic factors, reproductive history, fertility, menopausal status, exogenous hormones, diet, tobacco and alcohol consumption, and family history of breast cancer. | 16 Organochlorine pesticides in adipose tissue | Breast cancer | The geometric mean of aldrin in adipose was higher (but not significantly) among cases compared to controls. Overall, the OR for aldrin was 1.55 (1.0-2.4) and was 1.84 (1.06-3.18) among postmenopausal women. The only other significant risk of breast cancer was for lindane among postmenopausal women. | All women were Caucasian. Dieldrin was detected in <40% of the samples. |
| Mathur et al. 2002 | Cross Sectional | 135 cases and 50 controls | Breast cancer cases and controls were recruited from the Birla Cancer Institute, Jaipur, India. Blood samples were collected and questionnaires administered. | Questionnaire assessed age, diet, obstetrical and menstrual history, information regarding pesticide use, and geographic information. | Pesticide levels in blood breast cancer patients | Breast cancer patients had significantly higher average aldrin in blood samples than the controls (1.997 vs. 0.115 mg/L). This relationship continued to exist even after stratifying by age group for those aged 31-40 and 41-50 years old; and for all strata when stratified by urban vs. rural populations and for vegetation vs. non-vegetarian diets. Increased levels of DDT, DDE, DDD, HCH and its isomers, and heptachlor were also found. | There were no participants with any occupational or accidental exposure to pesticides. |



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TETRA TECH

| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
|---|---|---|---|---|---|---|---|
| McDuffie et al. 2001 | Case control | 517 Non-Hodgkins's Lymophoma cases and 1506 controls in Canada | Pesticide exposure was obtained through initial postal questionnaires followed by a phone interview for individuals who reported pesticide exposure of 10 h/year or more and a 15% random sample of the remaining individuals. Cases were obtained through provincial cancer registries excluding Quebec where hospital ascertainment was employed. Controls were selected from provincial health insurance records, computerized telephone listings or voters' lists. | Exposure to herbicides | Non-Hodgkin's Lymph-oma | The odds ratios associating NHL with aldrin were statisicallly significant. Aldrin was a significant predictor in a multivariate model which included exposure to other major chemical classes or individual pesticides, personal antecedent cancer, a history of cancer among first-degree relatives. | |
| Purdue et al. 2007 | Cohort | 51,011 participants from the Ag Health Study | Questionnaires were completed at the time of enrollment (1993-1997) including information on occupation, and pesticide use and exposure. Follow-up through December 31, 2002 was conducted using Iowa and North Carolina State Cancer Registries, state death registries, and NDI. Cohort members out of state were identified using IRS records, Motor Vehicle registration databases, and pesticide license registries. Analyses adjusted for age, sex, state, education, | Ever/never use, cumulative exposure, lifetime exposure days, and intensity weighted lifetime exposure to 50 specific pesticides | Cancer | 22,409 (48%) of participants ever used insecticides. Leukemia risk was greater than 1.5 (but not significant) with dieldrin use. When stratified by cumulative exposure categories, dieldrin use was significantly associated with an elevated risk of lung cancer among those with >9 days exposure [lifetime days of exposure: RR=2.8 (1.1-7.2) with p-trend=0.02; and intensity-weighted lifetime days of exposure: RR=3.5 (1.6-7.7) with p-trend=0.002]. Conversely, aldrin was associated with a | Insecticide applicators were primarily male and white. |



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| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
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| | | | smoking, alcohol use, cancer family history, and lifetime days of total pesticide application. | | | decreasing risk of colon cancer among those exposed to >9 intensity-weighted lifetime days of exposure [RR=0.4 (0.2-1.0) with p-trend=0.04]. | |
| Quintana et al. 2004 | Nested case control | 175 Non-Hodgkin's Lymphoma cases and 481 controls taken from original cohort | A data set originally collected between 1969 and 1983 by the EPA for the U.S. EPA National Human Adipose Tissue Survey was utilized. Samples of adipose tissue were collected randomly from cadavers and surgery patients. Levels of organochlorine pesticide residues were determined through the collected samples. | Organochlorine pesticide residue in adipose tissue | Non-Hodgkin's Lymph-oma | The highest quartile level of dieldrin in adipose tissue was associated with increased risk of NHL (OR=2.70; 1.58-4.61). The p-value for trend was significant for dieldrin as well. | There are a few limitations to this study including the collection of exposure information after diagnosis as well as lack of information on variables that could affect organochlorine levels. These variables include diet, occupation and BMI. |
| Ritchie et al. 2003 | Cross Sectional (pilot study) | 58 cases, 99 controls | Incident prostate cancer cases were identified from 2 Iowa clinics. Cases were pathologically confirmed, newly diagnosed (May 2000 to May 2001), and all were adenocarcinomas. Questionnaires were administered to collect data on age, race, family history, tobacco and alcohol use, sexual partners, STDs, hormone usage. Blood samples were taken to | Blood levels of 48 organochlorine compounds | Prostate cancer | Aldrin was not detected in any of the study participants. Dieldrin was detected in 29.3% of cases and 38.4% of controls. For those with >0.024 ug/g dieldrin in serum, the adjusted OR for prostate cancer was 0.28 (0.09-0.88) and not significant at lower concentrations. Dieldrin did not remain in the multivariate model of prostate cancer risks (p=0.13). | Cases were more likely to have a history of prostatitis, be overweight, and be married. Other organochlorines were associated with increased risk of prostate cancer. |



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| | | | test for organochlorines. | | | | |
| Schroeder et al. 2001 | Case Control | 182 cases and 1245 controls form the Factors Affecting Rural Men study | Authors investigated the role of agricultural risk factors for t(14,18) -positive non-Hodgkin's lymphoma (NHL), compared to t(14,18)-negative. Participants were from Iowa (identified thru the State Health Registry of Iowa) and Minnesota (identified thu active hospital surveillance). Tissues samples from male NHL cases collected by the Factors Affecting Rural Men study were assayed for t(14,18). Controls were recruited using random digit dialing. Controls were white men without hemolymphatic cancer, frequency mated on age, state, and vital status. Exposures were determined by interviews with participants or next-of-kin. Data collected included socio-demographic factors, tobacco | Self-reported exposure to 111 compounds | T(14,18)-positive non-Hodgkin's Lymph-oma | Aldrin was not associated with t(14,18) positive or negative NHL when comparing to control or positive to negative. Dieldrin was associated with t(14,18)-positive NHL when compared to controls (OR = 3.7, CI 1.9-7.0). Several other chemicals were also significantly associated with t(14,18)-positive NHL including Lindane, Toxaphene, Atrazine, and Phthalimides. | Comparisons of combinations of joint exposures between fumigants and other factors (farming, dairy cattle, chickens, pigs, soybeans, corn, fungicides, organophosphates) resulted in significantly elevated risks of t(14,18)-positive NHL among those exposed to both exposures compared to those without either exposure. |



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| | | | and alcohol use, hobbies, pets, medical history, occupational history, and non-occupational exposures. | | | | |
| Shukla et al. 2001 | Case Control | 30 cases, 30 controls | Participants were patients at the surgical unit of a university hospital from March 1997 to Feb. 1999. Controls were cases of cholelithiasis. Bile and blood were collected at the time of surgery. | Organochlorines in bile | Carcinoma of the gall-bladder | Biliary and blood aldrin was higher in cases than controls but the difference was not significant. | Most participants were postmenopausal housewives (24 cases, 22 controls). All of the men worked in offices. |
| Sielken et al. 1999 | Cohort | 570 male employees who worked for at least 1 year in the production of aldrin and dieldrin between Jan. 1, 1954 and Jan. 1, 1970. | Workers were followed-up through Jan 1, 1993. Blood samples were available for 343 participants taken during the exposure period. Lifetime average daily dose was calculated for each participant as the worker's average daily dose in the period between birth and end of follow-up date. Analyses assumed no exposure to aldrin and dieldrin outside of work and that workers weighed 70 kg. Air measurements and biological samples were available for analysis. Dose response was modeled using multistage, multistage Weibull, and proportional hazards models. | Dieldrin and aldrin intake, air and biomonitoring data | Cancer Death | 118 deaths including 37 cancer deaths as of Jan 1, 1993. 15% of workers had lifetime daily doses > 1ug/kg/day. Multistage and multistage Weibull dose response models showed that cancer risk was less than zero at 1ug/kg/day. Proportional hazards models resulted in estimated risks less than zero for lifetime average daily doses up to 2ug/kg/day. | "The cancer mortality data on these male workers suggest that low-dose exposures to aldrin and dieldrin do not significantly increase human cancer risk and may even decrease the human hazard rate for all types of cancer combined at low doses (e.g., 1ug/kg/day)." |



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| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
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| Swaen et al. 2002 | Cohort | 570 male employees who worked for at least 1 year in the production of aldrin and dieldrin between Jan. 1, 1954 and Jan. 1, 1970. | Workers were followed through Jan 1, 2001. Blood samples were available for 343 participants taken during the exposure period. Total intake of dieldrin was estimated for all participants. Air measurements and biological samples were available for analysis. | Dieldrin and aldrin intake, air and biomonitoring data | Cancer Death | Estimated dieldrin intake ranged from 11 to 7755 mg (average=737mg). There were 171 deaths and the overall SMR was 75.6 (64.6-87.7). The SMR for all neoplasms was not elevated (SMR=75.5). The only cause of death that was elevated was rectal cancer for the whole cohort and among those in the low intake group (first tertile, mean=270 mg dieldrin intake), SMR=3 (1.1-6.5) based on 6 cases and SMR=6 (1.2-17.2) based on 3 cases, respectively. When stratified by job title, only operators had any significant results, for rectal cancer SMR=5 (1.3-12.7) based on 4 cases and skin cancer SMR=7.5 (1.5-21.5) based on 3 cases. | Small numbers. "…no evidence of an increased risk for cancer of any particular type as a result of exposure to aldrin and dieldrin." |
| van Amelsvoort et al. 2009 | Cohort | 570 male employees who worked for at least 1 year in the production of aldrin and dieldrin between Jan. 1, 1954 and Jan. 1, 1970. | Workers were followed-up through April 30, 2006. Blood samples were available for 343 participants taken during the exposure period. | Dieldrin and aldrin intake, air and biomonitoring data | Cancer Death | Estimated dieldrin intake ranged from 11 to 7755 mg (average=737mg). There were 226 deaths, 82 from cancer, giving an SMR of 0.69 (0.60-0.79) for all causes of death and 0.76 (0.61-0.95) for cancer deaths. No specific cause of death or neoplasm was significantly elevated with exposure to aldrin and dieldrin at any level of exposure. However several | |



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| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
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| | | | | | | causes were significantly lower than expected: For the total group, cardiovascular disease, other causes, and trachea and lung cancer; cardiovascular disease for the low and moderate intake groups; and among those experiencing high intake all neoplasms, cardiovascular disease, and trachea and lung cancer all had SMRs significantly less than 1. When stratified by job title other causes among assistant operators; all causes among maintenance workers; all causes, cardiovascular disease, respiratory disease, and trachea and lung cancer among operators were all significantly less than 1. Operators had a significantly elevated SMR of 5.76 (1.19-16.8) for skin cancer based on 3 cases. | |



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| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
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| Ward et al. 2000 | Case Control | 150 cases, 150 controls | Among serum donors collected by the Janus Serum Bank in Norway between 1973 and 1991, women who worked outside the home or were resident farmers as of the 1970 or 1980 census. Of those women, breast cancer cases were determined from records of the Norwegian Cancer Registry though Dec. 31, 1993. Cancer-free controls from the same group were matched based on date of sample and date of birth. Additional data on potential confounders was collected from the Janus Serum Bank and Norwegian Cancer Registry. | 71 organochlorine compounds in serum | Breast Cancer | Aldrin and Dieldrin were not associated with breast cancer. | |
| Xu et al. 2010 | Cross-sectional | 4,237 in the HANES survey including 4,109 individuals without cancer, 65 prostate cancer cases, 63 breast cancer cases | Participants provided blood samples and information about medical conditions and demographic variables. | Serum concentrations of thirteen organochlorine (OC) pesticides including dieldrin | Self-reported physician-diagnosed breast and prostate cancer | There was a marginally significant (p=0.04) trend in the Odds Ratios (OR) for prostate cancer when compared by tertiles of serum concentration of dieldrin. The OR for the second tertile was 1.06 (95% CI: 0.30-3.73), the OR for the 3$^{rd}$ tertile was 2.74 (95% CI: 1.01-7.49) as compared to the lowest quartile. No association was found between serum concentrations of any of the OC pesticides and breast cancer. | Due to the nature of the cross-sectional design of this study, causality between OC pesticides and cancer risk cannot be concluded. |



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*Table 2- Epidemiologic Studies of Non-Cancer Endpoints*

| Study | Type | Size/ Population | Methods | Exposure | Outcome | Results | Notes |
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| Akkina et al. 2004 | Cross Sectional | 219 menopausal women in Hispanic Health NHANES | 1982-1984 survey years of the Hispanic Health NHANES were used. Data on age at menopause, reproductive history, demographic variables, other potential confounders were collected as part of the survey. Serum samples were also collected. ANOVA was used to investigate the relationship between age at menopause and serum levels of pesticides. | 18 organochlorine pesticides in serum | Age at menopause | Serum levels of dieldrin were above the detection limit (1ppb) in 19 individuals (8.7%). Dieldrin was not associated with age at menopause. | Serum levels of pesticides may not represent exposure at the time of menopause. Time from menopause to survey ranged from 0 to 37 years. |
| Asawasinsopon et al. 2006 | Cross Sectional | 39 mother-infant pairs Chian Pai province, Thailand | Participants were mother-infant pairs having normal, full term pregnancies. Women diagnosed with hypothyroid were ruled out. Questionnaires collected data on lifestyle, pesticide use/exposure, and delivery history. Maternal blood was collected 2-5 hours before delivery. Umbilical cord blood was collected when it was cut. | Organochlorines in maternal serum and in umbilical cord blood | Levels of thyroid hormones (total thyroxine, free thyroxine, thyroid stimulating hormone) | Level of dieldrin was positively correlated between material and umbilical cord blood. However, thyroid hormone levels did not vary with dieldrin levels. Significant decreases in total thyroxine were noted for 3 other pesticides. | This study is very small with only 39 births being analyzed. There is no indication of actual health effects among these children after birth. |



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| Damgaard et al. 2006 | Case-Control | 62 milk samples from mothers of cryptorchid boys and 68 milk samples from mothers of healthy boys | A joint longitudinal, prospective birth cohort study was performed by the authors in Finland and Denmark from 1997 to 2001. They examined regional prevalence rates and risk factors for cryptorchidism through questionnaires and biological samples including one breast milk sample per child. From the bank of breast milk samples, the researchers included 65 samples from each country (Denmark and Finland) to examine organochlorine pesticide exposures. Cases were defined as boys with cryptorchidism at birth and controls were defined as boys without cryptorchidism at birth or 3 months old. Breast milk was collected between 1 and 3 months postpartum and was analyzed for 27 OC pesticides. | Organochlorine pesticides in human breast milk | Crypt-orchidism | Eight of the OC pesticides were measurable in all samples (p,p'-DDE, β-HCH, HCB, α-endosulfan oxychlordane, p,p'-DDT, dieldrin, cis-HE). Five were measured in most samples. Seventeen of the 21 OC pesticides including dieldrin were measured in higher median concentrations in case breast milk compared to control breast milk. Except for trans-chlordane, there were no significant differences between cases and controls for individual pesticide chemicals. However, combined statistical analysis of the eight pesticides measured in all samples shows that the levels of pesticides in breast milk were significantly higher in cryptorchid boys. | This study cannot provide proof for a causal relationship because it cannot be proven that exposure preceded disease. |
| Everett & Matheson 2010 | Cross Sectional | 2341 NHANES participants used to examine exposure to dieldrin | Study of NHANES 1999-2004 survey years. Associations were tested using logistic regression adjusting for age, race, gender, education, poverty income ratio, BMI, waist circumference, physical activity, and family history of diabetes. | 8 pesticides and their metabolites were measured in non-fasting blood samples | Diagnosed and undiagnosed diabetes and pre-diabetes (glycohemo-globin 5.7-6.54%) based on self-report and glycohema-globin measure-ments | Dieldrin was not associated with total diabetes (diagnosed, undiagnosed, and pre-diabetes) OR=1.19 (0.70-2.04), or to pre-diabetes OR=0.89 (0.61-1.29). | No assessment of aldrin, no environmental information, no occupational or residential information was used in the analysis. |



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| Fenster et al. 2005 | Cohort | 385 Latinas living in the Salinas Valley, CA, an agricultural community. | Participants were part of a longitudinal birth cohort study, the Center for the Health Assessment of Mothers and Children of Salina project of the Center for Children's Environmental Health Research. Eligible women were <20 weeks gestation, at least 18 years old, eligible for Medi-Cal, and planning on giving birth at the Natividad Medical Center. Data was collected from interviews and medical record abstraction. Serum was drawn from the mothers at approximately 26 weeks gestation and at the hospital before delivery. Models were adjusted for maternal age, parity, country of birth, family income, timing of entry into prenatal care, smoking, total dimethyls at 26 weeks, pregnancy weight gain, prepregnancy BMI, total DAPs in urine at 26 weeks, infant sex, gestational age and gestational age squared. | 11 organochlorine pesticides in maternal serum | Infant's length of gestation, birth weight, and crown-heel length | Neither crude nor adjusted associations between health effects in infants and maternal serum dieldrin concentration during pregnancy were found. | Results are not generalizable as most women were Latina and born in Mexico, and selection was limited to low-income families. |
| Fowler et al. 2007 | Experi-mental | In vitro exposure of fetal human testis from women undergoing medical termination of pregnancy. | Investigators collected fetal testes from medically terminated normal pregnancies between 13 and 19 weeks of gestation. An in vitro experiment was carried out by exposing testes explants to 0.4ppb, 0.0004ppb or no dieldrin. Investigators performed immunolocalization of marker proteins, 2-dimensional gel electrophoresis and mass spectroscopy, 1-dimensional gel electrophoresis and western blot, and hormone assays. | Dieldrin in vitro | Leydig cell disruption | Dieldrin blocked LH-induced testosterone secretion from fetal testis explants in vitro. Dieldrin also blocked tissue protein concentrations of LH receptor and steroid acute regulatory protein. Dieldrin had no direct toxicological effects on the testis explants and no effect on anti-Mullerian hormone. | There were 2 to 4 specimens available for each treatment group of each experiment. |



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| Landgren et al. 2009 | Cohort | 678 men participat-ing in the Ag Health Study - stratified random sample of 57,310 licensed pesticide applicators. | Age-adjusted prevalence of MGUS among the men in the Ag Health Study were compared to 9,469 men from MN. Exposure to pesticide was self-reported at time of study enrollment (1993-1997) and serum samples were collected between 2006 and 2008. Logistic regression was used to control for age, education. | Self-reported pesticide use and pesticide concentrations in serum | Mono-clonal gammo-pathy of undeter-mined significance (MGUS) | Among those ever reporting exposure to dieldrin, the OR for MGUS was 5.6 (1.9-16.6) based on 6 cases. Two other compounds were significantly associated with increased risk of MGUS out of 50 compounds tested. | Excess risk of MGUS associated with dieldrin was not attenuated when adjusted for the use of other pesticides. The comparison group from MN was chosen because the Mayo Clinic had the largest MGUS screening study available at the time this study was conducted. |
| Li et al. 2005 | Review | | Comprehensive review of toxicological and epidemiological studies of the association between pesticides and Parkinson's Disease (PD). Analytic epidemiology studies were required to examine pesticide exposure (not farm work or rural residence, and broad descriptions like 'agricultural chemicals') and an outcome based on the PD case definition (i.e., not just a tremor). | Any pesticide, insecticide or herbicide | Parkinson's Disease | "We conclude that the animal and epidemiological data reviewed do not provide sufficient evidence to support a causal association between pesticide exposure and Parkinson's disease." 27 case control studies were reviewed, 16 reported no significant association between pesticides, herbicides, and/or insecticides and PD. None of the studies reviewed included any biomarker or environmental data. Base on the epidemiology studies alone, the authors concluded that the evidence is mixed. Dieldrin exposure in animal models is discussed and the authors conclude that it does not cause effects consistent with an animal model of PD. | Only one person scored the studies discussed in the paper. |



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| Louis et al. 2006 | Case Control | 136 cases and 144 controls | Cases were treated at the Neurological Institute of New York and identified from a database at the Center for Parkinson's disease and other movement disorders. Those with physical signs/diagnoses of Parkinsonism, dystonia, spinocerebellar ataxia were excluded. Controls were ascertained from the same source and from the same zip codes as cases, matched by age-strata, gender, and race. Questionnaires administered by a trained tester; videotaped neurological evaluations; serum samples collected; occupational histories evaluated by an industrial hygienist were all analyzed using Chi-square and student's T-tests, and Pearson correlation coefficients. | Exposure to 6 organochlorine pesticides was assessed by serum concentrations and occupational histories. | Essential Tremor | No association between ET and any of the 6 pesticides tested in serum. Parity (in women) was the only variable significantly associated with log dieldrin. | The authors report that they needed 160 cases and 160 controls to have adequate statistical power to detect a 20% difference based on a pilot study. |
| Montgomery et al. 2008 | Cohort | 31,787 pesticide applicators in the Ag Health Study | All data was collected from questionnaires at the time of study enrollment and after 5 years. Participants having diabetes at enrollment and those missing information pertaining to diabetes or other covariates (age, state, BMI) were excluded. Lifetime exposure to pesticides was calculated from reported use at enrollment (1993-1997). Only pesticide applicators were included (not family members); 97% were non-Hispanic White and 97% were male. | Cumulative number of days and ever/never use of 50 specific pesticides | Diabetes | 1,176 diagnosed diabetics and 30,611 non-diabetics were self-reported after a 5-year follow-up interview (conducted 1999-2003). The adjusted ORs (95% CI) found for exposure to aldrin are as follows: Ever use- 1.14 (0.97-1.33) compared to never users; 0.01-10 cumulative days of use: 0.84 (0.59-1.19), 10.01-100 days: 1.21(0.89-1.65), and over 100 days: 1.51 (0.88-2.58), with a p-value for trend of 0.08; additionally stratifying by age < and > 60 years and by state resulted in elevated but not significant ORs. When stratified by weight, under and normal, and overweight, individuals had elevated but not significant risks of diabetes with use of aldrin, however, obese individuals reporting ever use of aldrin had an OR=1.31 (1.05-1.63) for diabetes. | Not generalizable- the study was mostly white men, in rural areas. The study does not specify type I or type II diabetes, which are very different in etiology. Diabetes was only self-reported, not confirmed by a physician. |



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| Nagayama et al. 2007 | Cross Sectional | 92 Japanese mother-infant pairs living in or near Fukuoka, Japan. | Participants were recruited in the months of July and August of 1994-1996. Infants that were carried to term, without congenital abnormalities or disease, with normal pregnancies were included. Breast milk samples were collected 2-4 months after delivery. Peripheral venous blood was collected from infants at about 10 months of age. Lymphocyste subsets and ratio of CD4+ T cell to CD8+ T cell were investigated in vitro. | Pesticides in breast milk | Lymphocyte subsets (CD16+, HLA-DR+, CD4+, CD8+, CD3+,CD20+) percentage and ratio | While other pesticides were significantly associated with increases or decreases in lymphocyte subset percentages, dieldrin was not. | There is no consideration of other environmental, viral, bacterial, causes for changes in immune response. No attempt was made to measure exposure in utero. |
| Noakes et al. 2006 | Cross Sectional | 31 women in Western Australia | Participants were randomly selected among pregnant women undergoing caesarean section in 2001-2002, at a Hospital in an area of Western Australia where allergenic disease is epidemic. Maternal and neonate blood samples, maternal milk and adipose, and placental tissue was used to determine levels of persistent organic pollutants. Cord blood and maternal blood was collected for cytokine and lymphoproliferation response analyses. Immune responses were investigated in vitro. Data was analyzed by comparing medians and IQRs using Spearman rank correlation. | Persistent organic pollutants in maternal blood, adipose and breast milk, and in cord blood and placental tissue. | Allergenic immune response in women and infants | Aldrin was not present at detectable levels in any of the samples. While dieldrin was detected (in 1 adipose sample, 8 breast milk samples) it was not associated with any change in immune response. | All subjects had pollutant levels much less than has previously been associated with any subclinical effects. |
| Tomasallo et al. 2010 | Cohort | 3847 individuals and 1141 referents | Participants were originally recruited in 1993 and sport fish anglers studied in 1986 in the Great Lakes region. They included charter boat captains, their spouses, and sport fish anglers; referents were from the same communities but did not consume sport fish and less than 6 sport fish meals over the previous 10 years. Follow-up surveys were conducted in 1993-1995 by telephone. NDI was used to identify 342 deaths. | Total fish consumption, number of sport fish meals from the Great Lakes. The fish were expected to contain a variety of persistent bioaccumulative toxins. | Mortality | Fish consumption was not shown to be associated with any specific cause of death. | Dieldrin exposure was not specifically measured or tested. |



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| | | | Information on fish consumption and confounders (race, age, gender, BMI, education, annual income, and limited data for smoking and alcohol consumption) were collected from surveys. Analyses included Cox proportional hazards models and calculation of SMRs. | | | | |
| Weisskopf et al. 2010 | Case Control | 101 cases, 349 controls | Incident Parkinson's disease cases and controls were identified from the Finnish Mobile Clinic Health Examination Survey. The survey collected serum samples between 1968 and 1972 (analyzed in 2005-2007 for organochlorine pesticides). Cases were identified in the Social Insurance Institution's registry and were confirmed by medical records. Controls were matched by age, sex, municipality, and vital status. Logistic Regression was used to analyze the dataset. | Organochlorine pesticides in serum. | Parkinson's Disease | Dieldrin was the only chemical with any association to Parkinson's disease in this analysis. The average serum concentration of dieldrin was 39.6ng/g lipid and the median was 40 ng/g lipid. Geometric mean serum concentrations of dieldrin differed significantly based on region, smoking, and increase in BMI units per year. Analyses restricted to confirmed cases of never smokers, the OR per IQR was 1.95 (1.26-3.02), and for never smokers over the age of 66 the OR per IQR was 2.55 (1.58-4.39). For all cases, including those not confirmed by medical records but restricted to never smokers, risks were elevated but not significantly. The IQR is 28.2 ng/g lipid of dieldrin. | Aldrin was detected in 11.5% of controls, and 12.9% of cases. Never smokers have a higher risk of PD than ever smokers. The amount of time from collection of the samples to when cases were diagnosed presents problems with interpretation. Other risk factors such as genetics, head trauma, declining estrogen level, and family history were not considered. |



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# Appendix C: Benchmark Dose Analysis of Non-Cancer Effects of Aldrin

**Introduction**

In the 1993 IRIS document for Aldrin (CAS No. 309-00-2), the U.S. EPA calculated an oral Reference Dose (RfD) of 0.00003 mg/kg/day. The study on which the RfD was based was Fitzhugh et al. 1964, a study in which 12 rats/sex were fed diet containing 0, 0.5, 2, 10, 50, 100, or 150 ppm Aldrin for 2 years. The critical effects in this study were signs of liver toxicity, including enlarged centrilobular hepatic cells, with increased cytoplasmic oxyphilia, and peripheral migration of basophilic granules in dose levels ≥ 0.5 ppm. The authors of the paper described these effects as characteristic "chlorinated insecticide" lesions. Liver-to-body weight ratios were statistically significantly higher than controls in all aldrin treatments. The lowest dose of 0.5 ppm in the diet was determined to be the lowest observed adverse effect level (LOAEL). Because 0.5 ppm was the lowest dose level tested, a no observed adverse effect level (NOAEL) was not established. IRIS converted the LOAEL to 0.025 mg/kg-day, using the conversion factor of 1 ppm = 0.05 mg/kg-day. The RfD was formulated by dividing the LOAEL by an uncertainty factor of 1000 rounding: (0.025 mg/kg-day)/1000 = 0.000025 ≈ 0.00003 mg/kg/day. The uncertainty factor was based on extrapolation from animal to human (10), range of human sensitivities (10), and use of a LOAEL rather than a NOAEL (10).

ATSDR (2002) also used the Fitzhugh et al. 1964 study to develop a Minimal Risk Level (MRL) of 0.00003 mg/kg/day for aldrin. The MRL was calculated based on the same reasoning and calculations as the IRIS RfD.

**Method**

A benchmark dose (BMD) approach was used to derive a new RfD for aldrin based on the data reported by Fitzhugh et al. 1964. The U.S. EPA's BMDS 2.1.2 software package was used. BMDS 2.1.2 is the latest version of the BMDS series, released by EPA in June 2010.

One of the strengths of the BMD method is that it uses quantitative data. Unfortunately this strength is also a limitation in that the types of data required are not always available in published studies. The Fitzhugh et al. 1964 paper includes two tables that provide data about the liver toxicity of aldrin. Table 2 provides mean liver weight to body weight ratios for male and female rats that had been treated with 0.5 to 150 ppm aldrin. These data would be good for a BMD analysis by use of a Continuous Data model, except that the Continuous Data model requires means to be accompanied by standard deviations. Table 2 of the Fitzhugh paper does not report standard deviations in its mean organ weights table, so these data cannot be applied in a BMD model.

Table 4 of the Fitzhugh paper (see next page) reports the incidences of "characteristic chlorinated pesticide changes" in the liver of aldrin-treated rats. These are quantal data and can be used in a Dichotomous Model in the BMDS 2.1.2 software. The authors divided the incidences of observed liver lesions into categories of severity (from Trace to Moderate and >

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Moderate). For simplicity, the total observations for all lesions were entered into the BMDS data input spreadsheet.

**Table 4 from Fitzhugh et al. 1964 (Note, only Aldrin data were used in this modeling):**

Table 4. *Characteristic "chlorinated insecticide" changes in livers of rats fed aldrin or dieldrin*

| Compound and feeding level (ppm) | Degree of liver change* | | | | | | Number microscopically sectioned |
|---|---|---|---|---|---|---|---|
| | N | T | VS | S | S–M & M | >M | |
| None | 16 | 1 | 0 | 0 | 0 | 0 | 17 |
| Aldrin | | | | | | | |
| 0·5 | 15 | 4 | 0 | 0 | 0 | 0 | 19 |
| 2 | 10 | 8 | 0 | 1 | 0 | 0 | 19 |
| 10 | 11 | 3 | 7 | 1 | 0 | 0 | 22 |
| 50 | 0 | 0 | 0 | 6 | 10 | 2 | 18 |
| 100 | 0 | 0 | 0 | 0 | 5 | 6 | 11 |
| 150 | 0 | 0 | 0 | 0 | 2 | 7 | 9 |
| Dieldrin | | | | | | | |
| 0·5 | 17 | 4 | 0 | 1 | 0 | 0 | 22 |
| 2 | 12 | 5 | 5 | 1 | 0 | 0 | 23 |
| 10 | 7 | 7 | 3 | 1 | 0 | 0 | 18 |
| 50 | 0 | 0 | 3 | 8 | 6 | 3 | 20 |
| 100 | 0 | 0 | 1 | 1 | 8 | 8 | 18 |
| 150 | 0 | 0 | 0 | 1 | 5 | 5 | 11 |

*Among the symbols for the different grades of liver lesions, N=none, T=trace or minimal, VS=very slight, S=slight, and M=moderate. The figures for various degrees of liver lesions are based on the microscopic sections.

In order to make the BMD calculations more applicable to human risk from exposure to aldrin, the dose levels in ppm were converted into Human Equivalent Dose (HED) levels in units of mg/kg-day. The two steps in estimating the HED from the animal dose are: (1) converting the dietary concentrations to milligrams per kilograms per day in the animals; and (2) converting the animal dose to the equivalent human dose. ATSDR and IRIS used an assumption that 1 ppm = 0.05 mg/kg-day to convert the rat dose levels to units of mg/kg-day. The second step used the "¾ power" assumption where the human equivalent dose, in units of milligrams per kilograms body weight per day, is equal to the animal dose × (animal body weight/70)$^{1/4}$, where the rat body weight was estimated from Figure 1 of the Fitzhugh paper to be approximately 450 g, or 0.450 kg. The formulae and table below summarize the calculations to convert rat dose in ppm to HED in mg/kg/day.

Rat dose in mg/kg-day = (dose in ppm) x 0.05 mg/kg-day.

Rat dose to HED conversion factor = $(0.450/70)^{1/4}$ = 0.2831578

HED in mg/kg-day = (Rat dose in mg/kg-day) x 0.2831578

TETRA TECH

## Calculation of Human Equivalent Dose

| PPM in Diet | Rat Dose (mg/kg-day) | Human Equivalent Dose (mg/kg-day) |
|---|---|---|
| 0 | 0 | 0 |
| 0.5 | 0.025 | 0.0070789 |
| 2 | 0.1 | 0.028316 |
| 10 | 0.5 | 0.14158 |
| 50 | 2.5 | 0.07089 |
| 100 | 5 | 1.4158 |
| 150 | 7.5 | 2.1237 |

## Results

The BMD analysis of the liver lesion data are presented in the table below, and the BMDS input data, model parameters, and output are presented in subsequent pages. The first model was run in the Dichotomous Multistage model, as this is the simplest model for quantal data. The first run results using the entire range of doses were acceptable. In BMDS modeling, the highest dose level is commonly removed to see if it improves the fit of the curve to the data points. In the liver lesion data set, both the full data set and removal of the highest dose produced curves with acceptable p-value and scaled residuals, and the Akaike Information Coefficient (AIC) values were identical.

| Run | Data Set | P-value[1] | Highest Scaled Residual[2] | AIC[2] | Visual Assessment of Curve to Data Points[4] | BMD | BMDL[5] |
|---|---|---|---|---|---|---|---|
| 1 | All Data | 0.1835 | 1.938 | 96.3408 | Good | 0.0233849 | 0.0120675 |
| 2 | All Except High Dose | 0.1015 | 1.938 | 96.3408 | Good | 0.0233849 | 0.0120675 |

1 For the model to be acceptable, P-value must be > 0.1.
2 Scaled residuals report the gap between the curve line and the actual data points; for the model to be acceptable, all scaled residuals must have an absolute value of < 2.
3 The Akaike Information Coefficient (AIC) is used for comparison between models; generally, a lower AIC value indicates a better curve fit to the data.
4 Even when the numbers indicate a good curve fit, a visual inspection of the graph is important to ensure the curve is not wavy or contains other aberrations.
5 BMDL = Lower one-sided confidence limit on the BMD.

## Conclusion

In both runs of the liver lesion data, with and without the highest dose level, the reported BMD was identical, 0.0233849 mg/kg-d. The BMDL was 0.0120675 mg/kg-d.

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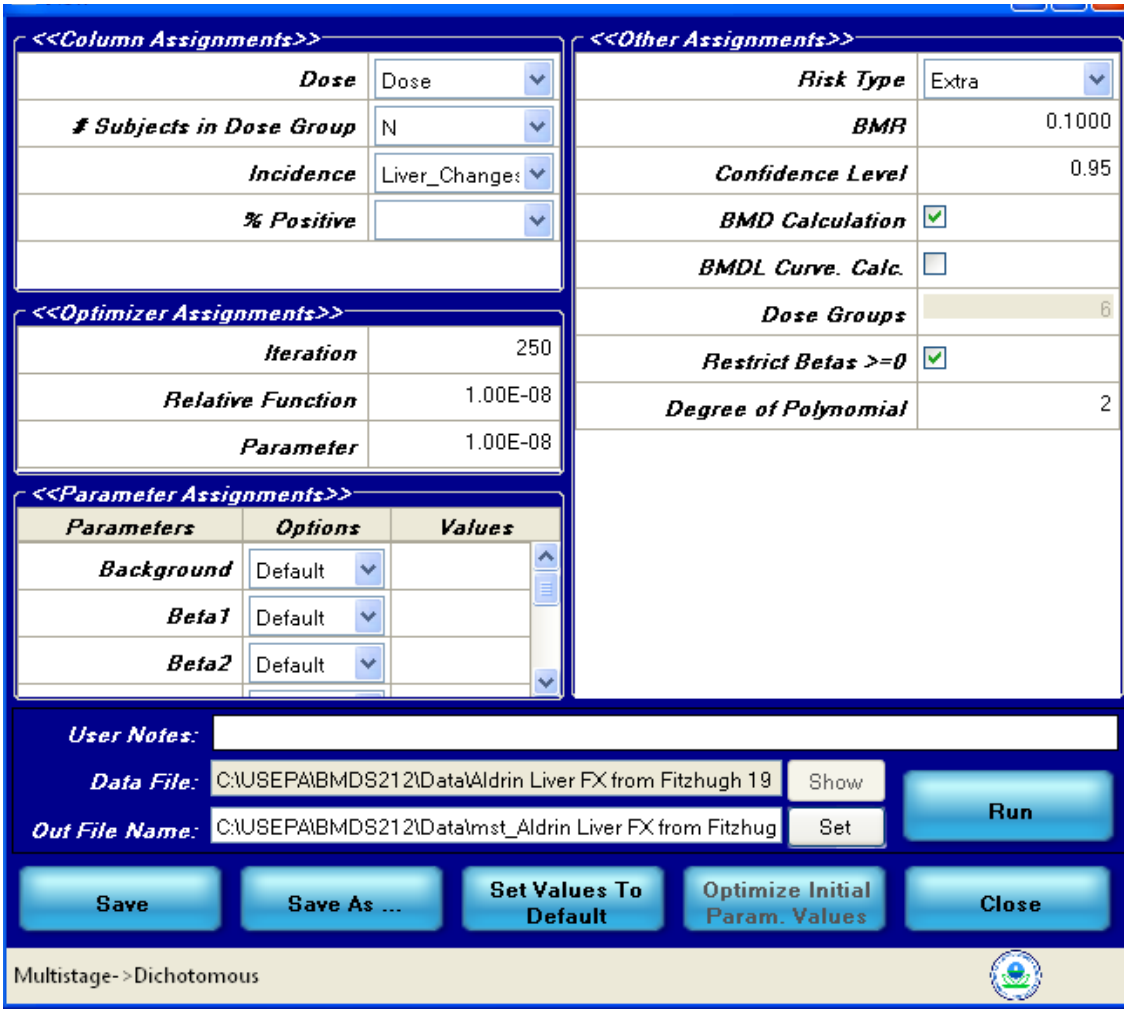
**BMDS Input Data Set:**

Model Type: Dichotomous | Model Name: Multistage

| | Dose | N | Liver_Changes | Col4 | Col5 |
|---|---|---|---|---|---|
| 1 | 0 | 17 | 1 | | |
| 2 | 0.007079 | 19 | 4 | | |
| 3 | 0.02832 | 19 | 9 | | |
| 4 | 0.1416 | 22 | 11 | | |
| 5 | 0.7079 | 18 | 18 | | |
| 6 | 1.416 | 11 | 11 | | |
| 7 | 2.124 | 9 | 9 | | |

**Model Parameters:**

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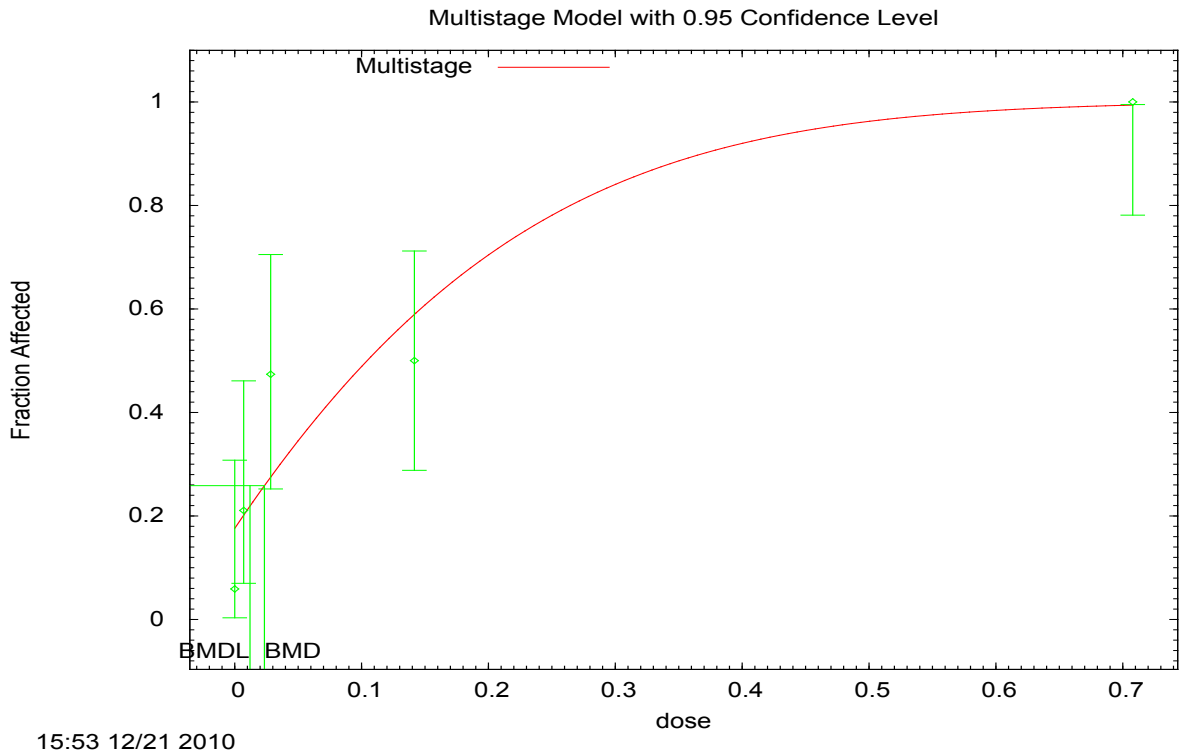
**Output for Run 1, Complete Data Set (All Dose Levels):**




```
 ================================================================
        Multistage Model. (Version: 3.2;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/mst_Aldrin Liver FX from Fitzhugh
1964_Opt.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/mst_Aldrin Liver FX from
Fitzhugh 1964_Opt.plt
                                                Tue Dec 21 15:52:46 2010
 ================================================================

 BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1-beta2*dose^2)]

   The parameter betas are restricted to be positive


   Dependent variable = Liver_Changes
   Independent variable = Dose

 Total number of observations = 7
 Total number of records with missing values = 0
 Total number of parameters in model = 3
 Total number of specified parameters = 0
 Degree of polynomial = 2
```

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Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 1
Beta(1) = 5.54426e+019
Beta(2) = 0

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) | Beta(2) |
|---|---|---|---|
| Background | 1 | -0.65 | 0.41 |
| Beta(1) | -0.65 | 1 | -0.78 |
| Beta(2) | 0.41 | -0.78 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.176075 | * | * | * |
| Beta(1) | 4.42317 | * | * | * |
| Beta(2) | 3.52018 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -41.9743 | 7 | | | |
| Fitted model | -45.1704 | 3 | 6.39212 | 4 | 0.1717 |
| Reduced model | -79.185 | 1 | 74.4214 | 6 | <.0001 |

AIC: 96.3408

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1761 | 2.993 | 1.000 | 17 | -1.269 |
| 0.0071 | 0.2016 | 3.831 | 4.000 | 19 | 0.097 |
| 0.0283 | 0.2751 | 5.227 | 9.000 | 19 | 1.938 |
| 0.1416 | 0.5896 | 12.971 | 11.000 | 22 | -0.854 |
| 0.7079 | 0.9938 | 17.889 | 18.000 | 18 | 0.334 |
| 1.4160 | 1.0000 | 11.000 | 11.000 | 11 | 0.004 |
| 2.1240 | 1.0000 | 9.000 | 9.000 | 9 | 0.000 |

Chi^2 = 6.22 d.f. = 4 P-value = 0.1835

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

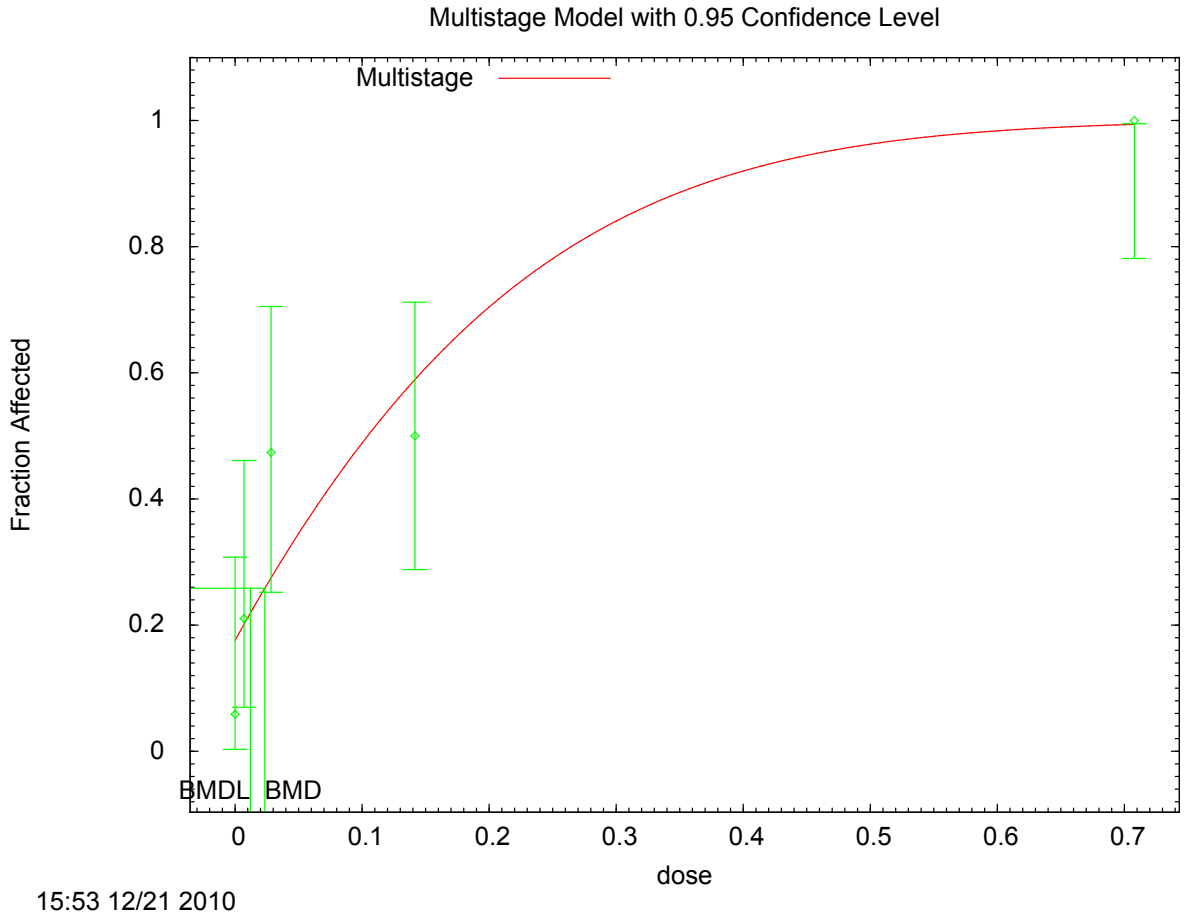
BMD = 0.0233849

BMDL = 0.0120675

BMDU = 0.0897018

Taken together, (0.0120675, 0.0897018) is a 90 % two-sided confidence interval for the BMD

**Output of Run 2, Data Set Excluding Highest Dose Group:**




```
 ================================================================
        Multistage Model. (Version: 3.2;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/mst_Aldrin Liver FX from Fitzhugh
1964_Opt.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/mst_Aldrin Liver FX from
Fitzhugh 1964_Opt.plt
                                                Tue Dec 21 15:51:33 2010
 ================================================================

 BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1-beta2*dose^2)]

   The parameter betas are restricted to be positive


   Dependent variable = Liver_Changes
   Independent variable = Dose

 Total number of observations = 6
```

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Total number of records with missing values = 0
Total number of parameters in model = 3
Total number of specified parameters = 0
Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 1
Beta(1) = 8.25022e+019
Beta(2) = 0

Asymptotic Correlation Matrix of Parameter Estimates

| | Background | Beta(1) | Beta(2) |
|---|---|---|---|
| Background | 1 | -0.65 | 0.41 |
| Beta(1) | -0.65 | 1 | -0.78 |
| Beta(2) | 0.41 | -0.78 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.176075 | * | * | * |
| Beta(1) | 4.42317 | * | * | * |
| Beta(2) | 3.52018 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -41.9743 | 6 | | | |
| Fitted model | -45.1704 | 3 | 6.39212 | 3 | 0.09402 |
| Reduced model | -73.4547 | 1 | 62.9608 | 5 | <.0001 |

AIC: 96.3408

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1761 | 2.993 | 1.000 | 17 | -1.269 |
| 0.0071 | 0.2016 | 3.831 | 4.000 | 19 | 0.097 |
| 0.0283 | 0.2751 | 5.227 | 9.000 | 19 | 1.938 |

| | | | | | |
|---|---|---|---|---|---|
| 0.1416 | 0.5896 | 12.971 | 11.000 | 22 | -0.854 |
| 0.7079 | 0.9938 | 17.889 | 18.000 | 18 | 0.334 |
| 1.4160 | 1.0000 | 11.000 | 11.000 | 11 | 0.004 |

Chi^2 = 6.22 d.f. = 3 P-value = 0.1015

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0233849

BMDL = 0.0120675

BMDU = 0.0897018

Taken together, (0.0120675, 0.0897018) is a 90 % two-sided confidence interval for the BMD

TETRA TECH

# Appendix D: Benchmark Dose Analysis of Non-Cancer Effects of Dieldrin

## Introduction

In the 1993 IRIS document for Dieldrin (CAS No. 60-57-1), the U.S. EPA calculated an oral Reference Dose (RfD) of 0.00005 mg/kg/day. The study on which the RfD was based was Walker et al. 1969, a study in which 12 rats/sex were fed diet containing 0, 0.1, 1.0, or 10.0 ppm Dieldrin for 2 years. IRIS converted the ppm dose levels to mg/kg-day, using the conversion factor of 1 ppm = 0.05 mg/kg-day. At the end of 2 years, females fed 1.0 and 10.0 ppm (0.05 and 0.5 mg/kg/day) had increased liver weights and liver-to-body weight ratios ($p<0.05$). Histopathological examinations revealed liver parenchymal cell changes including focal proliferation and focal hyperplasia at the 10 ppm dose level. These hepatic lesions were considered to be characteristic of exposure to an organochlorine insecticide. The LOAEL was identified by EPA as 1.0 ppm (0.005 mg/kg/day) and the NOAEL as 0.1 ppm (0.005 mg/kg/day). The RfD was formulated by dividing the LOAEL by an uncertainty factor of 100: (0.005 mg/kg-day)/100 = 0.00005 mg/kg/day. The uncertainty factor was based on extrapolation from animal to human (10) and range of human sensitivities (10).

ATSDR (2002) also used the Walker et al. 1969 study to develop a Minimal Risk Level (MRL) of 0.00005 mg/kg/day for dieldrin. The MRL was calculated based on the same reasoning and calculations as the IRIS RfD.

## Method

A benchmark dose (BMD) approach was used to derive a new RfD for dieldrin. The U.S. EPA's BMDS 2.1.2 software package was used. BMDS 2.1.2 is the latest version of the BMDS series, released by EPA in June 2010.

One of the strengths of the BMD method is that it uses quantitative data. Unfortunately this strength is also a limitation in that the types of data required are not always available in published studies. The data presented in Walker et al. 1969 was not suitable for a BMD model, because the data displaying the sensitive endpoint (liver lesions, Table 5 of Walker et al. 1969) did not represent a clear dose-response, and the authors determined that the liver lesions reported in this table were deemed to not be associated with organochlorine insecticides. The liver weight data in Table 4 of Walker et al. 1969 were a suitable fit for BMD modeling, but liver weight increases in the absence of other signs of liver toxicity (e.g., histopathology or clinical chemistry) is an adaptive response to increased metabolism of the chemical and is generally not considered to be an adverse effect (Sipes and Gandolfi 1991; Amacher et al. 1998). Therefore, Walker et al. 1969 did not present any data set that could be applied to a BMD model .

When JMPR (1967) reviewed the chronic rat toxicity of dieldrin, they identified the liver lesions reported by Fitzhugh et al. 1964 to represent the sensitive endpoint for dieldrin-induced liver toxicity. A BMD model analysis was conducted based on the data reported by Fitzhugh et al. 1964. Table 4 of the Fitzhugh paper (see next page) reports the incidences of "characteristic chlorinated pesticide changes" in the liver of aldrin-treated rats. These are quantal data and

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can be used in a Dichotomous Model in the BMDS 2.1.2 software. The authors divided the incidences of observed liver lesions into categories of severity (from Trace to Moderate and > Moderate). For simplicity, the total observations for all lesions were entered into the BMDS data input spreadsheet.

**Table 4 from Fitzhugh et al. 1964 (Note, only Dieldrin data were used in this modeling):**

Table 4. *Characteristic "chlorinated insecticide" changes in livers of rats fed aldrin or dieldrin*

| Compound and feeding level (ppm) | Degree of liver change* | | | | | | Number microscopically sectioned |
|---|---|---|---|---|---|---|---|
| | N | T | VS | S | S–M & M | >M | |
| None | 16 | 1 | 0 | 0 | 0 | 0 | 17 |
| Aldrin | | | | | | | |
| 0·5 | 15 | 4 | 0 | 0 | 0 | 0 | 19 |
| 2 | 10 | 8 | 0 | 1 | 0 | 0 | 19 |
| 10 | 11 | 3 | 7 | 1 | 0 | 0 | 22 |
| 50 | 0 | 0 | 0 | 6 | 10 | 2 | 18 |
| 100 | 0 | 0 | 0 | 0 | 5 | 6 | 11 |
| 150 | 0 | 0 | 0 | 0 | 2 | 7 | 9 |
| Dieldrin | | | | | | | |
| 0·5 | 17 | 4 | 0 | 1 | 0 | 0 | 22 |
| 2 | 12 | 5 | 5 | 1 | 0 | 0 | 23 |
| 10 | 7 | 7 | 3 | 1 | 0 | 0 | 18 |
| 50 | 0 | 0 | 3 | 8 | 6 | 3 | 20 |
| 100 | 0 | 0 | 1 | 1 | 8 | 8 | 18 |
| 150 | 0 | 0 | 0 | 1 | 5 | 5 | 11 |

*Among the symbols for the different grades of liver lesions, N=none, T=trace or minimal, VS=very slight, S=slight, and M=moderate. The figures for various degrees of liver lesions are based on the microscopic sections.

In order to make the BMD calculations more applicable to human risk from exposure to aldrin, the dose levels in ppm were converted into Human Equivalent Dose (HED) levels in units of mg/kg-day. The two steps in estimating the HED from the animal dose are: (1) converting the dietary concentrations to milligrams per kilograms per day in the animals; and (2) converting the animal dose to the equivalent human dose. ATSDR and IRIS used an assumption that 1 ppm = 0.05 mg/kg-day to convert the rat dose levels to units of mg/kg-day. The second step used the "¾ power" assumption where the human equivalent dose, in units of milligrams per kilograms body weight per day, is equal to the animal dose × (animal body weight/70)$^{1/4}$, where the rat body weight was estimated from Figure 1 of the Fitzhugh paper to be approximately 450 g, or 0.450 kg. The formulae and table below summarize the calculations to convert rat dose in ppm to HED in mg/kg/day.

Rat dose in mg/kg-day = (dose in ppm) x 0.05 mg/kg-day.

Rat dose to HED conversion factor = $(0.450/70)^{1/4}$ = 0.2831578

HED in mg/kg-day = (Rat dose in mg/kg-day) x 0.2831578

TETRA TECH

## Calculation of Human Equivalent Dose

| PPM in Diet | Rat Dose (mg/kg-day) | Human Equivalent Dose (mg/kg-day) |
|---|---|---|
| 0 | 0 | 0 |
| 0.5 | 0.10.025 | 0.0070789 |
| 2 | 0.50.1 | 0.028316 |
| 10 | 2.50.5 | 0.14158 |
| 50 | 52.5 | 0.07089 |
| 100 | 5 | 1.4158 |
| 150 | 7.5 | 2.1237 |

## Results

The BMD analysis of the liver lesion data are presented in the table below, and the BMDS input data, model parameters, and output are presented in subsequent pages. The Dichotomous Multistage model was used, as this is the simplest model for quantal data. The first run results using the entire range of doses were acceptable. In BMDS modeling, the highest dose level is commonly removed to see if it improves the fit of the curve to the data points. In the liver lesion data set, both the full data set and removal of the highest dose produced curves with acceptable p-value and scaled residuals, and the Akaike Information Coefficient (AIC) values were identical.

| Run | Data Set | P-value[1] | Highest Scaled Residual[2] | AIC[2] | Visual Assessment of Curve to Data Points[4] | BMD | BMDL[5] |
|---|---|---|---|---|---|---|---|
| 1 | All Data | 0.2937 | 1.579 | 96.2317 | Good | 0.0136975 | 0.00837329 |
| 2 | All Except High Dose | 0.2937 | 1.579 | 96.2317 | Good | 0.0136975 | 0.00837329 |

1 For the model to be acceptable, P-value must be > 0.1.
2 Scaled residuals report the gap between the curve line and the actual data points; for the model to be acceptable, all scaled residuals must have an absolute value of < 2.
3 The Akaike Information Coefficient (AIC) is used for comparison between models; generally, a lower AIC value indicates a better curve fit to the data.
4 Even when the numbers indicate a good curve fit, a visual inspection of the graph is important to ensure the curve is not wavy or contains other aberrations.
5 BMDL = Lower one-sided confidence limit on the BMD.

## Conclusion

In both runs of the liver lesion data, with and without the highest dose level, the reported BMD was identical, 0.0136975 mg/kg-d. The BMDL was 0.00837329 mg/kg-d.

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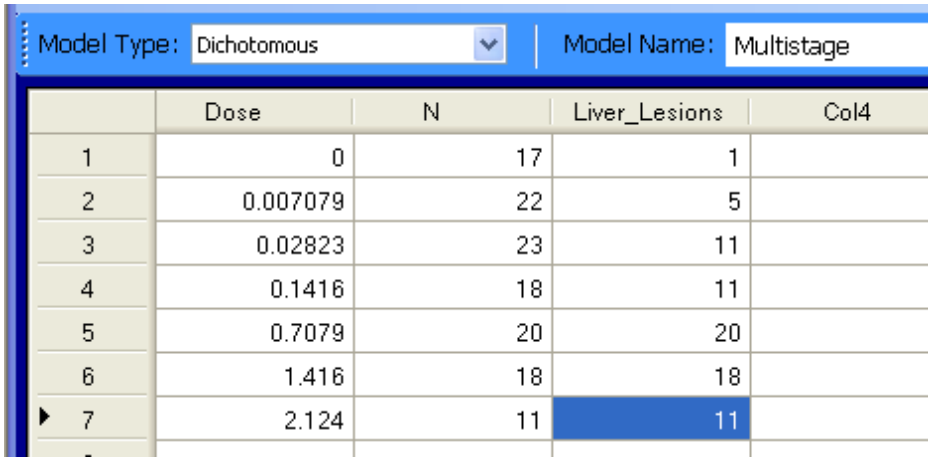
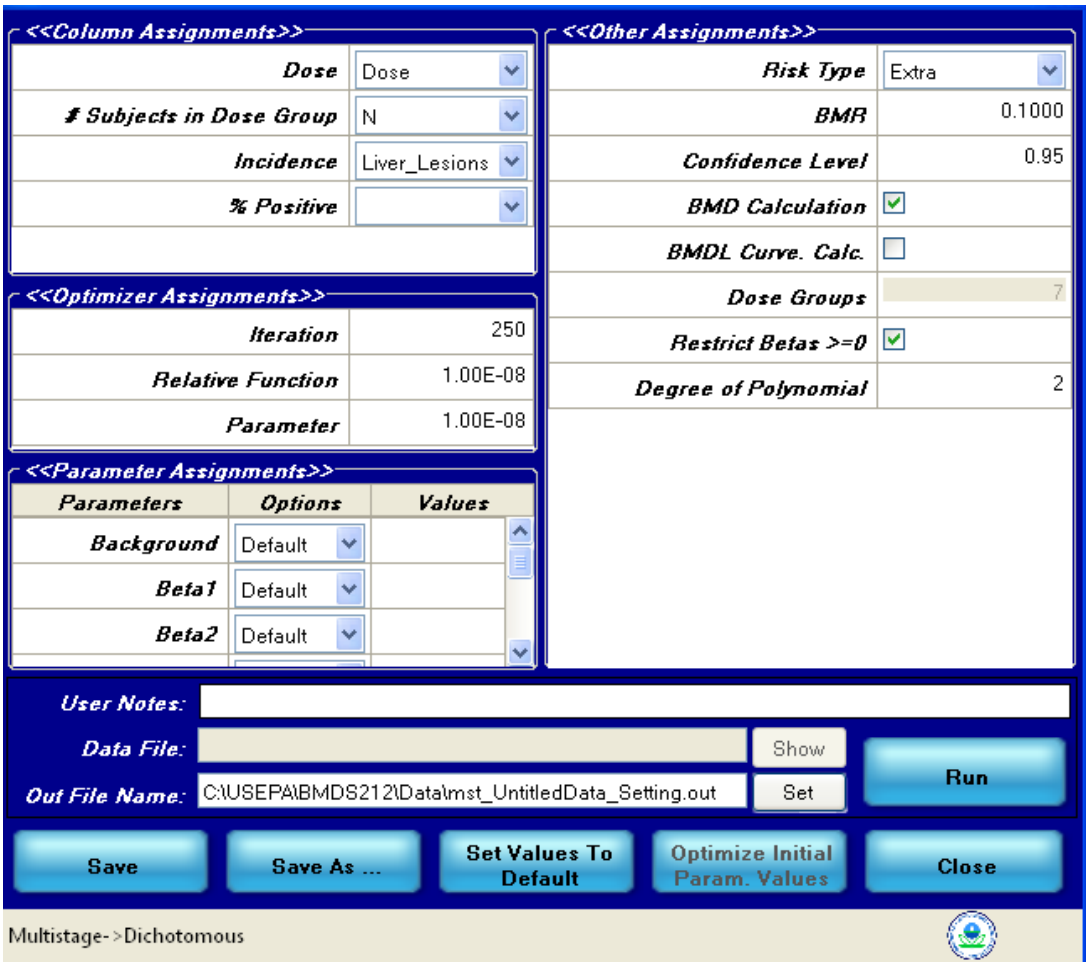
**BMDS Input Data Set:**



Model Type: Dichotomous | Model Name: Multistage

| | Dose | N | Liver_Lesions | Col4 |
|---|---|---|---|---|
| 1 | 0 | 17 | 1 | |
| 2 | 0.007079 | 22 | 5 | |
| 3 | 0.02823 | 23 | 11 | |
| 4 | 0.1416 | 18 | 11 | |
| 5 | 0.7079 | 20 | 20 | |
| 6 | 1.416 | 18 | 18 | |
| 7 | 2.124 | 11 | 11 | |

**Model Parameters:**



<<Column Assignments>>

| | |
|---|---|
| Dose | Dose |
| # Subjects in Dose Group | N |
| Incidence | Liver_Lesions |
| % Positive | |

<<Optimizer Assignments>>

| | |
|---|---|
| Iteration | 250 |
| Relative Function | 1.00E-08 |
| Parameter | 1.00E-08 |

<<Parameter Assignments>>

| Parameters | Options | Values |
|---|---|---|
| Background | Default | |
| Beta1 | Default | |
| Beta2 | Default | |

<<Other Assignments>>

| | |
|---|---|
| Risk Type | Extra |
| BMR | 0.1000 |
| Confidence Level | 0.95 |
| BMD Calculation | ☑ |
| BMDL Curve. Calc. | ☐ |
| Dose Groups | 7 |
| Restrict Betas >=0 | ☑ |
| Degree of Polynomial | 2 |

User Notes:

Data File: Show

Out File Name: C:\USEPA\BMDS212\Data\mst_UntitledData_Setting.out Set

Run

Save | Save As ... | Set Values To Default | Optimize Initial Param. Values | Close

Multistage->Dichotomous

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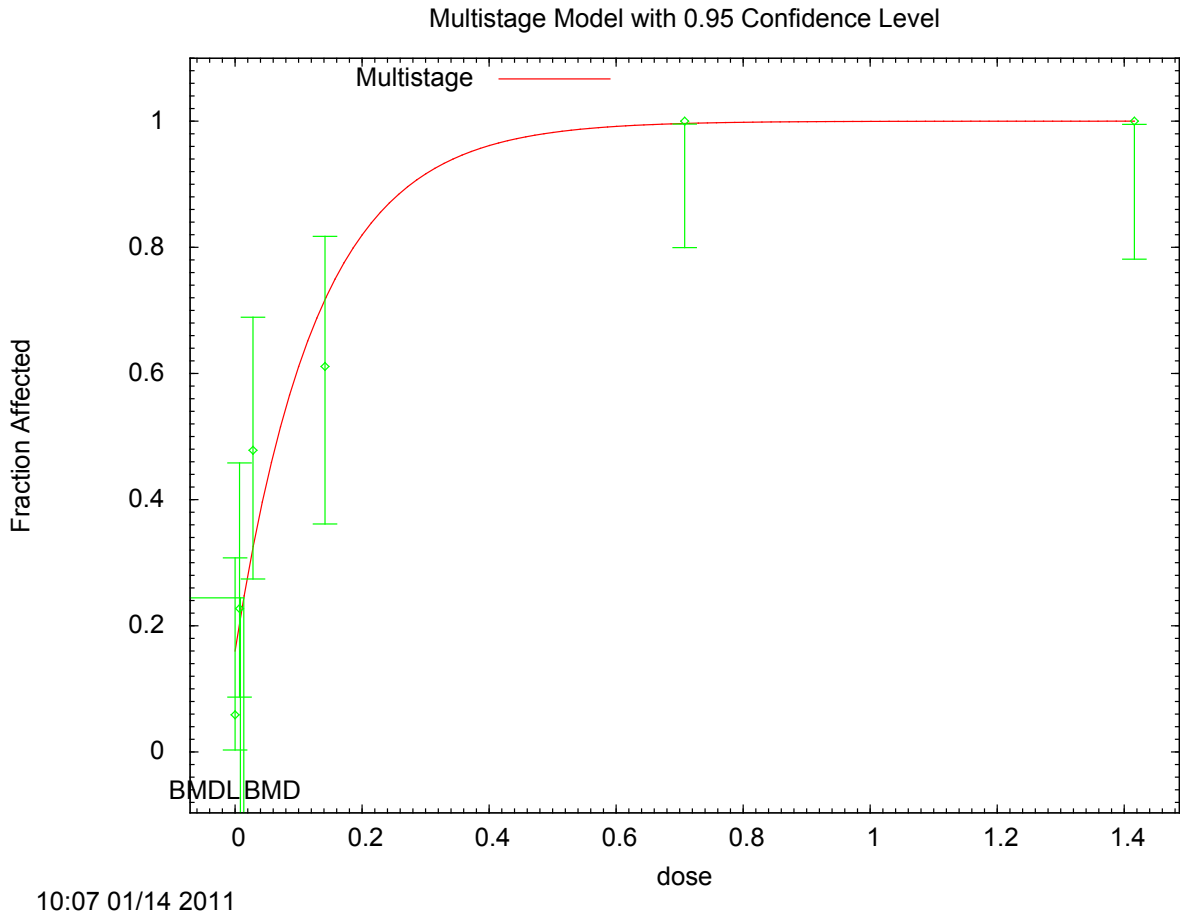
**Output for Run 1, Complete Data Set (All Dose Levels):**




```
=============================================================================
        Multistage Model. (Version: 3.2;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/mst_UntitledData_Setting.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/mst_UntitledData_Setting.plt
                                                 Fri Jan 14 10:07:56 2011
=============================================================================

 BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1-beta2*dose^2)]

   The parameter betas are restricted to be positive


   Dependent variable = Liver_Lesions
   Independent variable = Dose

 Total number of observations = 7
 Total number of records with missing values = 1
```

Total number of parameters in model = 3
Total number of specified parameters = 0
Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 1
Beta(1) = 8.25008e+019
Beta(2) = 0

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(2)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.53 |
| Beta(1) | -0.53 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.160248 | * | * | * |
| Beta(1) | 7.69196 | * | * | * |
| Beta(2) | 0 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -43.5434 | 6 | | | |
| Fitted model | -46.1159 | 2 | 5.14488 | 4 | 0.2728 |
| Reduced model | -80.9589 | 1 | 74.8309 | 5 | <.0001 |

AIC: 96.2317

Goodness of Fit

| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
|---|---|---|---|---|---|
| 0.0000 | 0.1602 | 2.724 | 1.000 | 17 | -1.140 |

| | | | | | |
|---|---|---|---|---|---|
| 0.0071 | 0.2048 | 4.505 | 5.000 | 22 | 0.262 |
| 0.0282 | 0.3242 | 7.456 | 11.000 | 23 | 1.579 |
| 0.1416 | 0.7174 | 12.914 | 11.000 | 18 | -1.002 |
| 0.7079 | 0.9964 | 19.927 | 20.000 | 20 | 0.270 |
| 1.4160 | 1.0000 | 18.000 | 18.000 | 18 | 0.017 |

Chi^2 = 4.94 d.f. = 4 P-value = 0.2937

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0136975

BMDL = 0.00837329

BMDU = 0.0418518

Taken together, (0.00837329, 0.0418518) is a 90 % two-sided confidence interval for the BMD

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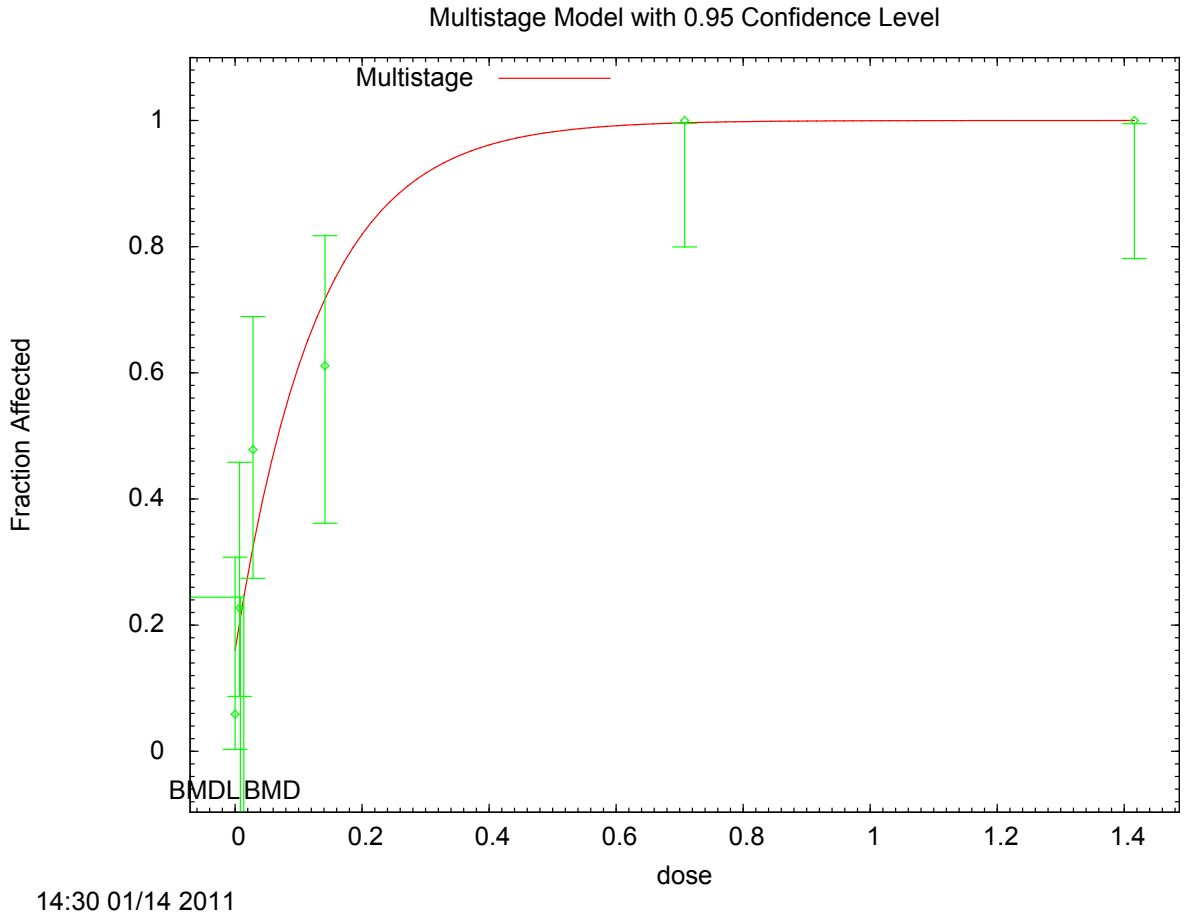
Tel: (703) 931-9301 Fax: (703) 931-9222

**Output of Run 2, Data Set Excluding Highest Dose Group:**




```
   14:30 01/14 2011
=================================================================
        Multistage Model. (Version: 3.2;  Date: 05/26/2010)
        Input Data File: C:/USEPA/BMDS212/Data/mst_UntitledData_Setting.(d)
        Gnuplot Plotting File:  C:/USEPA/BMDS212/Data/mst_UntitledData_Setting.plt
                                                Fri Jan 14 14:30:21 2011
 =================================================================

 BMDS_Model_Run
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

   The form of the probability function is:

   P[response] = background + (1-background)*[1-EXP(
                 -beta1*dose^1-beta2*dose^2)]

   The parameter betas are restricted to be positive


   Dependent variable = Liver_Lesions
   Independent variable = Dose

 Total number of observations = 6
 Total number of records with missing values = 0
 Total number of parameters in model = 3
 Total number of specified parameters = 0
```

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Degree of polynomial = 2

Maximum number of iterations = 250
Relative Function Convergence has been set to: 1e-008
Parameter Convergence has been set to: 1e-008

Default Initial Parameter Values
Background = 1
Beta(1) = 8.25008e+019
Beta(2) = 0

Asymptotic Correlation Matrix of Parameter Estimates

( *** The model parameter(s) -Beta(2)
have been estimated at a boundary point, or have been specified by the user,
and do not appear in the correlation matrix )

| | Background | Beta(1) |
|---|---|---|
| Background | 1 | -0.53 |
| Beta(1) | -0.53 | 1 |

Parameter Estimates

| Variable | Estimate | Std. Err. | 95.0% Wald Confidence Interval Lower Conf. Limit | Upper Conf. Limit |
|---|---|---|---|---|
| Background | 0.160248 | * | * | * |
| Beta(1) | 7.69196 | * | * | * |
| Beta(2) | 0 | * | * | * |

* - Indicates that this value is not calculated.

Analysis of Deviance Table

| Model | Log(likelihood) | # Param's | Deviance | Test d.f. | P-value |
|---|---|---|---|---|---|
| Full model | -43.5434 | 6 | | | |
| Fitted model | -46.1159 | 2 | 5.14488 | 4 | 0.2728 |
| Reduced model | -80.9589 | 1 | 74.8309 | 5 | <.0001 |

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| Dose | Est._Prob. | Expected | Observed | Size | Scaled Residual |
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| 0.0071 | 0.2048 | 4.505 | 5.000 | 22 | 0.262 |
| 0.0282 | 0.3242 | 7.456 | 11.000 | 23 | 1.579 |

| | | | | | |
|---|---|---|---|---|---|
| 0.1416 | 0.7174 | 12.914 | 11.000 | 18 | -1.002 |
| 0.7079 | 0.9964 | 19.927 | 20.000 | 20 | 0.270 |
| 1.4160 | 1.0000 | 18.000 | 18.000 | 18 | 0.017 |

Chi^2 = 4.94 d.f. = 4 P-value = 0.2937

Benchmark Dose Computation

Specified effect = 0.1

Risk Type = Extra risk

Confidence level = 0.95

BMD = 0.0136975

BMDL = 0.00837329

BMDU = 0.0418518

Taken together, (0.00837329, 0.0418518) is a 90 % two-sided confidence interval for the BMD

# APPENDIX C

## Technical Memorandum for RO #1

TETRA TECH

**TECHNICAL MEMORANDUM**

**To:** Roger Franklin, Director Environmental Services, Actus Lend Lease

**C:** Dr. Kay Johnson, Tetra Tech
Matt Horrigan, Tetra Tech
Randy Westhaus, PE, Tetra Tech

**From:** Gary Floyd, Tetra Tech
Gail Eaton, PG, Tetra Tech
Yvonne Parry, Tetra Tech
Tom Whitehead, PG, CHG, Tetra Tech

**Subject:** **Technical Memorandum for the Actions Implemented under Removal Action No. 1, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawai'i.**
**DCN: 2653504.003.F01**

**Date:** February 16, 2011

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## 1.0 INTRODUCTION

Tetra Tech has prepared this *Technical Memorandum for the Actions Implemented under Removal Action No. 1, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawai'i* (the "Tech Memo") on behalf of Hickam Communities LLC (HC). The purpose of the Tech Memo is to provide an interim report summarizing the development of the HC Action Plan (the "Action Plan") and the subsequent implementation of Removal Action No. 1 at the Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawai'i (hereinafter the "Site") (Figure 1). The Action Plan was presented in the *Removal Action Work Plan No. 1, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawai'i* (RO #1) (Tetra Tech 2010c). Once HC notified Tetra Tech of RO #1 approval by the Hawai'i Department of Health (HDOH), RO #1 implementation began immediately, commencing on October 15, 2010. Except for minor repairs of the soil caps and reseeding of select areas, the work conducted under RO #1 was completed by December 20, 2010.

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The removal action (RO) at the Site is part of the response action process as presented in the HDOH *Technical Guidance Manual – Interim Final* (TGM) (HDOH 2009). The complete report on the implementation of RO #1 and Removal Action No. 2 Work Plan (RO #2) (Tetra Tech 2010d) will be presented in a Removal Action Report (RAR) in accordance with the TGM (HDOH 2009).

Section 2.0 of the Tech Memo provides an overview of the development and decision making process under Removal Action No. 1; Section 3.0 discusses the environmental field support and oversight provided by Tetra Tech during RO #1 implementation; and Section 4.0 lists the references cited in the Tech Memo.

## 2.0 REMOVAL ACTION WORK PLAN NO. 1 – OVERVIEW

The purpose of RO #1 was to provide a basis and description of the procedures for implementing Removal Action No. 1 at the Site, and for managing excavated pesticide-impacted (PI) soil generated by this implementation. The Removal Action for the Site was initiated based on the Action Plan which was developed by HC, Tetra Tech, and the HDOH in response to preliminary analytical results of organochlorine pesticides detected in soil during the site investigation conducted from August to October 2010. The scope for the site investigation was presented in two Sampling and Analysis Plans (SAPs) entitled: *Sampling and Analysis Plan, Earhart I-2 and Earhart I-3 Neighborhoods, Hickam Air Force Base, Oʻahu, Hawaiʻi and Sampling and Analysis Plan, Onizuka II-1 Neighborhood, Hickam Air Force Base, Oʻahu, Hawaiʻi* (Tetra Tech 2010a and 2010b). These SAPs provided detailed descriptions of the methods used for selection of decision unit (DU) boundaries, soil sample collection, and soil sample preparation and analytical methods. The SAPs also provided detailed maps of the DU boundaries at the Site (Figures 2 through 4).

The preliminary results from the site investigation indicated that there were organochlorine pesticide detections in Site soil, primarily aldrin and dieldrin, at concentrations that exceed the Tier 2 Environmental Action Levels (EALs) established for HC property[1]. These detections initiated a preliminary risk analysis including calculation of the cumulative non-carcinogenic hazard index (HI) for soil. The results of this preliminary risk analysis further initiated the development the Action Plan to immediately address the PI soil detected in the 0 to 6-inch depth interval within DUs at the Site (Tetra Tech 2010c). The Action Plan provides three response actions based on the HIs calculated for the organochlorine pesticides detected in the 0 to 6-inch depth interval, which are presented below:

[1] The analytical results of the site investigation are not provided in this Technical Memorandum. The analytical results and an *Environmental Hazard Evaluation* (EHE) will be presented in the *Remedial Investigation Report* (RI Report) to be submitted under separate cover.

- **Response Action 1 – HI of less than 3 (HI < 3).** No immediate response is required under the Action Plan.

- **Response Action 2 – HI between 3 and 10.** The immediate response action under the Action Plan is to conduct a Visual Site Assessment (VSI) of the affected DU(s) to evaluate the presence of exposed soil. Areas of exposed or sparsely grass-covered soil with an area less than 200 square feet (sq ft) will require reseeding. For areas of exposed soil greater than 200 sq ft, excavation the area will be implemented, as specified in Response Action 3 below.

- **Response Action 3 – HI greater than 10 (HI > 10).** The immediate response action is to secure affected DU(s) by placing fencing around the perimeter, followed by excavation to 1-foot below grade and replacement with certified clean backfill.

### 2.1 Decision Units Identified for Soil Management

Based on the Action Plan, RO #1 identified five DUs for immediate action under Response Action 3, and 49 DUs under Response Action 2. The remaining DUs at the Site were within the parameters of Response Action 1, and did not require an immediate response action. No DUs in the Onizuka II-1 neighborhood were identified for an immediate action under Response Actions 2 or 3. Table 1 lists the DUs identified under Response Actions 2 and 3 and the actions required by the Action Plan and implemented under RO #1. Figures 2 through 4 show the DU boundaries and designations at the Site. Figures 5 and 6 show the DUs identified for excavation under Response Action 2 and 3.

## 3.0 ENVIRONMENTAL FIELD SUPPORT AND OVERSIGHT

Implementation of RO# 1 consisted of VSIs of the DUs identified by Response Action 2, and the excavation of PI soil from DUs identified by Response Actions 2 and 3. The VSIs and excavation activities are summarized in this section and include the environmental oversight conducted by Tetra Tech during the excavation, soil management, and backfilling of the affected DUs. Figures 5 and 6 show the DUs that were excavated during implementation of the RO #1. Photographic documentation is provided in Appendix A, and copies of the field records are provided in Appendix B.

### 3.1 Visual Site Inspections

Visual Site Inspections of DUs were conducted concurrently with the site investigation implemented under the SAPs (Tetra Tech 2010a and 2010b). As preliminary analytical results were received from the laboratory, the results were evaluated and DUs identified for VSIs under Response Action 2. Tetra Tech mobilized to the field to conduct VSIs of each of the 49 DUs for areas of exposed soil (also referred to as “bare spots” in the field records). The results of the VSIs indicated that a total of 47 DUs had < 200 sq ft of

exposed soil requiring reseeding (by hydroseeding), one DU had > 200 sq ft of contiguous exposed soil and required excavation, and one DU had no areas of exposed soil and did not require further action. The results of the VSIs were recorded in the field and are provided in Table 2.

### 3.2 Excavation Activities

Before excavation of DUs under the RO# 1 was implemented, HC notified the residents whose property was directly affected by, or adjacent to, DUs requiring excavation. Once HC completed resident notification, Tetra Tech mobilized to the Site to secure the DUs identified for excavation. These DUs were initially secured by installing orange construction (i.e. snow fencing) around the DU perimeters. The orange construction fencing was subsequently replaced by chain-link fencing by the Design/Build (D/B) Contractor before the start of the excavation activities (Appendix A).

Hickam Communities' D/B Contractor excavated and removed PI soil from a total of nine complete DUs at the Site. Four DUs at the Earhart I-2 and one at the Earhart I-3 neighborhoods the DUs were identified directly for complete excavation under Response Action 3. Since the site investigation was still ongoing during implementation of the RO #1, continued evaluation of the preliminary laboratory results indicated that three additional DUs adjacent to the four DUs at Earhart I-2 identified for excavation in the RO #1 had pesticide concentrations with calculated HIs close enough to the threshold under Response Action 3 that these DUs were also excavated. Three other adjacent DUs at Earhart I-2 were also partially over-excavated during implementation of RO #1. One DU (EAR2-DU-15d) was identified for complete excavation based on the results of the VSIs conducted at the Site under Response Action 2; whereby an area of exposed soil with a contiguous area of >200 sq ft was observed during the VSI. The DUs excavated and backfilled during RO #1 are shown in Figures 5 and 6, and the timeline if for the work are summarized below and presented in Table 3.

- **Earhart I-2.** EAR2-DU-42c was excavated and backfilled from October 15 through October 20;
- **Earhart I-2.** EAR2-DU-9d, -9e, and parts of EAR2-DU-30f, -37a, and -37d were excavated and backfilled from October 20 through October 25;
- **Earhart I-2.** EAR2-DU-6b and -6c, and EAR2-DU 52a and -52b were excavated and backfilled from October 25 through November 2;
- **Earhart I-2.** EAR2-DU-15d was excavated and backfilled on November 5; and
- **Earhart I-3.** EAR3-DU 2a was excavated and backfilled from November 18 through 22.

Tetra Tech provided environmental oversight on behalf of HC during excavation and backfilling activities at the Site. For each DU, the contractor excavated soil to a depth of 1-foot below ground surface and transported PI soil to a temporary soil management area discussed in Section 3.2.1. Before backfilling, a marker layer of geotextile fabric was placed on the floor of the excavation to prevent exposure by creating a visual barrier to the PI soil below 1-foot. The excavation was then backfilled to final grade, graded and reseeded. Tetra Tech monitored the loading and transport of PI soil to ensure it was completed in accordance with RO #1 (Appendix A). Tetra Tech confirmed that PI soil was only staged in the designated temporary soil management area, and was properly managed and secured. Tetra Tech also verified that air monitoring was conducted during PI soil excavation, that site workers had completed the required PI soil training and used proper PPE, and that appropriate site access safeguards were in place. Tetra Tech recorded general observations and verification measurements required under the RO #1 in daily field records (Appendix B).

### *3.2.1 Temporary PI Soil Stockpile Management Area*

In accordance with the RO #1, no PI soil was to be staged, stockpiled, or managed within occupied HC neighborhoods. There was an instance during the initial implementation of the RO #1, where a small volume of soil removed from around tree bases was being staged on the Site by temporarily placing it within the fenced area of a DU planned for excavation. This staging was attempted due to weather conditions causing a delay in soil transport trucks arriving on the Site. Tetra Tech noted this staging during environmental oversight, and this staging of soil at the Site was halted. The soil was subsequently trucked from the Site the same day. No further staging of soil was observed during the remainder of the RO #1 implementation.

All PI soil generated during RO #1 implementation was transported to a temporary soil management area located south of Ohana Nui Circle opposite the Earhart I-4 neighborhood. A map showing the temporary stockpile location is provided in the RO #1 (Tetra Tech 2010c). All potential PI materials excavated during RO #1 implementation were segregated by material (e.g. soil, debris, and removed vegetation) and stockpiled pending further management or disposal. The soil management area consisted of an approximately ½-acre site enclosed by a 6-foot chain link fence and locking gate. The interior of the area was graded, with a 6- to 12-inch soil berm to prevent runoff from leaving the area, and lined with 40-millimeter geotextile fabric. The PI stockpile was covered by a minimum 6-millimeter (mm) polyethylene sheeting and geotextile fabric and secured with anchors or sand bags to prevent wind or water erosion. Excavators used to regrade the PI stockpile were decontaminated with shovels, brooms, and wire brushes before leaving the lined soil management area.

### *3.2.2 Import Soil Characterization*

In accordance with the RO #1, soil identified for use as import backfill was characterized prior to placement into excavations at the Site (Tetra Tech 2010c). Stockpiles located at four different locations were sampled by Tetra Tech for soil characterization in four separate mobilizations between October 6 and November 22, 2010. All soil samples were collected using the multi-incremental (MI) soil sampling method, and submitted for analysis of organochlorine pesticides, and metals and petroleum hydrocarbons depending on whether the soil was from an on-site or off-site source. The field methods and analytical results from stockpile soil testing conducted under the RO #1 were presented in three separate Summary of Findings Reports (SoFRs) which are summarized below. Complete copies of the SoFRs are provided in Appendix C.

**D/B Contractor and Onizuka II-3 Stockpiles.** This SoFR documents the sampling and analysis of the two soil stockpiles that were sampled on October 6 and 8, 2010, and the collected soil samples submitted for analysis of organochlorine pesticides (Tetra Tech 2010e). The D/B Contractor Stockpile was an approximately 1,200-cubic yard (CY) soil stockpile located west of the D/B Contractor's Office. The soil in this stockpile was generated during grading operations at various HC residential sites within JBPHH. The Onizuka II-3 Stockpile was an approximately 1,600-CY soil stockpile located in a parking lot off Apollo Avenue at JBPHH. The soil in this stockpile was generated during burial pit excavation within open areas at the Onizuka II-3 Neighborhood.

Based on Tetra Tech's evaluation of the analytical results, the soil in both stockpiles was identified as not being PI soil, and therefore suitable for unrestricted use on HC property (Tetra Tech 2009). The analytical results are summarized below and provided in Appendix C.

- D/B Contractor Stockpile. Organochlorine pesticides were detected at concentrations at or above laboratory reporting limits in all of the MI soil samples collected from the D/B Contractor Stockpile. Detections for dieldrin were at concentrations exceeding the Tier 1 EAL for dieldrin. There are no detections exceeding the respective Tier 2 EALs established for HC property, and the Tier 2-based calculated risk is below the $1 \times 10^{-5}$ risk threshold established for HC property (Tetra Tech 2009).

- Onizuka II-3 Stockpile. Organochlorine pesticides were not detected at concentrations at or above laboratory reporting limits in the MI soil samples collected from the Onizuka II-3 Stockpile

**Windward Community College Stockpile.** This SoFR documents the sampling and analysis of one approximately 800 CY soil stockpile generated from a mass excavation conducted at Windward Community College (WCC) (Tetra Tech 2010f). The stockpile was sampled on November 2, 2010 after it was transported to the RHS Lee construction

yard, Pearl City, Hawai'i for staging and testing prior to import to the Site. Collected soil samples were submitted for analysis of organochlorine pesticides, Resource Conservation and Recovery Act (RCRA) 8 metals, and total petroleum hydrocarbons (TPH) as diesel and motor oil.

Based on Tetra Tech's evaluation of the analytical results, the soil in the WCC stockpile was identified as not being PI soil, and therefore suitable for unrestricted use on HC property (Tetra Tech 2009).

- Organochlorine pesticides were detected at concentrations at or above laboratory reporting limits in all of the MI soil samples collected from the WCC Stockpile. Detections for dieldrin were at concentrations exceeding the Tier 1 EAL for dieldrin. There were no detections exceeding the respective Tier 2 EALs established for HC property, and the Tier 2-based calculated risk is below the $1 \times 10^{-5}$ risk threshold established for HC property (Tetra Tech 2009).
- There were no detections of RCRA 8 metals or TPH as diesel or motor oil at concentrations exceeding the respective Tier 1 EALs.

**Hawaiian Earth Stockpiles.** This SoFR documents the sampling and analysis of two soil stockpiles imported to the Onizuka II-2 Neighborhood (Tetra Tech 2010g). The two stockpiles had volumes of 200 and 300 CY and consisted of topsoil imported from Hawaiian Earth Products, Ltd. (HIE). The stockpiles were sampled on November 22, 2010 after the soil was transported to the Onizuka II-2 Neighborhood for staging and soil testing prior to use as backfill at the Site. Collected soil samples were submitted for analysis of organochlorine pesticides, RCRA 8 metals, and TPH as diesel and motor oil.

Based on Tetra Tech's evaluation of the analytical results, the soil in the HIE stockpiles was identified as not being PI soil, and therefore suitable for unrestricted use on HC property (Tetra Tech 2009).

- Organochlorine compounds were detected in the soil samples but the detected concentrations are below the respective Tier 1 or Tier 2 EALs. The Tier 2-based calculated cumulative risk for the soil samples is below the $1 \times 10^{-5}$ risk threshold.
- The RCRA 8 metals lead and arsenic were detected at in the soil samples, but the detected concentrations are below the respective Tier 1 EALs.
- TPH as motor oil was detected in the soil samples, but the detected concentrations are below the Tier 1 EAL. TPH as diesel was not detected in the soil samples collected from the HIE stockpiles.

### *3.2.3 Import Soil Placement*

Hickam Communities D/B Contractor backfilled each DU within 2 business days following completion of the PI soil removal within the neighborhood with a minimum of

10-inches of clean fill material. In December 2010, each of the backfilled DUs was covered by a 2-inch layer of topsoil that was subsequently reseeded for lawns; however, rain events throughout December created rills in the newly installed and reseeded soil caps. These areas are currently being monitored and will be reseeded as necessary.

### 3.3 Residential Dust and Air Monitoring

In accordance with the RO #1, residential dust and air monitoring was conducted during excavation activities at the Site on October 15, 18 through 22, 25 through 28 and November 9, 12, 15 and 23, 2010. The purpose of the residential dust and air monitoring was to evaluate any potential exposure to HC residents from any dust and airborne pesticides (aldrin, chlordane, dieldrin, and heptachlor) generated during excavation activities. Residential air monitoring was also conducted during soil stockpiling activities at the temporary PI soil management area located near the Earhart I-4 neighborhood. The residential dust and air monitoring activities are summarized in this Section; the analytical results and a detailed discussion of the methods and results are presented in the memorandum entitled *Hickam Communities Residential Dust and Air Monitoring Results for Removal Action No. 1, October and November 2010, Earhart I-2, Earhart I-3, and Soil Stockpiling Area, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi* (Tetra Tech 2011). A copy of this memorandum is provided in Appendix D.

Tetra Tech contracted with Quinn Consultants, Inc. (QCI) to perform dust and air monitoring at the Site. In order to collect representative samples, two residential monitoring stations were placed at the perimeter of the excavation areas. A personal sampler for the collection of airborne pesticide samples was worn by select Site personnel working within some of the excavation areas. For the residential dust and air monitors placed at the excavation perimeters, one was located "reasonably" upwind and outside of the soil removal activities, but sufficiently close enough to the excavation work to ensure that monitoring data were representative of the neighborhood. The second sampler was placed downwind of the excavation areas and as close to the affected housing units as feasible, such that the collected air samples would be as representative as possible of potential exposures of nearby residents. During excavation activities at the Site:

- Dust readings were collected at a rate of 1 reading per minute over an 8-hour work day.
- Airborne pesticide samples were collected on filter cassettes at a rate of 1 liter per minute over an 8-hour work day.

Due to problems with data access with the dust monitoring equipment, there is only dust monitoring data available for October 2010. Please see Appendix D for more detailed information.

*Dust Monitoring Results.* Dust monitoring data from October 2010 was compared to the National Ambient Air Quality Standard (NAAQS) for 10 micrometer (µm) particulate matter ($PM_{10}$). Detections of dust were reported as average, minimum and maximum readings recorded over each 8-hour day during excavation activities. The average and minimum readings for dust at the Site were below the $PM_{10}$ threshold, and maximum dust readings exceeded the $PM_{10}$ threshold in three of the upwind samples and four of the downwind samples.

*Airborne Pesticide Monitoring Results.* Analytical results for airborne pesticides were compared to Residential Exposure Goals (REGs) calculated for the Site, based on site-specific determinations of risk-based air concentrations (Appendix D). Airborne pesticides were detected in some of the residential air monitoring samples collected during excavation work, but all of the detections were below the respective site-specific REGs.

For workers within the excavation area, the Occupational Safety and Health Administration (OSHA) Permissible Exposure Levels (PELs) (for aldrin, dieldrin, and chlordane) and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) (for heptachlor)[2] were applied. There was one detection of dieldrin in a personal monitor that slightly exceeded the REG for dieldrin, but all of the detections were below the respective OSHA PELs (Appendix D).

## 4.0 REFERENCES

HDOH (Hawai'i Department of Health). 2009. *Interim Final Technical Guidance Manual for Implementation of the Hawai'i State Contingency Plan.* Prepared by: Hawai'i Department of Health Environmental Management Division. June 21, 2009.

OSHA (Occupational Safety and Health Administration). 2010. *OSHA Permissible Exposure Limit (PEL) for General Industry, Total Dust.* Accessed at Internet Websit: http://www.osha.gov/dts/chemicalsampling/data/CH_259640.html

Tetra Tech. 2009. *Pesticide Impacted Soils Investigation and Management Program Manual.* Prepared for Hickam Community Housing LLC. May 2009.

Tetra Tech. 2010a. *Sampling and Analysis Plan, Earhart I-2 and Earhart I-3 Neighborhoods, Hickam Air Force Base, O'ahu, Hawai'i.* DCN: 2616902.0001.F01. Prepared for Hickam Communities, LLC. August 6, 2010.

[2] The ACGIH TLV is applied for heptachlor since an OSHA PEL has not been established for heptachlor.

Tetra Tech. 2010b. *Sampling and Analysis Plan, Onizuka II-1 Neighborhood, Hickam Air Force Base, Oʻahu, Hawaiʻi.* DCN: 2616902.0002.F01. Prepared for Hickam Communities, LLC. August 6, 2010.

Tetra Tech. 2010c. *Removal Action Work Plan No. 1, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawaiʻi.* Prepared for Hickam Communities LLC. October 11, 2010.

Tetra Tech. 2010d. *Removal Action No. 2 Work Plan, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawaiʻi.* Prepared for Hickam Communities LLC. December 2010.

Tetra Tech. 2010e. *TO#56: Summary of Findings Report on Sampling and Chemical Analysis of the Soil Stockpiles for Import to Earhart I-2 and Earhart I-3 Neighborhoods, Joint Base Pearl Harbor-Hickam, Hawaiʻi.* Prepared for Hickam Communities LLC. November 17, 2010.

Tetra Tech. 2010f. *TO#56 (Mod 4): Final Summary of Findings Report on Sampling and Chemical Analysis of Import Soil Stockpile Located at the RHS Lee Baseyard, Pearl City,, Hawaiʻi.* Prepared for Hickam Communities LLC. December 1, 2010.

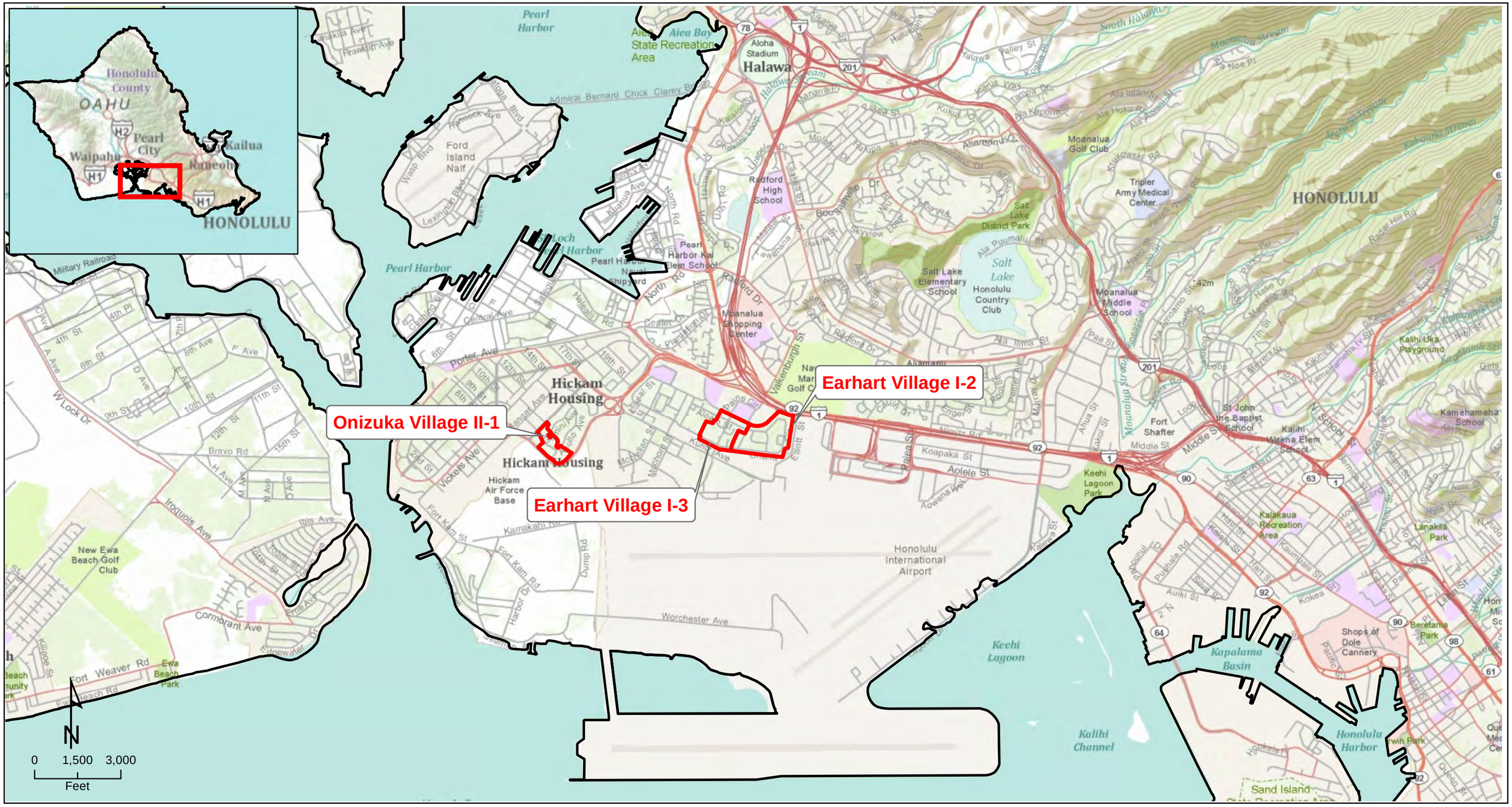
Tetra Tech. 2010g. *TO#56: Summary of Findings Report on Sampling and Chemical Analysis of the Onizuka II-2 Import Soil Stockpiles, Joint Base Pearl Harbor-Hickam, Hawaiʻi.* Prepared for Hickam Communities LLC. December 28, 2010.

Tetra Tech. 2011. *Hickam Communities Residential Dust and Air Monitoring Results for Removal Action No. 1, October and November 2010, Earhart I-2, Earhart I-3, and Soil Stockpiling Area, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi. DCN# 2653504.009.F01.* Internal Tetra Tech Memorandum. February 8, 2011.

Attachments:

| | |
|---|---|
| Figure 1. | Site Location |
| Figure 2. | Decision Units – Fall 2010, Earhart I-2 Neighborhood |
| Figure 3. | Decision Units – Fall 2010, Earhart I-3 Neighborhood |
| Figure 4. | Decision Units – Fall 2010, Onizuka II-1 Neighborhood |
| Figure 5. | Removal Action No. 1, Areas Excavated and Backfilled, October and November 2010, Earhart I-2 Neighborhood |
| Figure 6. | Removal Action No. 1, Areas Excavated and Backfilled, November and December 2010, Earhart I-3 Neighborhood |
| Table 1. | Removal Action No. 1, Hickam Communities Action Plan, Decision Units and Actions Implemented. |
| Table 2. | Removal Action No. 1, Visual Site Inspection Results |
| Table 3. | Removal Action No. 1, Decision Units Completely or Partially Excavated |
| Appendix A. | Photographic Documentation |
| Appendix B. | Oversight Field Records |
| Appendix C. | Summary of Findings Reports for Import Soil Sampling |
| Appendix D. | Residential Dust and Air Monitoring Memorandum |

# FIGURES




**Legend**

Hickam Communities Neighborhoods

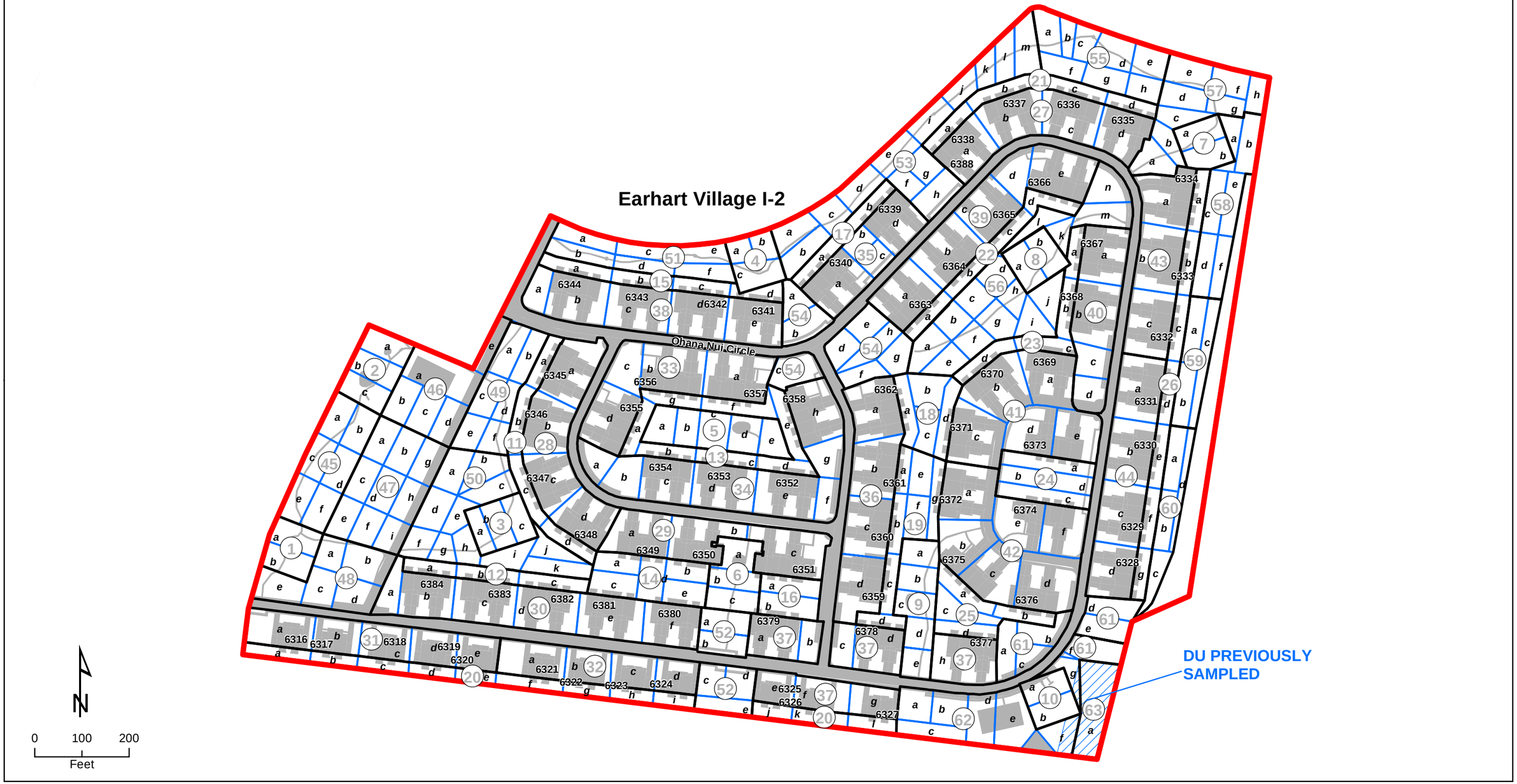
TETRA TECH

# *Site Location*
# *Removal Action No. 1*
# *Hickam Communities Neighborhoods*

Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i

**Figure 1**

R:\NEW\26535\Layouts\Site Location Removal Action No. 1.mxd 01/07/11 - YE




## Legend

- Earhart Village I-2
- Hardscapes
- Decision Units
- Grouped Decision Units

**Notes:**

- **DUs 20, 52, and 61 are split between two non-contiguous areas.**
- **DUs 37 and 54 are split between three non-contiguous areas.**

# *Decision Units - Fall 2010 Earhart I-2 Neighborhood*

Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i

TETRA TECH

**Figure 2**

## Legend

- Earhart Village I-3
- Hardscapes
- Decision Units
- Grouped Decision Units

**Notes:**

- **DUs 1, 5, 24, 25, 31, 33, 35, 36, and 40 are split between two non-contiguous areas.**
- **DU 34 is split between three non-contiguous areas.**

# *Decision Units - Fall 2010*
# *Earhart I-3 Neighborhood*

Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i

**Figure 3**

TETRA TECH

R:\NEW\26535\Layouts\Decision Units - Fall 2010 Earhart I-3 Neighborhood.mxd 01/07/11 - YE

## Legend

- Onizuka Village II-1
- Hardscapes
- b Decision Units
- (10) Grouped Decision Units

**Notes:**

- **DUs 1, 2, 3, 4 and 5 are split between two non-contiguous areas.**

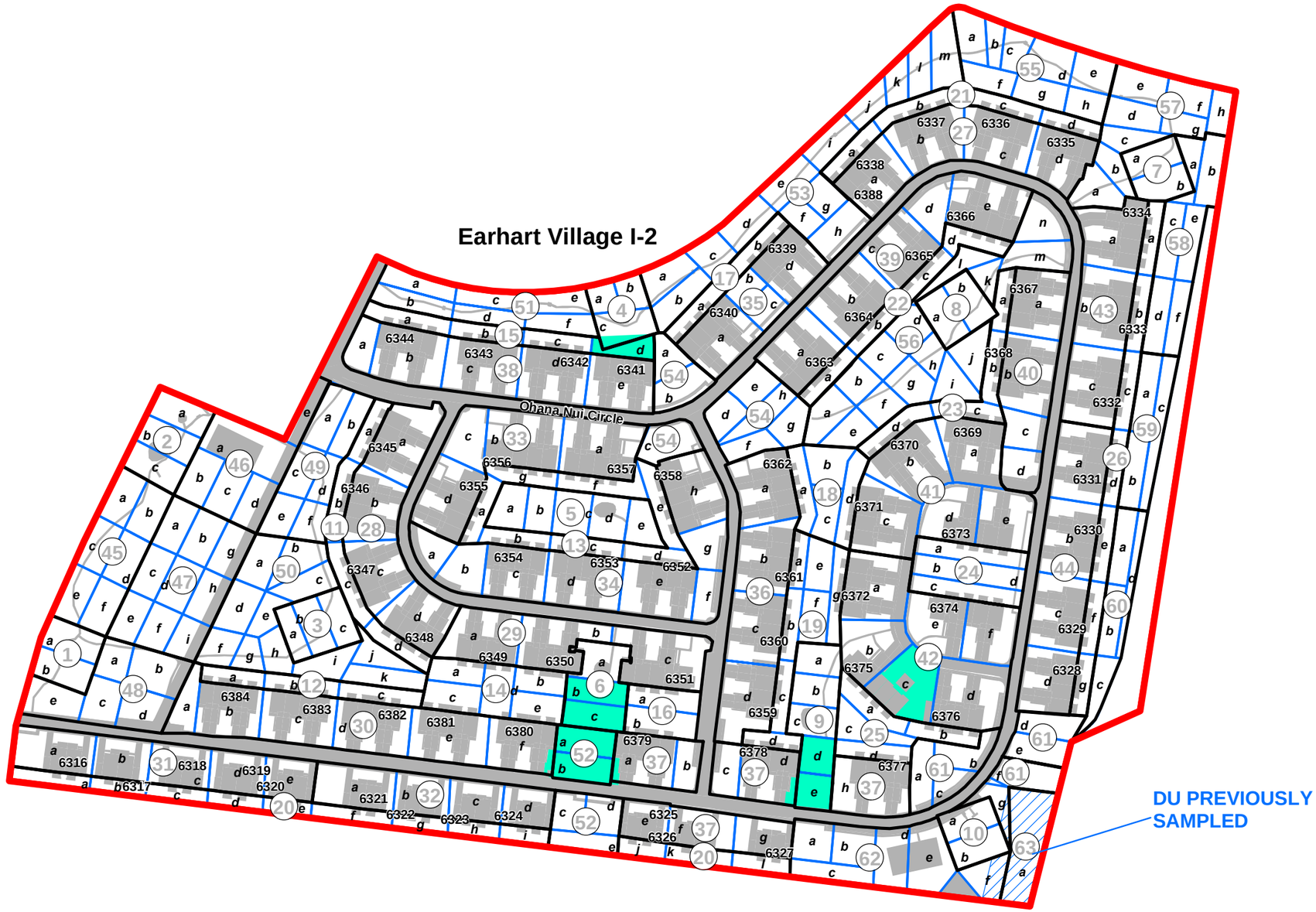
# *Decision Units - Fall 2010*
# *Onizuka II-1 Neighborhood*

Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i

TETRA TECH

**Figure 4**

R:\NEW\26535\Layouts\Decision Units - Fall 2010 Onizuka II-1 Neighborhood.mxd 07/07/11 - YE




## Legend

- Earhart Village I-2
- Hardscapes
- Decision Units
- Grouped Decision Units
- Areas Excavated and Backfilled for Removal Aciton No. 1

**Notes:**

- **DUs 20, 52, and 61 are split between two non-contiguous areas.**
- **DUs 37 and 54 are split between three non-contiguous areas.**

# *Removal Action No. 1*
# *Areas Excavated and Backfilled – October and November 2010*
# *Earhart I-2 Neighborhood*

Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i

**Figure 5**

TETRA TECH

R:\NEW\26535\Layouts\Earhart I-2 Areas Excavated and Backfilled.mxd 01/07/11 - YE

## Legend

- Earhart Village I-3
- Hardscapes
- Areas Excavated and Backfilled for Removal Aciton No. 1
- b Decision Units
- 10 Grouped Decision Units

**Notes:**

- **DUs 1, 5, 24, 25, 31, 33, 35, 36, and 40 are split between two non-contiguous areas.**
- **DU 34 is split between three non-contiguous areas.**

# *Removal Action No. 1*
# *Areas Excavated and Backfilled – November and December 2010*
# *Earhart I-3 Neighborhood*

Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i

**Figure 6**

TETRA TECH

R:\NEW\26535\Layouts\Earhart I-3 Areas Excavated and Backfilled.mxd 01/07/11 - YE

# TABLES

**Table 1**
**Removal Action No. 1 - Hickam Communities Action Plan**
**Decision Units and Actions Implemented**
**Joint Base Pearl Harbor-Hickam, Hawai'i**

| Neighborhood | DU Name | Response Action | Action Required |
|---|---|---|---|
| Earhart I-2 | EAR2-DU-6b | 2 | VSI |
| Earhart I-2 | EAR2-DU-6d | 3 | excavation |
| Earhart I-2 | EAR2-DU-9d | 3 | excavation |
| Earhart I-2 | EAR2-DU-9e | 2 | VSI |
| Earhart I-2 | EAR2-DU-11a | 2 | VSI |
| Earhart I-2 | EAR2-DU-11b | 2 | VSI |
| Earhart I-2 | EAR2-DU-12c | 2 | VSI |
| Earhart I-2 | EAR2-DU-13a | 2 | VSI |
| Earhart I-2 | EAR2-DU-13g | 2 | VSI |
| Earhart I-2 | EAR2-DU-14c | 2 | VSI |
| Earhart I-2 | EAR2-DU-14e | 2 | VSI |
| Earhart I-2 | EAR2-DU-15b | 2 | VSI |
| Earhart I-2 | EAR2-DU-15c | 2 | VSI |
| Earhart I-2 | EAR2-DU-15d | 2 | VSI / excavation |
| Earhart I-2 | EAR2-DU-19b | 2 | VSI |
| Earhart I-2 | EAR2-DU-22a | 2 | VSI |
| Earhart I-2 | EAR2-DU-23a | 2 | VSI |
| Earhart I-2 | EAR2-DU-23b | 2 | VSI |
| Earhart I-2 | EAR2-DU-26e | 2 | VSI |
| Earhart I-2 | EAR2-DU-27a | 2 | VSI |
| Earhart I-2 | EAR2-DU-27c | 2 | VSI |
| Earhart I-2 | EAR2-DU-27d | 2 | VSI |
| Earhart I-2 | EAR2-DU-28c | 2 | VSI |
| Earhart I-2 | EAR2-DU-29a | 2 | VSI |
| Earhart I-2 | EAR2-DU-30f | 2 | VSI |
| Earhart I-2 | EAR2-DU-33a | 2 | VSI |
| Earhart I-2 | EAR2-DU-33b | 2 | VSI |
| Earhart I-2 | EAR2-DU-34d | 2 | VSI |
| Earhart I-2 | EAR2-DU-35a | 2 | VSI |
| Earhart I-2 | EAR2-DU-35b | 2 | VSI |
| Earhart I-2 | EAR2-DU-36c | 2 | VSI |
| Earhart I-2 | EAR2-DU-36d | 2 | VSI |
| Earhart I-2 | EAR2-DU-37a | 2 | VSI |
| Earhart I-2 | EAR2-DU-38d | 2 | VSI |
| Earhart I-2 | EAR2-DU-39a | 2 | VSI |
| Earhart I-2 | EAR2-DU-40c | 2 | VSI |
| Earhart I-2 | EAR2-DU-42a | 2 | VSI |
| Earhart I-2 | EAR2-DU-42b | 2 | VSI |
| Earhart I-2 | EAR2-DU-42c | 3 | excavation |
| Earhart I-2 | EAR2-DU-43a | 2 | VSI |
| Earhart I-2 | EAR2-DU-52a | 3 | excavation |
| Earhart I-2 | EAR2-DU-52b | 2 | VSI |
| Earhart I-2 | EAR2-DU-60a | 2 | VSI |
| Earhart I-3 | EAR3-DU-2a | 3 | excavation |
| Earhart I-3 | EAR3-DU-5a | 2 | VSI |
| Earhart I-3 | EAR3-DU-12b | 2 | VSI |
| Earhart I-3 | EAR3-DU-20a | 2 | VSI |

**Table 1**
**Removal Action No. 1 - Hickam Communities Action Plan**
**Decision Units and Actions Implemented**
**Joint Base Pearl Harbor-Hickam, Hawai'i**

| Neighborhood | DU Name | Response Action | Action Required |
|---|---|---|---|
| Earhart I-3 | EAR3-DU-28b | 2 | VSI |
| Earhart I-3 | EAR3-DU-32b | 2 | VSI |
| Earhart I-3 | EAR3-DU-33a | 2 | VSI |
| Earhart I-3 | EAR3-DU-33c | 2 | VSI |
| Earhart I-3 | EAR3-DU-34c | 2 | VSI |
| Earhart I-3 | EAR3-DU-40e | 2 | VSI |
| Earhart I-3 | EAR3-DU-42i | 2 | VSI |

**Notes**

DU decision unit
VSI visual site inspection

**Table 2**
**Removal Action No. 1**
**Visual Site Assessment Results**
**Joint Base Pearl Harbor-Hickam, Hawai'i**

| HC Neighborhood | DU Name | VSI date | Contiguous Bare Areas [1] > 200 sq ft | Bare Areas [2] < 200 sq ft | VSI Comments [3] |
|---|---|---|---|---|---|
| Earhart 1-2 | EAR2-DU-6b | 16-Sep-10 | NO | YES, several | 200 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-34d | 16-Sep-10 | NO | YES, several | 25 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-36d | 16-Sep-10 | NO | YES, several | 45 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-15c | 16-Sep-10 | NO | YES, several large spots | 180 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-33a | 16-Sep-10 | NO | YES, several | 25 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-33b | 16-Sep-10 | NO | YES | 15 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-60a | 16-Sep-10 | NO | YES, several large spots | 250 to 300 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-30f | 15-Sep-10 | NO | YES, several small spots | 25 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-19b | 16-Sep-10 | NO | YES, several small spots | 10 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-36c | 16-Sep-10 | NO | YES, several small spots | 5 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-26e | 16-Sep-10 | NO | YES, several | 100 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-35b | 16-Sep-10 | NO | NO | no areas of exposed soil observed |
| Earhart 1-2 | EAR2-DU-13a | 16-Sep-10 | NO | YES, several | 250 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-27c | 16-Sep-10 | NO | YES, several | 100 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-40c | 16-Sep-10 | NO | YES, several | 25 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-14c | 16-Sep-10 | NO | YES, several | 150 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-28c | 16-Sep-10 | NO | YES, several | 180 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-42a | 16-Sep-10 | NO | YES, several | 4 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-12c | 16-Sep-10 | NO | YES, several | 400 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-14e | 16-Sep-10 | NO | YES, several | 175 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-37a | 16-Sep-10 | NO | YES, several | 5 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-52b | 16-Sep-10 | NO | YES, several | 55 sq ft exposed soil or sparsely grassed areas |

**Table 2**
**Removal Action No. 1**
**Visual Site Assessment Results**
**Joint Base Pearl Harbor-Hickam, Hawai'i**

| HC Neighborhood | DU Name | VSI date | Contiguous Bare Areas [1] > 200 sq ft | Bare Areas [2] < 200 sq ft | VSI Comments [3] |
|---|---|---|---|---|---|
| Earhart 1-2 | EAR2-DU-29a | 16-Sep-10 | NO | YES, several | 20 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-42b | 16-Sep-10 | NO | YES, several | 20 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-39a | 16-Sep-10 | NO | YES, several | 10 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-27d | 16-Sep-10 | NO | YES, several | 160 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-9e | 16-Sep-10 | NO | YES, several | 75 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-11b | 20-Sep-10 | NO | YES, several | 180 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-38d | 20-Sep-10 | NO | YES, several | 40 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-15b | 20-Sep-10 | NO | YES, several | 10 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-15d | 20-Sep-10 | YES | YES | perimeter fence installed/ DU will be excavated to 1 foot below final grade |
| Earhart 1-2 | EAR2-DU-23a | 22-Sep-10 | NO | YES, several | 180 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-23b | 22-Sep-10 | NO | YES, several | 120 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-11a | 27-Sep-10 | NO | YES, several | 65 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-2 | EAR2-DU-43a | 30-Sep-10 | NO | YES, several | 10 foot by 15 foot bare area under tree, several patchy areas. |
| Earhart 1-2 | EAR2-DU-22a | 30-Sep-10 | NO | YES, several | 35 sq ft exposed soil or sparsely grassed areas (inlcues 10 sq ft of bare soil in dog run) |
| Earhart 1-2 | EAR2-DU-27a | 30-Sep-10 | NO | YES, several | 30 sq ft exposed soil or sparsely grassed areas; drainage ditch is bare soil |
| Earhart 1-2 | EAR2-DU-35a | 30-Sep-10 | NO | YES, several | 3 sq ft exposed soil or sparsely grassed areas; few spots next to planter, |
| Earhart 1-2 | EAR2-DU-13g | 15-Oct-10 | NO | YES, several | 70 sq ft of sparsely grassed areas in backyards |
| Earhart 1-3 | EAR3-DU-32b | 4-Oct-10 | NO | YES | 30 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-3 | EAR3-DU-33c | 4-Oct-10 | NO | YES | 45 sq ft exposed soil or sparsely grassed areas |

**Table 2**
**Removal Action No. 1**
**Visual Site Assessment Results**
**Joint Base Pearl Harbor-Hickam, Hawai'i**

| HC Neighborhood | DU Name | VSI date | Contiguous Bare Areas [1] > 200 sq ft | Bare Areas [2] < 200 sq ft | VSI Comments [3] |
|---|---|---|---|---|---|
| Earhart 1-3 | EAR3-DU-33a | 4-Oct-10 | NO | YES | 90 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-3 | EAR3-DU-42i | 4-Oct-10 | NO | YES, several larger areas | 200 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-3 | EAR3-DU-34c | 8-Oct-10 | NO | YES | 40 sq ft exposed soil or sparsely grassed areas mainly along eastern edge of building |
| Earhart 1-3 | EAR3-DU-20a | 8-Oct-10 | NO | YES | 150 sq ft of sparsely grassed areas (western backyard) |
| Earhart 1-3 | EAR3-DU-28b | 11-Oct-10 | NO | YES | 50 sq ft exposed soil or sparsely grassed areas mainly between buildings |
| Earhart 1-3 | EAR3-DU-12b | 18-Oct-10 | NO | YES | 120 sq ft exposed soil or sparsely grassed areas (includes pet areas) |
| Earhart 1-3 | EAR3-DU-40e | 18-Oct-10 | NO | YES | 30 sq ft exposed soil or sparsely grassed areas |
| Earhart 1-3 | EAR3-DU-5a | 20-Oct-10 | NO | YES | 120 sq ft exposed soil or sparsely grassed areas (includes pet areas) |

**Notes**

DU decision unit
sq ft square feet
< less than
> greater than
VSI visual site inpsection
1 Excavation of DU only required if a single area of exposed soil has a total area >200 sq ft
2 Area of one or more exposed soil areas have a combined area of >200 sq ft, but since individual areas of exposed soil are <200 sq feet, only reseeding of exposed soil areas is required.
3 all measurements were made in the field and are an approximate.

**Table 3**
**Removal Action No. 1**
**Decision Units Completely or Partially Excavated**
**Joint Base Pearl Harbor-Hickam, Hawai'i**

| Neighborhood | DU Name | Action | Date Excavated / Backfilled (2010) |
|---|---|---|---|
| Earhart I-2 | EAR2-DU-42c | excavated (RA-3) | October 15 through 20 |
| Earhart I-2 | EAR2-DU-9d | excavated (RA-3) | October 20 through 25 |
| Earhart I-2 | EAR2-DU-9e | over-excavated | October 20 through 25 |
| Earhart I-2 | EAR2-DU-30f | partially excavated (eastern corner) | October 20 through 25 |
| Earhart I-2 | EAR2-DU-37a | partially excavated (western corner) | October 20 through 25 |
| Earhart I-2 | EAR2-DU-37d | partially excavated (eastern corner) | October 20 through 25 |
| Earhart I-2 | EAR2-DU-6c | excavated (RA-3) | October 25 through November 2 |
| Earhart I-2 | EAR2-DU-6b | over-excavated | October 25 through November 2 |
| Earhart I-2 | EAR2-DU-52a | excavated (RA-3) | October 25 through November 2 |
| Earhart I-2 | EAR2-DU-52b | over-excavated | October 25 through November 2 |
| Earhart I-2 | EAR2-DU-15d | excavated (RA-2) | Novemember 5 |
| Earhart I-3 | EAR3-DU-2a | excavated (RA-3) | November 18 through 22 |

**Notes**

DU decision unit
RA response action

# APPENDIX A

## Photographic Documentation

**Hickam Communities, Joint Base Pearl Harbor-Hickam –2010**
**Photographs of Removal Action No. 1 Implementation**

**Photo 1.** Earhart I-2: DU-42c, looking north, soil excavator starts on south side of the decision unit. 11/15/2010

**Photo 2.** Earhart I-2: DU-42c, looking west. 12-inch soil cut along back boundary of the decision unit. Gravel strip along building in the background remains in place. 11/15/2010

**Hickam Communities, Joint Base Pearl Harbor-Hickam –2010**
**Photographs of Removal Action No. 1 Implementation**

**Photo 3.** Earhart I-2: DU-42c looking south. Geotextile in placed on the floor of the excavation. Gravel strip for Building 6376 visible to left. 11/15/2010

**Photo 4.** Earhart I-2: DU-42c looking west. Excavator on grass outside excavated area during digging. 11/18/2010

**Hickam Communities, Joint Base Pearl Harbor-Hickam –2010**
**Photographs of Removal Action No. 1 Implementation**

**Photo 5.** Earhart I-2: DU-42c, looking north, soil excavation and load out into truck in the background. 11/18/2010

**Photo 6.** Earhart I-2: DU-42c, soil load out in final corner of the decision unit. Dump truck staged on protective pads. 11/18/2010

**Photo 7.** Earhart I-2: DU-9d and -9e, looking northwest. Protective pads laid out along eastern boundary, soil load-out begins in northwest corner of property.11/19/2010

**Photo 8.** Earhart I-2: DU-9d and -9e, looking west. Geotextile fabric is placed on the floor of the excavation as the excavation of the decision unit proceeds.11/20/2010

**Photo 9.** Earhart I-2: DU-9d and -9e, looking south. Utility markings are shown by the fluorescent pink spray painted markings on the lawn.11/20/2010

**Photo 10**. DU-9d and -9e, looking southwest. Photo shows the extent of the decision unit excavation and geotextile placed on the floor of the excavation. The cone marks the location of a utility box.11/20/2010

**Photo 11.** Earhart I-2: DU-9d and-9e, looking north. 11/21/2010

**Photo 12.** Earhart I-3: DU-2a, looking southwest. Note the 1-foot cut on the completed excavation. Geotextile fabric in place and secured on the floor of the excavation. 11/18/2010

**Photo 13.** Earhart I-3: DU-2a, looking southwest. Excavation north of sidewalk complete. Path to area for dump truck marked by geotextile fabric. 11/18/2010

**Photo 14.** Earhart I-3: DU-2a, looking south. Final area load out by front end loader. Note geotextile fabric placed on sidewalk to prevent soil from being spread outside of the decision unit. 11/22/2010

**Photo 15.** Earhart I-3: DU-2a, southeast corner following excavation and prior to placement of geotextile fabric on the floor of the excavation.11/22/2010

**Photo 16.** Earhart I-4: Soil management area, looking east. Geotextile fabric remains in place over bulk of the stockpile during loading operations. 11/22/2010

**Photo 17.** Earhart I-3: DU-2a, south of sidewalk following excavation and placement of geotextile fabric on the floor of the excavation. 11/22/2010

**Photo 18.** Earhart I-3: DU-2a, south of sidewalk. Irrigation lines in place, backfilling and grading in progress. Air monitor is visible on the fence above the sign. 11/23/2010

**Photo 19.** Earhart I-3: DU-2a, south of sidewalk. Grading completed following backfilling of the desicion unit.11/23/2010

**Photo 20.** Earhart I-3: DU-2a, looking southwest. Grading complete. Decision unit it ready for placement of topsoil and reseeding. 11/23/2010

# APPENDIX B

## Oversight Field Records

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# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/2/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor Oversight

**Equipment Used:**

**Weather:** Sunny

| Time | Project Activity |
|---|---|
| 745 | Tt arrived on site, deliver PTP form Health & Safety Meeting<br>Delta currently attending all hands health & safety meeting at community center. |
| 830 | Delta arrives on site, sets up for day's activity<br>- Two trucks on-site for soil hauling<br>- Soil removal begins in ~~SW~~ SE corner of DU-52 |
| 1015 | Excavator fuel truck on-site |
| 1025 | Jeff Edmonson on-site for status update for 5-minutes |
| 1030 | Lunch |
| 1200 | Return to work<br>- No soil import occurring at DU-9, screener is still inoperable<br>- Attempted to save small bush in front yard of 562 (Building 6379) fails. No way to clear all P.I. soil to depth without risking exposure |
| 1545 | Delta Completes soil load-out from DU-6/52,<br>- Total of 2.5 truck loads removed<br>- Begin to lay out remainder of geotextile |
| 1615 | Off-site |

# FIELD NOTES

**Project Title:** Earhart I-2 RAP Remediation
**Project #:** 100-SFD-T26535
**Date:** 11/3/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** PI Soil Removal

**Equipment Used:**

**Weather:** Overcast, scattered showers

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, drop off PTP ~~form~~ |
| | Health & Safety Meeting |
| | - Delta uncovering plastic sheeting from stockpile area - only room for 8-10 truckloads of soil unless the stockpile is regraded to consolidate soil to a greater height |
| | - Delta performing dry decontamination on excavator within DU-6/52 in preparation of moving it to DU-15 using flat bed trailer |
| | - Import soil being hauled into DU-9 and being graded to ~~within 2" of~~ (5m) depth of 10" |
| 930 | Jeff Edmonson on-site to review work so far |
| | Trailer on-site to move excavator over to DU-15 |
| | Light rain begins falling |
| 945 | Stockpiled soil consolidated to create more room for soil from DU-15 leaving 6"-12" of soil over front (gate-side) of enclosure |
| | Delta concerned about tracking mud when driving into and out of stockpile due to wet soil |
| | Heavy rubber mats laid out on lawn approaching DU-15 |
| 1015 | Grading continues at DU-9 |
| 1100 | Delta begins removing 6' chain link fencing from DU-9 |

11/3/10 Earhart 1-2 RAP Remediation

1130 Lunch

1600 Return to site

Remainder of afternoon spent grading DU to ensure 10" of clean fill

1530 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/5/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor oversight

**Equipment Used:**

**Weather:**

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site. drop off PTP form |
| | Health & Safety Meeting |
| | Delta laying out heavy rubber sheeting on grass from Ohauna Nui Circle to backyard of building 6341 |
| | Stockpile still covered by plastic sheeting |
| | No fencing around DU-2 in Earhart 1-3 |
| 730 | Delta on stand by due to car blocking pathway to DU, recieve call from Jeff Edmonson, he has contacted Hickam Communities to locate owner |
| 900 | Car moved out of the way - work begins on excavation. Digging begins in western portion of the DU work proceeds slowly due to tight quarters of houses |
| | Geotextile laid out over eastern portion of DU so that truck doesn't track soil in and out |
| 1030 | Fuel truck on-site for excavator |
| | One stretch of soil out base of stockpile needs to be covered - Delta is moving geotextile back as the leading edge of the stockpiled soil piles approaches the entry gate |
| 1130-1200 | Break for lunch |
| | Delta Covering stockpile (including plastic cover) with geotextile sheets and additional sand bag weights. Geotextile also secured with wire ties driven into the soil |

11/5/10 Earhart 1-2 RAP Remediation

~~JM~~ 1230 While excavation eastern portion of DU-15 the excavator struck a sewer line cleanout. Delta removed the concrete curtain and upper 4" of 4"-diameter piping, marked the damaged pipe with a hi-vis yellow shirt and continued excavation

Eastern portion of DU has very little maneuver room, haul out truck placed alongside perimeter fence outside of DU-15 for loading

1300 Discuss plans for DU-2 with Delta - They have no plans to excavate in Earhart 1-3. No construction fencing in place these. Delta plans to demob after completion of all backfilling at Earhart 1-2. Call Yvonne & ~~Jeff~~ G. to discuss

1315 Verify excavation depth of 12" within DU-15. Straight cut along perimeter except along back lanai where 3" cut at top and 1:1 slope down to 12"

Extra caution used along back of DU where 4"-diameter water line for irrigation is present at a depth of approximately 12". Hand tools used along the line

1430 Excavation completed, Delta begins decon of excavator treads in preparation for moving it off-site.

1500 Excavator loaded onto flat bed trailer along with all of the heavy rubber mats

Recommend to Delta that they re-secure geotextile in DU-52 where it is not fully secured.

1600 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/9/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny, low 80s

| Time | Project Activity |
|---|---|
| 800 | Tt arrived on site |
| | Health & Safety Meeting |
| | Delta active at DU-6/52. Bobcat moved from DU-9, currently levelling out imported soil at DU-6/52 |
| | - Irrigation lines installed at DU-6/52. Two trucks hauling soil from Onizuka to Earhart, dumping soil at entrance to DU in SE corner. Then the Bobcat spreads soil through DU. Delta also has one crewman using hand tools to do detail work around edges and plants |
| 1000 | Kevin Q. on-site to inquire about dust monitoring at I-3, DU-2 and at stockpile. I informed him that Delta was still mobilizing and that Tt would contact him before work begins. After talking to Yvonne: Kevin is to collect data from stockpile area today, even though the pile is covered. This is to gather background numbers before work starts for comparison later |
| 1030 | Observed that no irrigation lines are installed in the SW corner of site. Delta to halt work after eastern portion of DU is backfilled |

11/9/10 Earhart 1-2 RAP Remediation

1050 Follow dump truck to Orizuka to confirm imported soil is coming from correct source

1130 Delta breaks for lunch

1200 Resume work

Actus landscaping crew on-site installing additional irrigation lines on western portion of the DU-6/SZ

Delta has removed debris encountered during excavation - only unused construction fence rolls remain on-site

3 Soil trucks still importing material to site

1350 YCP on-site for rental car/administrative renewal

1320 YCP returns to site

Mark K. of Delta on-site to discuss status of irrigation lines. HC crew likely will not be complete by day's end, but will have enough completed to allow for backfilling in NW corner tomorrow. Delta expects to work tomorrow.

1445 HC clears piping and equipment, completed work and off-site

With piping in place, backfilling starts on western section of DU.

1500 Cast backfill Delivery

1530 off-site

TETRATECH



# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/10/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor oversight

**Equipment Used:**

**Weather:** Partly cloudy, scattered light rain

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, deliver PTP form to DB contractor office |
| | Health & Safety Meeting |
| | - Stockpile is covered, no dust monitoring installed yet |
| | - No activity at DU-2, 9, or 15 |
| | - Backfilling continues at DU-6/52 |
| | 3 Trucks loading soil from Onizuka. Bobcat used to grade soil |
| | Survey stakes in place, blue tape marks 12" above level of geotextile |
| 1100 - 1130 | Lunch |
| | Irrigation lines being installed in DU-15 by Actus, one truck shifted from hauling soil to DU-6/52 is now hauling to DU-15. Bobcat working at DU-6/52 along with laborer doing detail work with hand tools. |
| 1330 | Trucks done hauling soil to DU-6/52, now hauling to DU-15, soil will be left inside DU-15 until grading is complete and Bobcat can move to new DU. |
| 1400 | Mark K. on-site to review work at DU-15, still no word on timeframe for excavation at DU-2 |

11/10/10 Earhart I-2 RAP Remediation

1500 Delta completes soil import to both areas, need to complete grading fine detail work

1530 Water truck cleans surface of road outside D4-15

1545 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/11/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny, warm

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, deliv PTP form to DB office |
| | Health & Safety Meeting |
| | Delta has two man crew working at DU-15 to remove 6' chain link fencing. They replace it with 4' plastic orange construction fencing |
| | - Extra caution, exercising care with grading around broken clean-out. |
| | - Delta expresses some concern regarding drainage. They are matching original grade due to narrow width of DCA |
| 1130-1700 | Break for lunch |
| 1230 | Delta off-site due to ~~pers~~ family emergency with crew. Off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/2/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Partly sunny

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site |
| | Health & Safety Meeting |
| | Delta doing final detail work at DU-15, |
| 815 | Delta "decons" imported sand and soil inside DU using hand tools and broom, then moves work over to DU-6/52 |
| | At day's start there are two small stockpiles of soil staged on site. Some areas (in NW corner) of DU still have exposed geotextile. |
| 1030 | Maintenance truck on-site for Bobcat fueling |
| 1045 | Resume grading of soil, Bobcat completes NW quandrant, only detailing work remains in that portion of the site |
| 1120 | Photodocument current status of grading. Identify several low spots that need grading, especially along drainage swale west of building 6379. Discuss with Delta crew, they are doing general grading, will return to do fine smoothing after all stockpiles graded out and all geotextile covered |
| 1130-1200 | Lunch break |
| | Delta resumes grading operations |

11/12/10 Earhart 1-2 RAP Remediation

1220 off-site, Marlena Overton on-site for oversight
1430 Return to site
1530 off site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/15/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Light rain scattered

| Time | Project Activity |
|---|---|
| 715 | Tt arrived on site<br>Health & Safety Meeting |
| 745 | Delta arrives on site, begins installing orange construction fence along Ohana Nui Circle. Two man crew at work |
| 830 | Delta delivers additional fencing supplies to crew.<br>Using Bobcat to grade base open areas, hand tools to grade around perimeter |
| 930 | Delta moves to DU-9, installs additional fencing and details out grading |
| 1000 | Rain clears to partly cloudy |
| 1130 | Break for lunch |
| 1200 | Return to site<br>Work crew not present - call Mark K, but recieve no response - wait 30 minutes for return call |
| 1245 | Off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-3 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/23/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor oversight - backfilling of DU-2

**Equipment Used:**

**Weather:** Sunny, warm

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site |
| | Health & Safety Meeting |
| | - Work resumes backfilling on north side of sidewalk, grading continues with bobcat |
| | - Backfill source is stockpile on Orizuka II-3, follow truck to verify |
| | - Trucks are brushing clean backfill off after filling to prevent spillage on roadway. Soil is covered with tarp during transit |
| 820 | Maintenance truck on-site to refuel bobcat |
| | Kevin Quinn on-site to implement air monitoring |
| 830 | Work starts on south side of sidewalk |
| 900 | Last truck delivers soil to DU. Detail work begins to ensure minimum of 10" depth |
| 1000 | Delta completes grading operations |
| 1030 | YKP and Jeff on-site for brief update on status |
| 1100 | Off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-3 RAP Remediation
**Project #:** ~~205~~ 100-SFO-T26535-04
**Date:** 11/22/10 **Time:**
**Location:** Hickam Communities AFB
**Client:** Hickam Communities
**Tt Personnel:** S Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny, no breeze

| Time | Project Activity |
|---|---|
| 930 | Tt arrived on site |
| | Health & Safety Meeting |
| | - Delta is currently digging area south of sidewalk at DU-2 Bench and waste/rubbish can left in place, excavated around concrete support |
| | - Hickam Communities has crew installing irrigation piping on northern side of sidewalk |
| | - Delta elects to excavate to sidewalk south side of DU-2 |
| | Trucks are being loaded from DU, they are parked on the sidewalk with geotextile laid out below |
| | No air monitoring set up at DU-2 or stockpiles |
| 1120 | Soil load-out complete, truck sent off-site |
| 1130 - 1200 | Break for lunch |
| 1230 | Delta delivers a load of backfill to north of sidewalk, Bobcat brought down to DU-2 to begin grading |
| | When not grading backfill Delta is using hand tools to scrape dry soil off of front-end loader. Decon proceeds without water. |

TETRA TECH



11/22/10 Earhart 1-3 RAP Remediation

1340 Front end loader removed from site and parked within gate at ~~topsoil~~ JMP stockpiled soil yard

Delta laying out geotextile over south side of DU - HC prepping PVC for installation

1530 off-site

TETRA TECH



# FIELD NOTES

**Project Title:** 100-SFO-T26535
**Project #:** Earhart 1-3 RAP Remediation
**Date:** 11/18/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Soil removal at DU-2

**Equipment Used:**

**Weather:** Partly sunny

| Time | Project Activity |
|---|---|
| 715 | Tt arrived on site<br>Health & Safety Meeting |
| 730 | Delta on site removing fence, orange fencing<br>Excavation starts on north side of DU. Dump truck parks on south corner of DU. Geotextile fabric laid out in loading area to prevent dump truck from tracking PI soil out of DU |
| 830 | Shane (Delta) Mark Ti on-site to discuss extent of digging. Excavator to stay inside DU as marked out to prevent cross contamination. If excavator encounters geotextile before extent of DU, digging will halt in that area. Delta will not excavate soils placed on geotextile during construction of Earhart 1-4 neighborhood. |
| 900 | Single dump truck hauling soil to stockpile area which has been uncovered on loading (west) side |
| 945 | Delta excavates out along western DU boundary to locate extent of geotextile/clean fill. Boundary is approximately 3' beyond stake |
| 1130-1200 | Lunch break |

11/18/10 EARHART 1-3 RAP Remediation

1215 Mark M on-site, requests clafification of extent of excavation we talk with excavator - will excavate everything inside DU and extend out to west until either clean fill (coral sands) or geotextile

1330 Delta begins to lay out geotextile in excavated portion of DU - most soil north of playground and sidewalk

1400 Delta completes excavating, no more truckloads pulled out - begins covering stockpile and excavated area with geotextile

12 Truckloads removed from DU-2

1530 Off-site

738-8825

TETRA TECH



# FIELD NOTES

**Project Title:** 100-HFD-T26555
**Project #:** Earhart I-3 RAP Remediation
**Date:** 11/17/10 **Time:**
**Location:** Earhart I-3, Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor oversight

**Equipment Used:**

**Weather:** Sunny and warm

| Time | Project Activity |
|---|---|
| 800 | Tt arrived on site |
| | Health & Safety Meeting |
| | - GP arrives on site to install 6' chain link fence at DU-2, discuss placement with Mark and Shane and GP crew, fence to be installed along sidewalk and 2' out from all stakes. Satellite dish in NE corner to be outside fence line |
| | - Stockpile has been completely covered by geotextile over plastic sheeting |
| 1030 | GP completes (SM) installation of fencing from Earhart I-2, DU-42, ~~DU-6/52~~ and DU-9. Fencing still down at DU-15, notify GP crew of location of that fencing |
| 1100 | GP moves to DU-6/52 and begins removing 6' construction fencing. 4' fence to remain in place |
| 1200 | GP off for lunch |
| 1230 | GP returns, picks up dismantled fencing from DU-15 |
| 1300 | off-site |

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-570-4
**Project Title:** Earhart 1-2 and Earhart 1-3
**Date:** December 9, 2010
**Time:** 822
**Location:** Joint Base Pearl Harbor Hickam (JBPHH)
**Client:**
**Tt Personnel:** MOverton & A. Ungerleider

**Misc. Personnel:**

**Statement of Work:** Pesticide impacted (PI) soil Management oversight
**Equipment Used:** Camera

**Weather:** Upper 70

| Time | Project Activity |
|---|---|
| 822 | Tt arrived on site MO on site |
| 822 | Health & Safety Meeting |
| 8 | Truck observed off-loading soil in area between bldg 6377 and 6378 - (DU-E) (37 D+E) |
| 825 | A. Ungerleider on site MO & AU discuss soil backfill areas. TWO trucks bringing soil for backfill. Soil is from behind the ACTUS office. |
| 840 | - Trucks on site but not off loading soil. |
| 844 | - MO calls Y. Parry to ask why trucks are not off-loading soil. Y. Parry tells MO soil is coming from behind office but waiting on Frank Frietas to confirm that NO other soil added. |
| 907 | MO offsite |
| 0908 | Orange geotextile fabric is layed down at entrance to backfill area. |
| 0915 | Trucks resume hauling in and dumping soil onto this backfill area between bldgs 6377 and 6378. TWO trucks are hauling in soil. One is a Kamaili truck and the other is a "Hanson Construction truck. |
| 0935 | Jacobson workers backfill area with bobcat and rakes. They are spreading around the soil brought in by the trucks. |

TETRA TECH



0940 Tt Au mobilizes to stockpile area behind Actus offices.

0945 Tt Au observes Dozer loading "Amazon" truck with Soil from large stockpile. Stockpile is located between the 1st and second entrance to the Yard, on the Street side of the Yard up against the Fence. When Au enters the site, Kamalii truck is leaving the Yard with full load of soil.

0955 Tt Au observes same dozer/loader loading the "Amazon" truck heading for I-II loading an RHS Lee truck with different material from a different stockpile. This material is very rocky and is located just to the right of the 1st entrance to the yard

1005 Tt Au calls Tt MO + YP to identify the material being hauled out by RHS Lee and neither can identify it or know where it is going.

1020 Tt Au returns to I-2 and notices that material is being dumped in 2nd backfill area between buildings 6380 and 6379, at a+b of decision unit 52 and b+c of decision unit 6. Orange geotextile material is also placed here at the entrance to the fenced area.

1030 Tt Au returns to decision unit 37 where in d+E backfilling of soil is continuing by bobcat. This area is close to being completed.

1050 Tt Au returns to decision units 6+52 to observe continued dumping and backfilling of material

1100 Workers break for lunch.

1115 Jacobson worker informs Au that roughly 14 more loads of soil are needed hereat du's 52+6.

1200 Tt Au off to lunch + to get Hickam I.D. card renewed. Tt Au notices that at this point roughly 4 loads of soil have been dropped at Du's 52+6.

1300 Tt Au back on site.

1305 Tt Au observes backfilling continuing at DU 37(D+E).

1327 Backfilling 2" of soil at DU 37(D+E) has been completed. Bobcat mobilizes to Du's 52+6. Visual site check looks as if soil was backfilled 2" on top of the coral material that was previously backfilled to 10".

1340 Tt Au observes backfilling being conducted at DU's 52 and 6. Bobcat being used to spread soil left by hauling trucks.

1352 Tt Au observes hauling trucks continuing to dump soil at Du's 52 (A+B) + 6 (B+C).

1435 Tt Au observes hauling trucks continuing to dump soil at Du's 52(A+B) and 6 (B+C). Bobcat is spreading the soil in the NE section of the area.

1445 Tt Au observes Jacobson worker spreading soil at DU 37(D+E) with a rake in areas that needed it.

1527 Tt Au notices small area by Ohana nui circle at DU 37 that needs to be backfilled beside sidewalk. Worker is still present spreading with rake.

1535 Tt Au off site. Operators are staying until 1730 but no more trucks are hauling in material.

NOTE: Times on Camera are 4:14 before time that appears on Camera up until Image ID 180-0584 due to Time setting on Camera being incorrect.

TETRA TECH

Page _ of _

# PHOTOGRAPHIC LOG

**Project Title:** Earhart I-2 & Earhart I-3

**Date:** December 9, 2010

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 0839 | 180-0569 | Soil stockpiled for backfilling @ DU 37 | | |
| 0842 | 180-0570 | Jacobson workers laying orange geotextile at | | |
| | | entrance to DU 37. | | |
| 0915 | 180-0571 | Hauling truck dumping soil at DU 37. | | |
| 0934 | 180-0573 | Jacobson workers spreading backfill material | | |
| | | with bobcat and rake @ DU 37 | | |
| 0954 | 180-0575 | "Amazon" hauling truck used for hauling material | | |
| | | to DU 37 in Earhart I-2 getting soil | | |
| | | from stockpile @ Yard behind Artis office | | |
| 0958 | 180-0577 | RHS Lee truck getting loaded with different | | |
| | | "rocky" material from different stockpile at the | | |
| | | same yard. Same loader used for I-2 | | |
| | | trucks is loading the RHS truck. | | |
| 1025 | 180-0580 | hauling truck dumping soil at DU's 52+6. | | |
| 1032 | 180-0582 | Bobcat backfilling soil at DU 37. | | |
| 1327 | 180-0584 | DU 37 completely backfilled. | | |
| 1340 | 180-0585 | DU's 52 & 6 being backfilled. | | |
| 1520 | 180-0586 | Stockpiles from dumped loads at DU's 52&6. | | |
| 1527 | 180-0587 | Small area yet to be backfilled at DU 37. | | |
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TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 and Earhart I-3
**Project #:** 100-SFO-T
**Date:** December 13, 2010 **Time:** 0800
**Location:** Earhart neighborhood, Hickam AFB
**Client:** HCH/Aetus
**Tt Personnel:** Aron Ungerleider

**Misc. Personnel:** Louie (Jacobson)

**Statement of Work:** PI soil management oversight

**Equipment Used:** Camera

**Weather:** Hot, sunny

| Time | Project Activity |
|---|---|
| 0800 | Tt arrived on site |
| 0805 | Health & Safety Meeting |
| 0810 | Tt AU drives around Earhart I-2 and Earhart I-3 to check where Jacobson personnel are working today. Tt AU notices that personnel are only at decision units 52+6. |
| 0825 | Tt AU notices that Jacobson workers are backfilling decision units 52+6. All of the stockpiles that were present at the end of the day last Thursday are still present. bobcat is being used for backfilling. |
| 0835 | Tt AU notices that corner closest to Earhart and ohana mi circle at decision unit 37 still needs some soil. Recent rain may have created small gaps where more backfilling is needed. |
| 0850 | Tt AU meets with Louie (Jacobson) who tells him that no soil will be hauled in today due to dampness of soil. He said soil will most likely be hauled in tomorrow. |
| 1000 | Jacobson workers continue to backfill soil in decision units 52+6 primarily working in 6B. Bobcat is used as well as rake. |
| 1100 | workers break for lunch. |
| 1145 | workers resume backfilling at 52+6 still working primarily at 6B. |
| 1205 | Tt AU offsite. |

TETRA TECH



## Photographic Log

| Time | Image I.D. | Description |
|---|---|---|
| 826 | 180-0588 | Decision unit 52+6. w/ soil stockpiles |
| 826 | 180-0589 | Decision unit 52+6 w/ soil stockpiles |
| 0832 | 180-0590 | SE corner of decision unit 37 |
| 1143 | 180-0591 | Decision unit 52+6. |
| 1143 | 180-0592 | SE corner of DU 52+6 (previously 52b) in foreground. |
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TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 & I-3
**Project #:** 100-SFO-T
**Date:** December 14, 2010 **Time:** 0800
**Location:** Earhart I-2 + I-3, Joint base Pearl Harbor Hickam (JBPHH)
**Client:** ACH / (Actus)
**Tt Personnel:** Aron Ungerleider

**Misc. Personnel:**

**Statement of Work:** PI Soil management oversight.

**Equipment Used:** Camera

**Weather:** Hot, Sunny.

| Time | Project Activity |
|---|---|
| 0800 | Tt arrived on site |
| 0805 | Health & Safety Meeting |
| 0810 | Tt Au drives around both Earhart I-2 and Earhart I-3 |
| | Tt Au notices Jacobsen personnel only at DU 52+6. |
| 0818 | Tt Au observes workers backfilling soil at DU's 52+6 with bobcat and rake. |
| 0820 | Tt Au observes there are no more "gaps" in backfill at southeast corner of building 37. |
| 0822 | Tt Au speaks on the phone with Louie from Jacobson he says today they won't haul in stuff from the yard behind the Actus offices, but instead they will use their flatbed to haul extra soil from 52+6 to DU 15. He says they will begin doing this at 10:00 AM. |
| 0840 | Tt Au observes workers backfilling soil with bobcat and rake at DU's 52+6. |
| 0944 | Tt Au observes bobcat operator refueling the bobcat on the DU. No leak or spill is observed. |
| 1000 | Tt Au observes Jacobsen flatbed truck arrive at DU 52+6. Bobcat begins to load the flatbed with soil stockpiled for backfilling at DU 52+6. workers lay down tarp on curb to catch fallen / loose soil falling onto the curb. |
| 1012 | Tt Au observes that the flatbed has a full load of soil now, the load has been covered with a blue plastic tarp. |
| 1015 | Jacobsen flatbed departs DU 52+6, drives to DU 15 (D) behind bldg. 6341 in Earhart I-2. Jacobsen backs into DU and dumps soil onto DU. |
| 1050 | Jacobsen flatbed arrives at DU 15 (D) for 2nd load of soil brought from DU 52+6. |
| 1100 | Workers break for lunch, Tt Au offsite for lunch. |
| 1200 | Tt Au onsite at DU 52+6. |

TETRA TECH



Jacobsen workers continue to backfill DU 52+6. Flatbed continues to bring soil to DU 15(d).

1230 Flatbed dumps load of soil at DU 15(d).

1257 Flatbed dumps another load of soil from DU 52+6 at DU 15.

1324 Flatbed dumps another load of soil at DU 15.

1330 Flatbed driver tells T+A that they are finished bringing soil to DU 15 and that they will begin to bring soil to DU 2.

1357 Flatbed arrives with 1st load of soil from 52+6 at DU 2.

1359 Flatbed dumps soil on DU 2. (behind bldg. 6301)

1421 Flatbed dumps second load of soil from 52+6 at DU 2.

1427 T+A mobilizes to DU 52+6. Flatbed is being loaded with soil to take to DU 2. Several stockpiles still remain on the DU.

1435 T+A offsite.

TETRA TECH



# PHOTOGRAPHIC LOG

Project Title: Earhart I-3 and I-2

DATE: Dec. 14, 2010

| Time | Photo I.D. | Description |
|---|---|---|
| 0818 | 180-0593 | Du 52+6. |
| 0819 | 180-0594 | SE corner of DU 37. |
| 0851 | 180-0595 | looking west on Du 52+6. |
| 0944 | 180-0596 | refueling bobcat on Du 52+6. |
| 1005 | 180-0598 | loading soil from Du 52+6 onto Jacobsen flatbed. |
| 1005 | 180-0599 | loading soil from Du 52+6 onto Jacobsen flatbed. |
| 1013 | 180-0601 | Covering flatbed soil load with tarp |
| 1019 | 180-0602 | Du 15(2) behind bldg. 6341. |
| 1025 | 180-0603 | dumping soil onto Du 15 |
| 1214 | 180-0604 | Du 52+6. |
| 1216 | 180-0605 | loading soil from Du 52+6 into flatbed over geotextile. |
| 1230 | 180-0606 | Dumping soil at Du 15 |
| 1230 | 180-0607 | Dumping soil at Du 15 |
| 1257 | 180-0608 | Dumping soil at Du 15 |
| 1324 | 180-0609 | Dumping soil at Du 15. |
| 1330 | 180-0610 | Du 52+6. |
| 1357 | 180-0611 | Driving into Du 2 to dump soil brought from Du 52+6. |
| 1359 | 180-0612 | Dumping soil from 52+6 Du at Du 2. |
| 1421 | 180-0613 | Dumping soil at Du 2. |
| 1427 | 180-0614 | Du 52+6 w/ remaining stockpiles. |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 & Earhart I-3
**Project #:** 100-SFO-T
**Date:** December 15, 2010 **Time:** 0800
**Location:** Joint Base Pearl Harbor Hickam (JBPHH)
**Client:** HCH/ACTUS
**Tt Personnel:** Aron Ungerleider

**Misc. Personnel:**

**Statement of Work:** PI Soil management oversight

**Equipment Used:** Camera

**Weather:** Hot, sunny

| Time | Project Activity |
|---|---|
| 0800 | Tt arrived on site |
| 0805 | Health & Safety Meeting |
| 0810 | Tt Av drives around the decision units to see where Jacobsen personnel are working today And to check on the backfill status for each decision unit. Tt Av notices several stockpiles on DU 2 that haven't been spread yet. Tt Av notices personnel using bobcat to backfill DU 52+6 which is almost entirely backfilled. Tt Av notices DU 37 is still completely backfilled. Tt Av notices workers using rake And Mini bobcat at DU 15 which is About ½ complete. |
| 0830 | Tt Av remains At DU 15 watching workers backfill this decision unit. |
| 0915 | Tt Av mobilizes to DU 52+6 where workers continue to backfill with A bobcat. Unit is 95% complete. |
| 1020 | Tt Av mobilizes back to DU 15. Watches workers finish this DU. |
| 1030 | Tt observes Jacobsen workers leave this DU As they have completed backfilling it. A small pile remains in the center of the DU beside a slight depression where A water valve exists. Workers are leaving this unbackfilled for plumbing access. |
| 1041 | Tt Av mobilizes to DU 2 where workers begin spreading soil that is Already stockpiled on the DU using Mini bobcat And rake. |
| 1100 | Workers break for lunch. Tt Av offsite lunch. |
| 1145 | Tt Av back onsite at DU 2. Workers continue to spread soil on this DU with rake and mini bobcat. |
| 1202 | Tt Av calls Lexie (Jacobsen) who tells him they won't be having soil out of the yard behind the Actus building today. |
| 1230 | Tt Av mobilizes to DU 52+6. Backfilling has been completed at this DU. |
| 1240 | Tt Av offsite. |

TETRA TECH



## Photographic Log

Date: 12-15-2010

| Time | Photo I.D. | Description |
|---|---|---|
| 0821 | 180-0615 | DU 2. |
| 0825 | 180-0616 | DU 52+6. backfilling w/ bobcat. |
| 0829 | 180-0617 | DU 15. Backfilling w/ mini bobcat |
| 0830 | 180-0618 | DU 15. backfilling w/ rake + mini. bobcat. |
| 0927 | 180-0619 | DU 15. backfilling w/ rake + mini bobcat |
| 0949 | 180-0620 | DU 52+6. Backfilling w/ bobcat |
| 1031 | 180-0621 | DU 15. |
| 1050 | 180-0622 | DU 2. Backfilling |
| 1229 | 180-0623 | DU 2. Backfilling |
| 1233 | 180-0624 | DU 52+6. Completed w/ backfilling. |
| | | |
| | | |
| | | |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 & I-3
**Project #:** 100-SFO-T
**Date:** December 16, 2010 **Time:** 0800
**Location:** Earhart neighborhood, JBPHH
**Client:** HCH/Actus
**Tt Personnel:** Aron Ungerleider, Yvonne Pant

**Misc. Personnel:**

**Statement of Work:** PI soil management oversight

**Equipment Used:** Camera

**Weather:** Hot, sunny

| Time | Project Activity |
|---|---|
| 0800 | Tt arrived on site |
| 0805 | Health & Safety Meeting |
| 0810 | Tt A drives around all sites at I-2 and I-3 to see where workers are and what progress has been made at each site. |
| 0824 | Tt A notices that backfilling has been completed at DU 2. |
| 0828 | Tt A notices that backfilling has been completed at DU 52+6. |
| 0829 | Tt A notices JAcobsen workers taking soil at DU 37. workers are also working on sprinklers or some sort of irrigation lines. |
| 0830 | Tt A arrives at DU 42(C) to check on status of the DU. No soil has been left here yet although mini bobcat is here. Tt A waits here for workers to arrive. |
| 0840 | After no workers arrive Tt A mobilizes to Yard behind Actus offices to see if flatbed is loading soil from stockpiles. |
| 0845 | Tt A arrives at the Yard. NO JAcobsen vehicles present. Tt A calls Louie (JAcobsen) to inquire as to today's planned work. He says they will begin hauling soil out of the Actus Yard soon to DU 42(C). |
| 0905 | Tt A returns to DU 37 where workers are still raking and conducting irrigation work. |
| 0945 | JAcobsen flatbed makes 1st trip to Actus Yard. Tt A follows in his personal vehicle. |
| 1000 | JAcobsen flatbed loads 1st load of soil from screened stockpile in the Yard. Takes it to DU 42. |
| 1011 | JAcobsen flatbed dumps soil at DU 42. Operator on mini bobcat spreads soil around the DU. |

TETRA TECH



| | |
|---|---|
| 1020 | Jacobsen flatbed makes 2nd trip to get soil from Acres Yard |
| 1024 | Jacobsen flatbed arrives at Yard. loader loads him with soil. |
| 1036 | Jacobsen flatbed dumps 2nd load of soil at DU 42. operator on Mini bobcat spreads soil around the DU. |
| 1045 | Jacobsen flatbed arrives at Acres Yard to get 3rd load of soil. |
| 1100 | workers break for lunch. Tt Av ~~[illegible]~~ A offsite lunch. |
| 1150 | Tt Av onsite @ DU 42 to meet Tt YP. workers are not working. |
| 1220 | After waiting for work to resume at DU 42, Tt Av departs DU to go fill out photo log before leaving for the day. |
| 1300 | Tt Av offsite. |

## Photographic Log

| Time | Photo I.D. | Description |
|---|---|---|
| 0824 | 180-0625 | DU 2. Completed. |
| 0828 | 180-0626 | DU 37. workers caking. |
| 0828 | 180-0627 | DU 37. workers caking. |
| 0830 | 180-0628 | DU 42. Yet to commence work. |
| 0830 | 180-0629 | DU 42. Yet to commence work. |
| 1010 | 180-0630 | DU 42. 1st load of soil being dumped. |
| 1011 | 180-0631 | DU 42 1st load of soil being dumped. |
| 1014 | 180-0632 | Mini bobcat being used to spread soil around DU 42. |
| 1024 | 180-0633 | 2nd load of soil being loaded at Acres Yard. |
| 1027 | 180-0634 | Soil stockpile that is used for backfilling DU's @ I-2 & I-3. |
| 1036 | 180-0635 | 2nd load of soil being dumped at DU 42. |
| 1046 | 180-0636 | Jacobsen truck at Acres Yard ready to be loaded with soil. |
| 1047 | 180-0637 | Jacobsen flatbed being loaded with 3rd soil load of day. |

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-sto-

**Project Title:** Earhart 1-2

**Date:** December 17, 2010

**Time:** 1230

**Location:** Joint Base Pearl Harbor-Hickam (JBPHH) / ~~Earhart~~ 1-2

**Client:** Hickam Communities (HC) / ACTUS

**Tt Personnel:** M. Overton

**Misc. Personnel:**

**Statement of Work:** Pesticide-Impacted (PI) Soil Management oversight

**Equipment Used:** Camera

**Weather:** 80's sunny - partly cloudy

| Time | Project Activity |
|---|---|
| 1230 | Tt arrived on site MO on site |
| 1230 | Health & Safety Meeting |
| | - Jacobsen working in area between bldg #6379 & . Installing sprinklers using trencher (DU ) |
| | - Between bldg #6376 & #6375 - soil backfilled |
| | - Between driveways at bldg 6375 - soil backfilled |
| | MO offsite. |
| 1240 | MO offsite. |

TETRA TECH



# PHOTOGRAPHIC LOG

**Project Title:** Earhart 1-2

**Date:** December 17, 2010

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 1235 | 158-6788 | Between bldg 6379 & installing sprinklers | – | Landscapers |
| 1239 | 158-6789 | Between bldg # 6376 & 6375 | | - soil backfilled |
| 1240 | 158-6790 | Between driveways at bldg 6375 | | - soil backfilled |

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-sto-

**Project Title:** Earhart 1-2 & Earhart 1-3

**Date:** December 20, 2010

**Time:** 1043

**Location:** Joint Base Pearl Harbor-Hickam (JBPHH

**Client:** Hickam Communities (HC) / Actus

**Tt Personnel:** M. overton

**Misc. Personnel:**

**Statement of Work:** Pesticide-Impacted (PI) Soil Management Oversight

**Equipment Used:** camera

**Weather:** 80's overcast, rainy

| Time | Project Activity |
|---|---|
| 1043 | Tt arrived on site MO on site |
| 1043 | Health & Safety Meeting |

- Area between bldg 6378 & 6380 - backfilled and hydroseeded
- Area between bldg 6378 & 6377 - backfilled and hydroseeded
- Area between bldg 6376 & 6375 - backfilled and hydroseeded
- Area between driveways of bldg 6375 backfilled and hydroseeded
- Area behind bldg 6341 backfilled & hydroseeded, small area excavated & stockpiled next to excavation. Does not appear orange geotextile penetrated
- Area across from bldg. 6457 - backfilled & hydroseeded.

All areas however backfilled & hydroseeded however rain has caused some rill erosion in multiple areas. MO talks to David (Actus) on site and is told that rain cause some soil/hydroseed to come out into roadway & hydroseeder on site today filled w/

water to clean off sidewalk & roadways.
1112 - M10 offsite.

TETRA TECH



## PHOTOGRAPHIC LOG

**Project Title:** Earhart 1-2 & Earhart 1-3

**Date:** December 20, 2010

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 1052 | 159-6816 | Between bldg 6379 & 6380 - backfilled & hydroseeded | | |
| 1055 | 159-6817 | Between bldg 6378 & 6377 - backfilled & hydroseeded | | |
| 1059 | 159-6818 | Between bldg 6376 & 6375 - backfilled & hydroseeded | | |
| 1059 | 159-6819 | Between driveways at bldg 6375 - backfilled & hydroseeded | | |
| 1104 | 159-6820 | Bldg 6341 - backfilled & hydroseeded (small excavation area) | | |
| 1104 | 159-6821 | Bldg 6341 - backfilled & hydroseeded | | |
| 1111 | 159-6822 | Across from bldg 6457 - backfilled & hydroseeded. | | |

# APPENDIX C

## Summary of Findings Reports for Import Soil Sampling

December 1, 2010

Mladena Yankova Kukin mladena.yankovakukin@actuslendlease.com
Development Manager
Hickam Communities LLC
211 Mercury Street
Honolulu, HI 96818

**Subject: TO#56 (Mod 4): Final Summary of Findings Report on Sampling and Chemical Analysis of Import Soil Stockpile Located at the RHS Lee Baseyard, Pearl City, Hawai`i**

Dear Ms. Yankova:

This final summary of findings report (SoFR) presents the results of import stockpile soil sampling and chemical analysis Tetra Tech performed on behalf of Hickam Communities LLC (HC) under Task Order #56 Modification 4. This report documents the sampling and analysis of one approximately 800-cubic yard (CY) soil stockpile generated from a mass excavation conducted at Windward Community College (WCC) (Greco 2010), Tax Map Key (TMK) 1-4-5-023:014. The stockpile is currently located at the RHS Lee construction yard, Pearl City, O`ahu, Hawai`i (hereinafter the "Site").

The purpose of this investigation was to evaluate the stockpiled soil for the presence (if any) of organochlorine pesticides, metals, and total petroleum hydrocarbons (TPH) as diesel and motor oil, and to determine the suitability of the soil for import as clean backfill for the HC including the neighborhoods Earhart I-2 and Earhart I-3. The soil sampling and evaluation of the analytical results was done in accordance with the *Pesticide Impacted Soils Investigation and Management Program Manual* (Program Manual) (Tetra Tech 2009), and the *Removal Action Work Plan No. 1* (RO# 1) (Tetra Tech 2010b).

## FIELD METHODS

Tetra Tech mobilized to WCC for stockpile sampling on November 2, 2010. All sampling activities were conducted in accordance to the Sampling Analysis Plan (SAP) prepared for this sampling event (Tetra Tech 2010a). A copy of the field records is provided in Appendix A.

Before sampling, the stockpile was separated into two decision units (DU) (WCC-STP-1 and WCC-STP-2) as shown in Figure 1. Tetra Tech followed the multi-incremental (MI) soil sampling protocols recommended by Hawai`i Department of Health (HDOH) for this event (HDOH 2009). For the stockpile MI soil samples, Tetra Tech collected seventy-five (75) soil increments (subsamples) using dedicated stainless steel spoons. Samples were collected from each DU at depths ranging from the surface down to the original grade. Soil at depths greater than 6-inches was collected from the bucket of an excavator, which safely accessed and collected material from various locations from the interiors of the individual stockpile decision units (DU). For quality assurance/quality control purposes, Tetra Tech collected one MI soil sample in triplicate (one MI sample and two replicates).

The collected soil was composited in the field by placing the sample into a 1-gallon sealable plastic bag. To preserve sample integrity during sample collection and transport, the MI soil sample bag was sealed, labeled, and placed into an ice-cooled insulated chest for transport under a chain-of-custody to the analytical laboratory.

## ANALYTICAL METHODS

A total of four MI soil samples were submitted to Torrent Laboratory, Milpitas, California for analysis. The MI soil samples were prepared according to the HDOH MI sub-sampling protocol (HDOH 2009). Material from each 1-gallon bag was air dried at room temperature, sieved through a 2 millimeter (mm) sieve. The sieved material was then spread out and thirty sub-samples collected by the laboratory were combined into one MI sample and prepared for analysis. Each MI soil sample was analyzed for:

- Organochlorine Pesticides by US Environmental Protection Agency (EPA) Method 8081A;
- Resource Conservation and Recovery Act (RCRA) 8 Metals by EPA Method 6010; and
- Total Petroleum Hydrocarbons (TPH) as diesel and motor oil by EPA Method 8015B, with silica gel cleanup.

## ANALYTICAL RESULTS

The analytical results were compared to the following screening levels:

- The HDOH Tier 1 Environmental Action Levels (EALs) for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is not a drinking water resource (Table B-1) (HDOH 2009b);
- The Site-specific Tier 2 EALs for aldrin, dieldrin, and technical chlordane established for HC property (Tetra Tech 2009);
- The Tier 2-based cumulative risk was calculated for organochlorine pesticides and compared to the 1 x $10^{-5}$ cumulative risk threshold established for HC property (Tetra Tech 2009).

The laboratory analytical results are summarized below, and presented in Table 1. A copy of the analytical report is provided Appendix B. Only analytes detected at or above the laboratory reporting limit are shown in Table 1.

### Pesticides

- Organochlorine compounds were detected at concentrations at above the laboratory reporting limits in all of the MI soil samples collected from the stockpile.

Dieldrin was detected in all four MI soil samples at concentrations ranging from 0.0065 milligrams per kilogram (mg/kg) to 0.038 mg/kg. The detection for dieldrin in WCC-STP-1 is below the HDOH Tier 1 EAL for dieldrin (0.03 mg/kg), but exceeds the Tier 1 EAL for the triplicate sample collected for WCC-STP-2. All of the detections are below the Tier 2 EAL.

- Aldrin was detected in the triplicate sample collected from WCC-STP-2 at concentrations ranging from 0.099 mg/kg to 0.021 mg/kg which are below the Tier 1 EAL for aldrin (0.029 mg/kg). Aldrin was not detected in the sample collected for WCC-STP-1
- Minor concentrations of 4,4 –dichlorodiphenyldichloroethane (DDD) were detected in two of the three MI soil samples collected from STP-WCC-2. These detections are below the Tier 1 EAL for DDD (2.0 mg/kg). There is no Tier 2 EAL established for HC property.

### Metals

- The RCRA-8 metals lead and arsenic were detected at concentrations at or above the laboratory reporting limits in all of the MI soil samples collected from the stockpile.

- Arsenic was detected in all four MI soil samples at concentrations ranging from 2.2 mg/kg to 4.7 mg/kg; however these detections are below the Tier 1 EAL for arsenic (20 mg/kg).
- Lead was detected in all four MI soil samples at concentrations ranging from 6.9 mg/kg to 7.7 mg/kg; however these detections are below the Tier 1 EAL for lead (200 mg/kg).

### Petroleum Hydrocarbons

- TPH as diesel and motor oil were detected at concentrations above the laboratory reporting limits in the MI soil samples collected from the stockpile.
- TPH as diesel was detected in MI soil sample WCC-STP-1 at a concentration of 6.8 mg/kg, which is below the respective Tier 1 EAL (500 mg/kg). TPH as diesel was not detected in the triplicate sample WCC-STP-2.
- TPH as motor oil was detected in all four MI soil samples at concentrations ranging from 44 mg/kg to 66 mg/kg; however these detections are below the respective Tier 1 EAL (200 mg/kg).

## CUMULATIVE RISK

Cumulative risk is the sum of the carcinogenic risks of the individual compounds. For HC sites, the calculated Tier 2-based cumulative risk posed by aldrin, chlordane, and dieldrin is compared to the $1 \times 10^{-5}$ risk threshold established for HC (Tetra Tech 2009). The cumulative risk can be exceeded even if there are no detections above the HC Tier 2 EALs. If the calculated cumulative risk exceeds the risk threshold, the soil is designated as pesticide-impacted (PI) soil.

- The calculated Tier 2-based cumulative risk does not exceed the $1 \times 10^{-5}$ risk threshold any of the MI soil samples collected from the WCC stockpile.

## CONCLUSIONS

Based on Tetra Tech's evaluation of the analytical results, and the project plans (Tetra Tech 2009 and 2010b), Tetra Tech concludes that the soil in the WCC stockpile located at the Site **is not PI soil** and is therefore suitable for unrestricted use on HC property.

- Organochlorine pesticides were detected at concentrations at or above laboratory reporting limits in all of the MI soil samples collected from the WCC Stockpile. There are no detections exceeding the respective Tier 2 EALs established for HC

property, and the Tier 2-based calculated risk is below the 1 x $10^{-5}$ risk threshold established for HC property (Tetra Tech 2009). Detections for dieldrin were at concentrations exceeding the Tier 1 EAL for dieldrin.

- There were no detections of RCRA-8 metals or petroleum hydrocarbon compounds at concentrations exceeding the respective Tier 1 EALs.

## REFERENCES

CFR (Code of Federal Regulations). 2010. CFR Title 40: 261.24 Table 1—Maximum Concentration of Contaminants for the Toxicity Characteristic. Accessed at internet website URL: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9b8d30a98d2bd8ffe90e6b8042d2ffc6&rgn=div8&view=text&node=40:25.0.1.1.2.3.1.5&idno=40

Greco, Arthur. 2010. Actus Superintendent. Email to Yvonne Parry (Tetra Tech) on November 16

HDOH (Hawai`i Department of Health). 2009a. *Interim Final Technical Guidance Manual for Implementation of the Hawaii State Contingency Plan.* Prepared by: Hawai`i Department of Health Environmental Management Division. June 21.

HDOH (Hawai`i Department of Health). 2009b. HDOH Environmental Action Levels, Supplemental Models in Excel Format, EAL Surfer. March 2009. Accessed at internet website URL: http://hawaii.gov/health/environmental/hazard/eal2005.html

Tetra Tech. 2009. *Pesticide-Impacted Soils Investigation and Management Program Manual, Hickam Air Force Base,* O`ahu, Hawai`i. Prepared for Hickam Community Housing LLC. May 2009.

Tetra Tech. 2010a. *Sampling and Analysis Plan, Stockpile Sampling, RHS Lee Construction Yard, Pearl City, Hawai`i.* Prepared for Prepared for Hickam Communities LLC. November 2, 2010.

Tetra Tech. 2010b. *Removal Action Work Plan No. 1, Immediate Actions for Pesticide-Impacted Soil, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, O`ahu Hawai`i.* Prepared for Hickam Communities, LLC. DCN 2653504.001.F05. October 11, 2010.

If you have any questions or comments about this report, please do not hesitate to contact me at (415) 490-2975 or Yvonne Parry in our Honolulu office, at (808) 533-3366. Tetra Tech appreciates the opportunity to provide continued environmental support to HC.

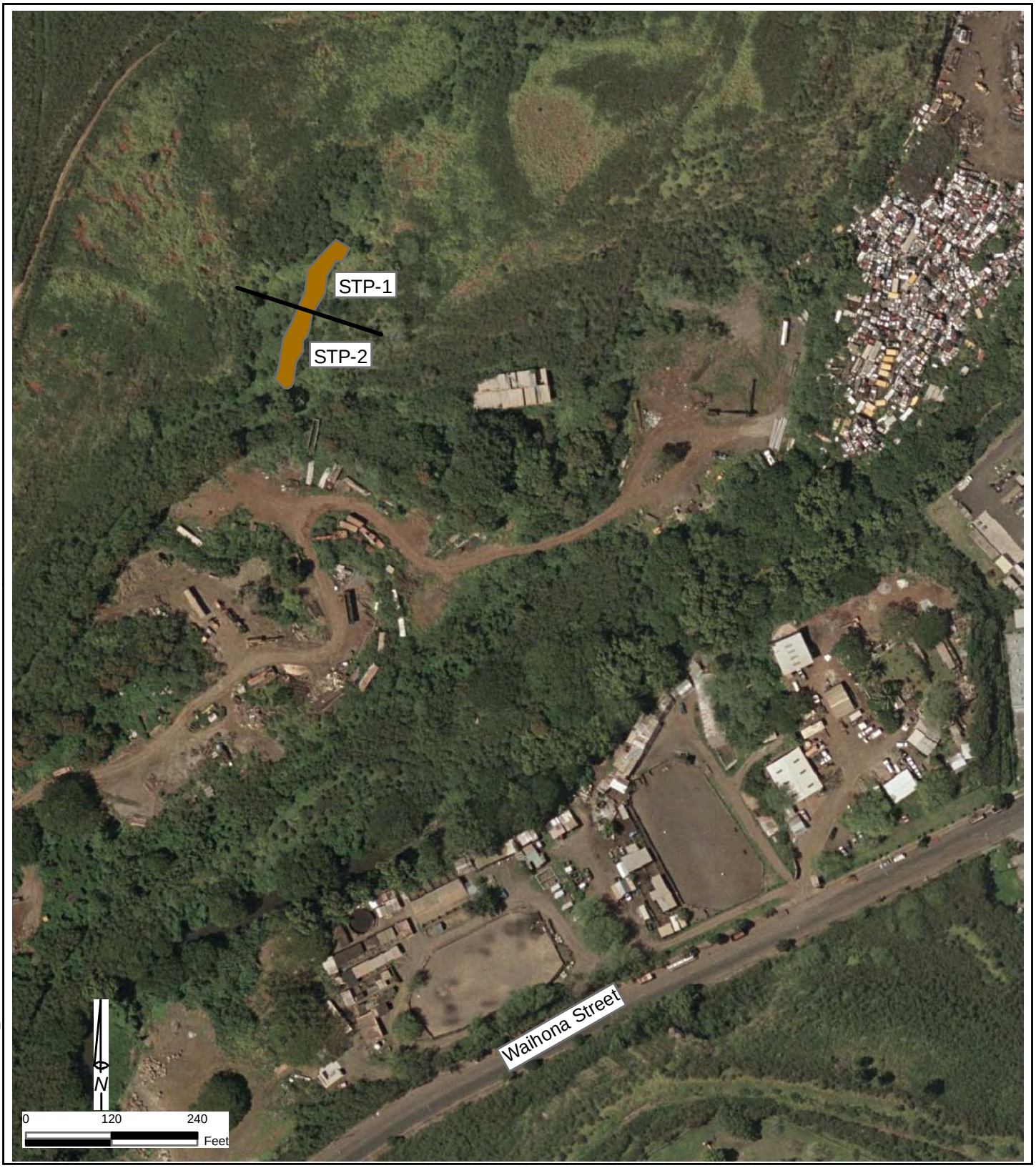
Sincerely,
**TETRA TECH**

Gail Eaton, P.G.
Senior Geologist
Tetra Tech

Attachments:
Figure 1 – WCC Stockpile Location
Table 1 – Summary of WCC Stockpile Analytical Results
Appendix A – Field Records
Appendix B – Laboratory Analytical Reports

cc: Gary Floyd, Program Manager, Tetra Tech
Tom Whitehead C.HG., Technical Lead, Tetra Tech
Yvonne Parry, Project Manager, Tetra Tech

# FIGURE

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**Legend:**

Stockpile Area

# *RHS Lee Stockpile Location Map*

Pearl City, O'ahu, Hawai'i

Tetra Tech, Inc

**Figure 1**

# TABLE

**Table 1**
**Hickam Communities**
**Analytical Results for Soil**
**RHS Lee Stockpile**
**Hickam Air Force Base, O'ahu, Hawai'i**

| Sample ID → | HDOH Tier 1 EAL[1] (mg/kg) | HC Tier 2 EAL[2] (mg/kg) | WCC-STP-1 (mg/kg) | WCC-STP-2A (mg/kg) | WCC-STP-2B (mg/kg) | WCC-STP-2C (mg/kg) |
|---|---|---|---|---|---|---|
| ***Sample Date →*** | | | ***11/2/2010*** | ***11/2/2010*** | ***11/2/2010*** | ***11/2/2010*** |
| *Pesticides* | | | | | | |
| 4,4´-DDD | 2.0 | NE | < 0.0047 | 0.005 | < 0.0047 | 0.0048 |
| Aldrin | 0.029 | 0.42 | < 0.0044 | 0.0099 | 0.021 | 0.013 |
| Dieldrin | 0.03 | 0.45 | 0.0065 | 0.037 | 0.038 | 0.034 |
| ***Cumulative Risk*** | | | 1 E-07 | 1 E-06 | 1 E-06 | 1 E-06 |
| *RCRA 8 Metals* | | | | | | |
| Arsenic | 20 | NE | 2.4 | 2.2 | 4.7 | 4.1 |
| Lead | 200 | NE | 6.9 | 7.7 | 7.1 | 7.7 |
| *Petroleum Hydrocarbons and Constituents* | | | | | | |
| TPH as Diesel | 500 | NE | 6.8 | < 2.0 | < 2.0 | < 2.0 |
| TPH as Motor Oil | 500 | NE | 44 | 56 | 60 | 66 |

***Notes:***

Only detected analytes are shown in this table.

Exceeds HDOH Tier 1 EAL

Exceeds HC Tier 2 EAL

Below 1 x $10^{-5}$ risk threshold

Above 1 x $10^{-5}$ risk threshold

| | |
|---|---|
| HDOH | Hawai`i Department of Health |
| HC | Hickam Communities LLC (formerly Hickam Community Housing LLC) |
| EAL | Environmental Action Level |
| mg/kg | milligram per kilogram |
| < | less than the laboratory reporting limit |
| DDD | dichlorodiphenyldichloroethane |
| NE | not established |
| 1 | HDOH Tier 1 EALs for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is a non drinking water resource (Table B-1) (HDOH 2009). |
| 2 | Site-specific Tier 2 EALs calculated for Hickam Communities property (Tetra Tech 2009). |

# APPENDIX A

## FIELD RECORDS

TETRA TECH



# FIELD NOTES

**Project Title:** RHS LEE STOCKPILE SAMPLING
**Project #:**
**Date:** 11-2-2010 **Time:** 1145
**Location:**
**Client:**
**Tt Personnel:** J. BARLOS

**Misc. Personnel:**

**Statement of Work:** STOCKPILE SAMPLING

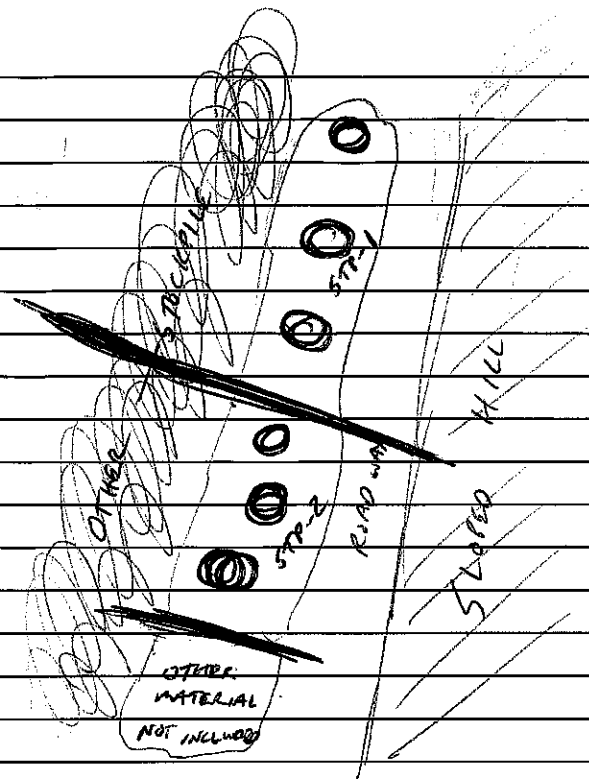
**Equipment Used:** EXCAVATOR & SPOONS TO SAMPLE

**Weather:** ≈80° CLOUDY

| Time | Project Activity |
|---|---|
| 1145 | Tt arrived on site |
| 1146 | Health & Safety Meeting |
| 1149 | MEET WITH RHS LEE TO DISCUSS LOCATION OF STOCKPILE STOCKPILE IS LOCATED ON SEPARATE LOT AND IS SITTING ALONG SIDE OTHER STOCK PILES. RHS LEE CONFIRMS THAT STOCKPILE ALONG EAST SIDE IS WHAT IS TO BE SAMPLED. |
| 1158 | TT JB MOBS TO STOCKPILE AND SORTS AND DIVIDES IT INTO TWO (2) SEPARATE DECISION UNITS. OPERATOR OF EXCAVATOR PREPARES FOR EXCAVATION. SEE SKETCH |
| 1209 | BEGIN SAMPLING WCC-STP-1 |
| 1310 | WCC-STP-1 SAMPLE COLLECTED |
| 1316 | BEGIN SAMPLING WCC-STP-2 |
| 1410 | WCC-STP-2A SAMPLE COLLECTED |
| 1415 | WCC-STP-2B SAMPLE COLLECTED |
| 1420 | WCC-STP-2C SAMPLE COLLECTED |
| | ALL SAMPLES CONSISTED OF 75 INCREMENTS COMING FROM 3 HOLES AND OUTER SHELL INCREMENTS. 60 INCREMENTS WERE TAKEN FROM THE 3 HOLES (20 EACH HOLE) AND 15 WERE TAKEN FROM OUTER SHELL OF STOCKPILE. |
| 1428 | TT PACKS UP SAMPLE AND LEAVES SITE. |

TETRA TECH




STOCKPILE
STP-1
OTHER
STP-2
ROAD WAY
SLOPED HILL
OTHER MATERIAL NOT INCLUDED

# APPENDIX B

## LABORATORY ANALYTICAL REPORTS

Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306

RE: RHS Lee Stockpile

Work Order No.: 1011030

Dear Yvonne Parry:

Torrent Laboratory, Inc. received 4 sample(s) on November 04, 2010 for the analyses presented in the following Report.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.

Patti Sandrock

November 11, 2010
Date

**Date:** 11/11/2010

**Client:** Tetra Tech Inc (HI)

**Project:** RHS Lee Stockpile

**Work Order:** 1011030

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Analytical Comments for method SW8081A, For MS, QC Analytical Batch ID 402935, Note:The % recoveries for Dieldrin is outside of laboratory control limits. The associated LCS/LCSD % recoveries and % RPD are within limits. No corrective action required.

Note: Although an MSD was prepared, it was not analyzed or reported due to a laboratory extraction error (no surrogates or spike added to the sample). % RPD of LCS/LCSD is reported in lieu of MS/MSD % RPD.

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

**WCC-STP-1** 1011030-001

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.0051 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.0041 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.0065 | mg/Kg |
| TPH as Diesel (SG) | SW8015B(M) | 1 | 0.76 | 2.0 | 6.8 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 1 | 1.8 | 4.0 | 44 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 2.4 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 6.9 | mg/Kg |

**WCC-STP-2A** 1011030-002

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.0099 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.010 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.010 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.037 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0050 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 1 | 1.8 | 4.0 | 56 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 2.2 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 7.7 | mg/Kg |

**WCC-STP-2B** 1011030-003

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.021 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.0097 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.0089 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.038 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 1 | 1.8 | 4.0 | 60 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 4.7 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 7.1 | mg/Kg |

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

**WCC-STP-2C** 1011030-004

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.013 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.012 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.012 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.034 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0048 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 1 | 1.8 | 4.0 | 66 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 4.1 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 7.7 | mg/Kg |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-1 | **Lab Sample ID:** | 1011030-001A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 13:10 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0560 | 0.34 | 2.4 | | mg/Kg | 402947 | 1512 |
| Lead | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0740 | 0.260 | 6.9 | | mg/Kg | 402947 | 1512 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| beta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| delta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Aldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor epoxide | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0042 | 0.020 | 0.0051 | J | mg/Kg | 402935 | 1503 |
| alpha-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | 0.0041 | J | mg/Kg | 402935 | 1503 |
| Endosulfan I | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDE | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Dieldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0043 | 0.020 | 0.0065 | J | mg/Kg | 402935 | 1503 |
| Endrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDD | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan II | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDT | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endrin aldehyde | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan sulfate | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Methoxychlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402935 | 1503 |
| Endrin Ketone | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402935 | 1503 |
| Toxaphene | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402935 | 1503 |
| TCMX (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 52.5 | 139 | 109 | | % | 402935 | 1503 |
| DCBP (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 50.2 | 139 | 102 | | % | 402935 | 1503 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-1 | **Lab Sample ID:** | 1011030-001A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 13:10 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 0.76 | 2.0 | 6.8 | x | mg/Kg | 402938 | 1502 |
| TPH as Motor Oil (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 1.8 | 4.0 | 44 | | mg/Kg | 402938 | 1502 |
| Pentacosane (S) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 61.5 | 133 | 98.2 | | % | 402938 | 1502 |

**NOTE:** x- Not typical of Diesel standard pattern (possibly fuel lighter than diesel)

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2A | **Lab Sample ID:** | 1011030-002A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:10 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0560 | 0.34 | 2.2 | | mg/Kg | 402947 | 1512 |
| Lead | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0740 | 0.260 | 7.7 | | mg/Kg | 402947 | 1512 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| beta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| delta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Aldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | 0.0099 | J | mg/Kg | 402935 | 1503 |
| Heptachlor epoxide | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0042 | 0.020 | 0.010 | J | mg/Kg | 402935 | 1503 |
| alpha-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | 0.010 | J | mg/Kg | 402935 | 1503 |
| Endosulfan I | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDE | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Dieldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0043 | 0.020 | 0.037 | | mg/Kg | 402935 | 1503 |
| Endrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDD | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0047 | 0.020 | 0.0050 | J | mg/Kg | 402935 | 1503 |
| Endosulfan II | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDT | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endrin aldehyde | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan sulfate | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Methoxychlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402935 | 1503 |
| Endrin Ketone | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402935 | 1503 |
| Toxaphene | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402935 | 1503 |
| TCMX (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 52.5 | 139 | 124 | | % | 402935 | 1503 |
| DCBP (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 50.2 | 139 | 120 | | % | 402935 | 1503 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2A | **Lab Sample ID:** | 1011030-002A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:10 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 0.76 | 2.0 | ND | | mg/Kg | 402938 | 1502 |
| TPH as Motor Oil (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 1.8 | 4.0 | 56 | | mg/Kg | 402938 | 1502 |
| Pentacosane (S) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 61.5 | 133 | 90.3 | | % | 402938 | 1502 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2B | **Lab Sample ID:** | 1011030-003A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:15 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0560 | 0.34 | 4.7 | | mg/Kg | 402947 | 1512 |
| Lead | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0740 | 0.260 | 7.1 | | mg/Kg | 402947 | 1512 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| beta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| delta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Aldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | 0.021 | | mg/Kg | 402935 | 1503 |
| Heptachlor epoxide | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0042 | 0.020 | 0.0097 | J | mg/Kg | 402935 | 1503 |
| alpha-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | 0.0089 | J | mg/Kg | 402935 | 1503 |
| Endosulfan I | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDE | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Dieldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0043 | 0.020 | 0.038 | | mg/Kg | 402935 | 1503 |
| Endrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDD | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan II | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDT | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endrin aldehyde | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan sulfate | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Methoxychlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402935 | 1503 |
| Endrin Ketone | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402935 | 1503 |
| Toxaphene | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402935 | 1503 |
| TCMX (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 52.5 | 139 | 116 | | % | 402935 | 1503 |
| DCBP (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 50.2 | 139 | 109 | | % | 402935 | 1503 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2B | **Lab Sample ID:** | 1011030-003A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:15 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 0.76 | 2.0 | ND | | mg/Kg | 402938 | 1502 |
| TPH as Motor Oil (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 1.8 | 4.0 | 60 | | mg/Kg | 402938 | 1502 |
| Pentacosane (S) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 61.5 | 133 | 98.1 | | % | 402938 | 1502 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2C | **Lab Sample ID:** | 1011030-004A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:20 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0560 | 0.34 | 4.1 | | mg/Kg | 402947 | 1512 |
| Lead | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0740 | 0.260 | 7.7 | | mg/Kg | 402947 | 1512 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| beta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| delta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Aldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | 0.013 | J | mg/Kg | 402935 | 1503 |
| Heptachlor epoxide | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0042 | 0.020 | 0.012 | J | mg/Kg | 402935 | 1503 |
| alpha-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | 0.012 | J | mg/Kg | 402935 | 1503 |
| Endosulfan I | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDE | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Dieldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0043 | 0.020 | 0.034 | | mg/Kg | 402935 | 1503 |
| Endrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDD | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0047 | 0.020 | 0.0048 | J | mg/Kg | 402935 | 1503 |
| Endosulfan II | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDT | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endrin aldehyde | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan sulfate | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Methoxychlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402935 | 1503 |
| Endrin Ketone | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402935 | 1503 |
| Toxaphene | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402935 | 1503 |
| TCMX (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 52.5 | 139 | 121 | | % | 402935 | 1503 |
| DCBP (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 50.2 | 139 | 113 | | % | 402935 | 1503 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2C | **Lab Sample ID:** | 1011030-004A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:20 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 0.76 | 2.0 | ND | | mg/Kg | 402938 | 1502 |
| TPH as Motor Oil (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 1.8 | 4.0 | 66 | | mg/Kg | 402938 | 1502 |
| Pentacosane (S) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 61.5 | 133 | 97.6 | | % | 402938 | 1502 |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545_TPHSG | **Prep Date:** | 11/08/10 | **Prep Batch:** | 1502 |
| **Matrix:** | Soil | **Analytical Method:** | SW8015B(M) | **Analyzed Date:** | 11/08/10 | **Analytical Batch:** | 402927 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| TPH as Diesel (SG) | 0.76 | 2.0 | ND | |
| TPH as Motor Oil (SG) | 1.8 | 4.0 | ND | |
| Pentacosane (S) | | | 108 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1503 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 11/09/10 | **Analytical Batch:** | 402935 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.00044 | 0.0020 | ND | |
| gamma-BHC | 0.00040 | 0.0020 | ND | |
| beta-BHC | 0.00036 | 0.0020 | ND | |
| delta-BHC | 0.00049 | 0.0020 | ND | |
| Heptachlor | 0.0011 | 0.0020 | ND | |
| Aldrin | 0.00044 | 0.0020 | ND | |
| Heptachlor epoxide | 0.00032 | 0.0020 | ND | |
| gamma-Chlordane | 0.00042 | 0.0020 | ND | |
| alpha-Chlordane | 0.00036 | 0.0020 | ND | |
| Endosulfan I | 0.00059 | 0.0020 | ND | |
| 4,4'-DDE | 0.00048 | 0.0020 | ND | |
| Dieldrin | 0.00043 | 0.0020 | ND | |
| Endrin | 0.00057 | 0.0020 | ND | |
| 4,4'-DDD | 0.00047 | 0.0020 | ND | |
| Endosulfan II | 0.0015 | 0.0020 | ND | |
| 4,4'-DDT | 0.00081 | 0.0020 | ND | |
| Endrin aldehyde | 0.0010 | 0.0020 | ND | |
| Endosulfan sulfate | 0.00049 | 0.0020 | ND | |
| Methoxychlor | 0.00062 | 0.0050 | ND | |
| Endrin Ketone | 0.00040 | 0.0020 | ND | |
| Chlordane | 0.010 | 0.020 | ND | |
| Toxaphene | 0.010 | 0.10 | ND | |
| TCMX (S) | | | 82.6 | |
| DCBP (S) | | | 69.1 | |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3050B_MI | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1512 |
| **Matrix:** | Soil | **Analytical Method:** | SW6010B | **Analyzed Date:** | 11/11/10 | **Analytical Batch:** | 402947 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier | |
|---|---|---|---|---|---|
| Arsenic | 0.0560 | 0.34 | 0.13 | | |
| Lead | 0.0740 | 0.260 | 0.24 | | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545_TPHSG | **Prep Date:** | 11/08/10 | **Prep Batch:** | 1502 |
| **Matrix:** | Soil | **Analytical Method:** | SW8015B(M) | **Analyzed Date:** | 11/08/10 | **Analytical Batch:** | 402927 |
| **Units:** | mg/Kg | | Blank | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | 0.76 | 2.0 | ND | 33.33 | 72.2 | 84.7 | 15.9 | 50.8 - 111 | 30 | |
| TPH as Motor Oil (SG) | | | ND | 100 | | | | 61.5 - 133 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1503 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 11/09/10 | **Analytical Batch:** | 402935 |
| **Units:** | ug/Kg | | LCSD | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | ND | 20 | 95.1 | 106 | 10.8 | 44.2 - 125 | 30 | |
| gamma-BHC | 0.40 | 2.0 | ND | 20 | 91.1 | 102 | 10.9 | 56.9 - 124 | 30 | |
| beta-BHC | 0.36 | 2.0 | ND | 20 | 96.3 | 108 | 11.7 | 44.2 - 125 | 30 | |
| delta-BHC | 0.49 | 2.0 | ND | 20 | 82.2 | 94.2 | 13.9 | 61.5 - 116 | 30 | |
| Heptachlor | 1.1 | 2.0 | ND | 20 | 95.4 | 108 | 12.0 | 63.6 - 125 | 30 | |
| Aldrin | 0.44 | 2.0 | ND | 20 | 99.0 | 111 | 11.5 | 53 - 126 | 30 | |
| Heptachlor epoxide | 0.32 | 2.0 | ND | 20 | 95.3 | 107 | 11.5 | 54.6 - 130 | 30 | |
| gamma-Chlordane | 0.42 | 2.0 | ND | 20 | 97.1 | 109 | 11.7 | 68.7 - 123 | 30 | |
| alpha-Chlordane | 0.36 | 2.0 | ND | 20 | 97.4 | 108 | 10.6 | 42.4 - 128 | 30 | |
| Endosulfan I | 0.59 | 2.0 | ND | 20 | 90.0 | 105 | 15.4 | 61.2 - 119 | 30 | |
| 4,4'-DDE | 0.48 | 2.0 | ND | 20 | 95.9 | 107 | 10.8 | 45.3 - 123 | 30 | |
| Dieldrin | 0.43 | 2.0 | ND | 20 | 92.7 | 104 | 12.0 | 44 - 128 | 30 | |
| Endrin | 0.57 | 2.0 | ND | 20 | 89.2 | 102 | 13.3 | 44.1 - 126 | 30 | |
| 4,4'-DDD | 0.47 | 2.0 | ND | 20 | 90.3 | 102 | 12.0 | 39.6 - 123 | 30 | |
| Endosulfan II | 1.5 | 2.0 | ND | 20 | 80.5 | 96.1 | 17.7 | 56.7 - 112 | 30 | |
| 4,4'-DDT | 0.81 | 2.0 | ND | 20 | 89.9 | 101 | 11.4 | 52.8 - 134 | 30 | |
| Endrin aldehyde | 1.0 | 2.0 | ND | 20 | 74.6 | 89.4 | 18.2 | 50.2 - 113 | 30 | |
| Endosulfan sulfate | 0.49 | 2.0 | ND | 20 | 82.4 | 97.5 | 16.7 | 62.1 - 116 | 30 | |
| Methoxychlor | 0.62 | 5.0 | ND | 20 | 77.1 | 88.7 | 14.1 | 55.2 - 126 | 30 | |
| Endrin Ketone | 0.40 | 2.0 | ND | 20 | 79.9 | 92.9 | 14.9 | 53.9 - 120 | 30 | |
| TCMX (S) | | | ND | 2100 | 96.4 | 105 | | 52.5 - 121 | | |
| DCBP (S) | | | ND | 2100 | 84.2 | 95.8 | | 50.2 - 121 | | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3050B_MI | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1512 |
| **Matrix:** | Soil | **Analytical Method:** | SW6010B | **Analyzed Date:** | 11/11/10 | **Analytical Batch:** | 402947 |
| **Units:** | mg/Kg | | Blank | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.056 | 0.34 | 0.13 | 10 | 98.9 | 97.3 | 1.6 | 75 - 125 | 30 | , |
| Lead | 0.074 | 0.26 | 0.24 | 10 | 105.6 | 104 | 2.1 | 75 - 125 | 30 | , |

Torrent LABORATORY, INC.

# MS/MSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1503 |
| **Matrix:** | **Soil** | **Analytical Method:** | SW8081A | **Analyzed Date:** | 11/09/10 | **Analytical Batch:** | 402935 |
| **Spiked Sample:** | 1011030-004A | | | | | | |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Sample Conc. | Spike Conc. | MS % Recovery | MSD % Recovery | MS/MSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Aldrin | 4.4 | 20 | 1.29 | 20 | 116 | | | 53.9 - 142 | | |
| gamma-BHC | 4.0 | 20 | 0.10 | 20 | 94.1 | | | 56.9 - 120 | | |
| Heptachlor | 11 | 20 | 0.15 | 20 | 106 | | | 52.2 - 117 | | |
| Dieldrin | 4.3 | 20 | 3.45 | 20 | 169 | | | 29.2 - 130 | | S |
| Endrin | 5.7 | 20 | 0.00 | 20 | 104 | | | 44.1 - 121 | | |
| 4,4'-DDT | 8.1 | 20 | 0.22 | 20 | 99.3 | | | 24.6 - 134 | | |
| TCMX (S) | | | | 2100 | 118 | | | 52.5 - 139 | | |
| DCBP (S) | | | | 2100 | 123 | | | 50.2 - 139 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: RHS Lee Stockpile

Work Order No.: 1011030

Date and Time Received: 11/4/2010 14:07

Received By: NG

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 4 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | | | | |
| pH Checked by: | pH Adjusted by: | | | |

Torrent LABORATORY, INC.

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)
**QC Level:**
**Project Name:** RHS Lee Stockpile
**TAT Requested:** 3 day:25
**Project # :** 100-SFO-T26535-04
**Date Received:** 11/4/2010
**Report Due Date:** 11/11/2010
**Time Received:** 14:07

**Comments:** 3 day TAT!!!(+2 days drying) Recv'd 4 soils for 8081 ; TPHDOSG ; Lead and Arsenic @4'C.Pls. email an EDD result to Y.Parry ; G.Eaton and T.Whitehead.Incremental sampling required.

**Work Order # :** ***1011030***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1011030-001A | WCC-STP-1 | 11/02/10 13:10 | Soil | 05/03/11 | | | EDD<br>S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |
| **Sample Note:** | 3 day Rush! Multi incremental sampling, soils need to be air dried and subsampled. 8081,Pb,As, TPHD/MoSG. | | | | | | | |
| 1011030-002A | WCC-STP-2A | 11/02/10 14:10 | Soil | 05/03/11 | | | S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |
| 1011030-003A | WCC-STP-2B | 11/02/10 14:15 | Soil | 05/03/11 | | | S_6010BMI<br>S_TPHDOSG<br>S_8081MITetra | |
| 1011030-004A | WCC-STP-2C | 11/02/10 14:20 | Soil | 05/03/11 | | | S_6010BMI<br>S_TPHDOSG<br>S_8081MITetra | |

Torrent LABORATORY, INC.

# RUSH 3-DAY TAT

# CHAIN-OF-CUSTODY RECORD

TETRA TECH

1011030

Client Name/Account #: TetraTech, Inc.
Address: 737 Bishop St., Suite 3020
City/State/Zip: Honolulu, HI 96813
Project Manager: Y. Parry
Telephone Number: (808)533-3366 Fax No.: (808)533-3306
Sampler Name: (Print) J. Barlos
Sampler Signature:

Report To: Y. Parry, G. Eaton, T. Whitehead
Invoice To: Y. Parry
Project ID: RHS Lee Stockpile
Project #: 100-SFO-T26535-04

| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Preservative: Ice | $HNO_3$ (Red Label) | HCl (Blue Label) | NaOH (Orange Label) | $H_2SO_4$ Plastic (Yellow Label) | $H_2SO_4$ Glass(Yellow Label) | None (Black Label) | Other (one MeOH VOA) | Matrix: Groundwater | Wastewater | Drinking Water | Sludge | Soil | Other (specify): | Analyze For: Multi-Incremental Preparatic | 8081 | 8015B TPH Diesel and Motor Oil (4 silica gel cleanup) | Lead & Arsenic (6010) | | | | | | | RUSH TAT (Pre-Schedule | Standard TAT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001A | WCC-STP-1 | 11/2/10 | 1310 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | |
| 002A | WCC-STP-2A | 11/2/10 | 1410 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | |
| 003A | WCC-STP-2B | 11/2/10 | 1415 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | |
| 004A | WCC-STP-2C | 11/2/10 | 1420 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | |

RUSH
3 DAYS

**Special Instructions:**
Please proceed with air-drying, sieving and subsampling as per HDOH guidance

Method of Shipment: FEDEX

**Laboratory Comments:**
Temperature Upon Receipt: 4 °C
VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| Jaymes Barlos | 11-3-2010 | 1200 | FedEx | 11-3-2010 | 1200 |
| Relinquished by: | Date | Time | Received by Laboratory: NAVIN G | Date | Time |
| FedEx | 11-4-10 | 14:07 | R. G. Ghodasara | 11-4-10 | 14:07 |

Page 1 of 1

TETRA TECH

November 17, 2010

Mladena Yankova Kukin mladena.yankovakukin@actuslendlease.com
Development Manager
Hickam Communities LLC
211 Mercury Street
Honolulu, HI 96818

**Subject: TO#56: Summary of Findings Report on Sampling and Chemical Analysis of the Soil Stockpiles for Import to Earhart I-2 and Earhart I-3 Neighborhoods, Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i**

Dear Ms. Yankova Kukin:

This final summary of findings report (SoFR) presents the results of import stockpile soil sampling conducted on behalf of Hickam Communities LLC (HC), on HC property at Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i. Tetra Tech performed the stockpile soil sampling under Task Order #56.

The purpose of this investigation was to evaluate the stockpiled soil for the presence (if any) of organochlorine pesticides, and to determine the suitability of the soil for import as clean backfill for the HC neighborhoods Earhart I-2 and Earhart I-3. The soil sampling and evaluation of the analytical results was done in accordance with the *Pesticide Impacted Soils Investigation and Management Program Manual* (Program Manual) (Tetra Tech 2009), and the *Removal Action Work Plan No. 1* (RO# 1) (Tetra Tech 2010c). This SoFR documents the sampling and analysis of the two soil stockpiles described below:

- **DB Contractor Stockpile.** An approximately 1,200-cubic yard (CY) soil stockpile located west of the DB Contractor's Office (Figure 1). The soil in this stockpile was generated during grading operations at various HC residential sites within JBPHH.

- **Onizuka II-3 Stockpile.** An approximately 1,600-CY soil stockpile located in a parking lot off Apollo Avenue (Figure 2). The soil in this stockpile was generated during burial pit excavation within open areas at the Onizuka II-3 Neighborhood.

## FIELD METHODS

Tetra Tech mobilized to sample the stockpile near the DB Contractor's Office on October 6, 2010, and to sample the Onizuka II-3 stockpile on October 8, 2010. All sampling activities were conducted in accordance to the Sampling Analysis Plans (SAP) prepared for these sampling events (Tetra Tech 2010a and 2010b, respectively).

Before sampling, each stockpile was separated into decision units (DU) as shown in Figures 1 and 2. The stockpile located near the DB Contractor's Office was separated into three DUs (DB-STP-1 through DB-STP-3) and the Onizuka II-3 stockpile was separated into four DUs (ONI-STP-1 through ONI-STP-4). Tetra Tech followed the MI soil sampling protocols recommended by Hawai`i Department of Health (HDOH) for this event (HDOH 2009a). For each stockpile DU, one multi-incremental (MI) soil sample was collected Tetra Tech collected fifty (50) soil increments (subsamples) using dedicated stainless steel spoons. Samples were collected from each DU at depths ranging from the surface down to the original grade. Soil at depths greater than 6-inches was collected from the bucket of an excavator, which safely accessed and collected material from various locations from the interiors of the individual stockpile DUs. For quality assurance/quality control purposes, Tetra Tech collected triplicate (one MI sample and two replicates) from one DU at each stockpile (DB-STP-3 and ONI-STP-4).

The collected soil was composited in the field by placing the subsamples for each MI soil sample into a 1-gallon sealable plastic bag. To preserve sample integrity during sample collection and transport, the MI soil sample bag was sealed, labeled, and placed into an ice-cooled insulated chest for transport under a chain-of-custody to the analytical laboratory.

## ANALYTICAL METHODS

A total of eleven MI soil samples were submitted to Torrent Laboratory, Milpitas, California for analysis. The MI soil samples were prepared according to the HDOH MI sub-sampling protocol (HDOH 2009a). Material from each 1-gallon bag was air dried at room temperature, sieved through a 2 millimeter (mm) sieve. The sieved material was then spread out and thirty sub-samples collected by the laboratory were combined into one MI sample and prepared for analysis. Each MI soil sample was analyzed for Organochlorine Pesticides by US Environmental Protection Agency (EPA) Method 8081A.

## ANALYTICAL RESULTS

The analytical results were compared to the following screening levels:

- The HDOH Tier 1 Environmental Action Levels (EALs) for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is not a drinking water resource (Table B-1) (HDOH 2009b);
- The Site-specific Tier 2 EALs for aldrin, dieldrin, and technical chlordane established for HC property (Tetra Tech 2009); and
- The Tier 2-based cumulative risk was calculated for organochlorine pesticides and compared to the 1 x $10^{-5}$ cumulative risk threshold established for HC property (Tetra Tech 2009).

The laboratory analytical results are summarized below, and presented in Table 1. Copies of the analytical reports are provided in Appendix B. Only analytes detected at or above the laboratory reporting limit are shown in Table 1.

### Results

- **DB Contractor Stockpile.** Organochlorine pesticides were detected at concentrations at or above laboratory reporting limits in the DB Contractor Stockpile.
    - Dieldrin concentrations ranged from 0.12 to 0.19 milligrams per kilogram (mg/kg) which exceed the HDOH Tier 1 EAL for dieldrin (0.03 mg/kg); however these detections are below the Tier 2 EAL.
    - There were no other detections of organochlorine pesticides exceeding the respective Tier 1 EALs in the DB Contractor Stockpile.
- **Onizuka II-3 Stockpile.** Organochlorine pesticides were not detected at concentrations at or above laboratory reporting limits in the MI soil samples collected from the Onizuka II-3 Stockpile. [1]

## CUMULATIVE RISK

Cumulative risk is the sum of the carcinogenic risks of the individual compounds. For HC sites, the calculated Tier 2-based cumulative risk posed by aldrin, chlordane, and dieldrin is compared to the 1 x $10^{-5}$ risk threshold established for HC (Tetra Tech 2009). The cumulative risk can be exceeded even if there are no detections above the HC Tier 2 EALs. If the calculated cumulative risk exceeds the risk threshold, the soil is designated as pesticide-impacted (PI) soil.

[1] Since there were no detections at or above the laboratory reporting limit in the MI soil samples collected from the Onizuka II-3 stockpile, a table was not generated.

- For the DB Contractor Stockpile, the calculated Tier 2-based cumulative risk does not exceed the $1 \times 10^{-5}$ risk threshold for any of the MI soil samples.

## CONCLUSIONS

Based on Tetra Tech's evaluation of the analytical results, and the project plans (Tetra Tech 2009 and 2010c), Tetra Tech concludes that the soil in both stockpiles located at the Site **is not PI soil** and is therefore suitable for unrestricted use on HC property.

**DB Contractor Stockpile.** Organochlorine pesticides were detected at concentrations at or above laboratory reporting limits in all of the MI soil samples collected from the DB Contractor Stockpile. There are no detections exceeding the respective Tier 2 EALs established for HC property, and the Tier 2-based calculated risk is below the $1 \times 10^{-5}$ risk threshold established for HC property (Tetra Tech 2009). Detections for dieldrin were at concentrations exceeding the Tier 1 EAL for dieldrin.

**Onizuka II-3 Stockpile.** Organochlorine pesticides were not detected at concentrations at or above laboratory reporting limits in the MI soil samples collected from the Onizuka II-3 Stockpile

## REFERENCES

CFR (Code of Federal Regulations). 2010. CFR Title 40: 261.24 Table 1—Maximum Concentration of Contaminants for the Toxicity Characteristic. Accessed at internet website URL: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9b8d30a98d2bd8ffe90e6b8042d2ffc6&rgn=div8&view=text&node=40:25.0.1.1.2.3.1.5&idno=40

HDOH (Hawai`i Department of Health). 2009a. *Interim Final Technical Guidance Manual for Implementation of the Hawaii State Contingency Plan.* Prepared by: Hawai`i Department of Health Environmental Management Division. June 21.

HDOH (Hawai`i Department of Health). 2009b. HDOH Environmental Action Levels, Supplemental Models in Excel Format, EAL Surfer. March 2009. Accessed at internet website URL: http://hawaii.gov/health/environmental/hazard/eal2005.html

Tetra Tech. 2009. *Pesticide-Impacted Soils Investigation and Management Program Manual, Hickam Air Force Base,* O`ahu, Hawai`i. Prepared for Hickam Community Housing LLC. May 2009.

Tetra Tech. 2010a. *Sampling and Analysis Plan, Stockpile Sampling, West of the Design/Build Contractor Office, Hickam Air Force Base, Hawai`i.* Prepared for Prepared for Hickam Communities LLC. October 6, 2010.

Tetra Tech. 2010b. *Sampling and Analysis Plan, Stockpile Sampling, Onizuka II-3, Hickam Air Force Base, Hawai`i.* Prepared for Prepared for Hickam Communities LLC. October 8, 2010.

Tetra Tech. 2010c. *Removal Action Work Plan No. 1, Immediate Actions for Pesticide-Impacted Soil, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, O`ahu Hawai`i.* Prepared for Hickam Communities, LLC. DCN 2653504.001.F05. October 11, 2010.

If you have any questions or comments about this report, please do not hesitate to contact me at (415) 490-2975 or Yvonne Parry in our Honolulu office, at (808) 533-3366. Tetra Tech appreciates the opportunity to provide continued environmental support to HC.

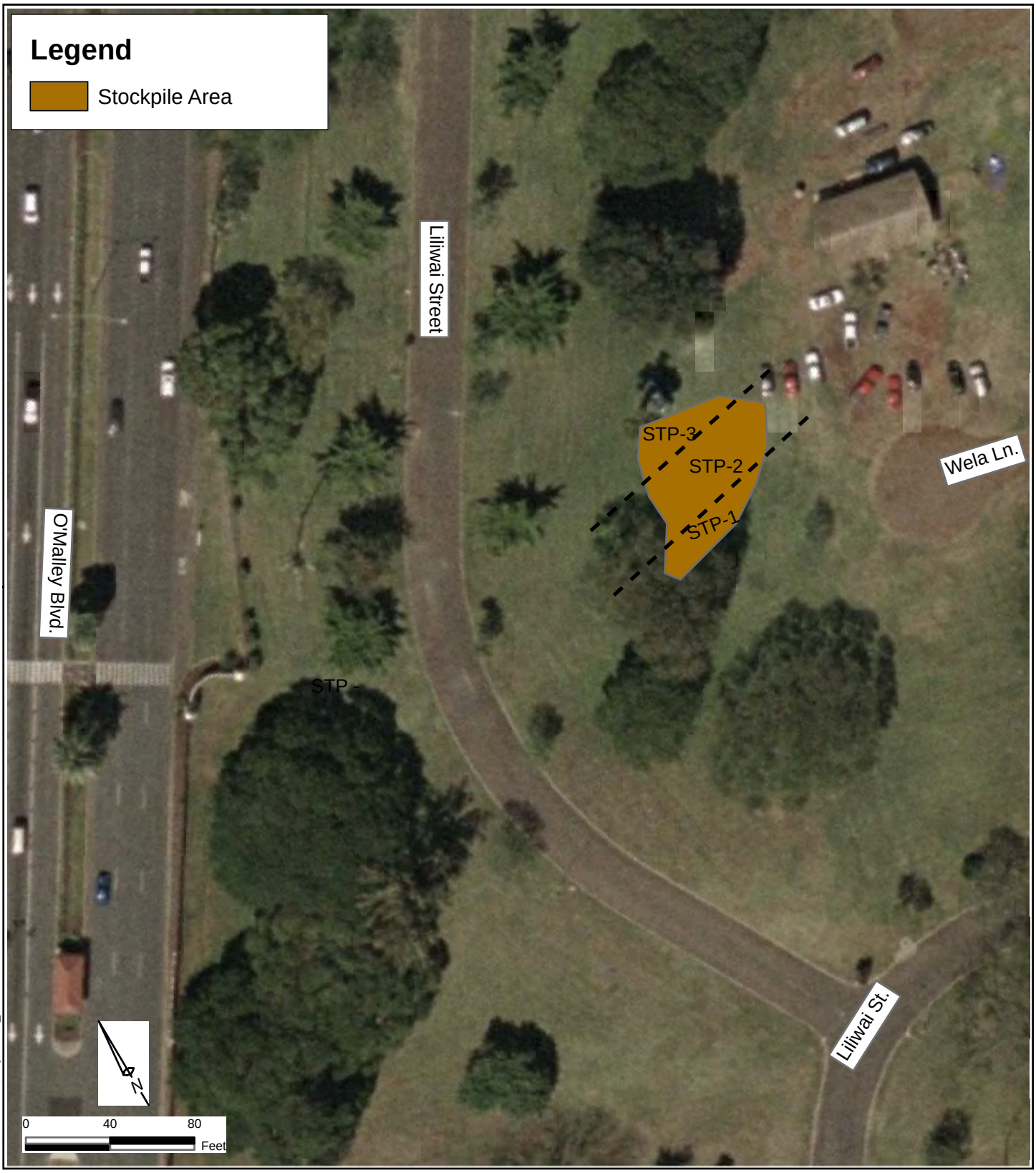
Sincerely,
**TETRA TECH**

Gail Eaton, P.G.
Senior Geologist
Tetra Tech

Attachments:
Figure 1 – DB Contractor Office Stockpile Location
Figure 2 – Onizuka II-3 Stockpile Location
Table 1 – Summary of DB Contractor Office Stockpile Analytical Results
Appendix A – Field Records
Appendix B – Laboratory Analytical Reports

cc: Gary Floyd, Program Manager, Tetra Tech
Tom Whitehead C.HG., Technical Lead, Tetra Tech
Yvonne Parry, Project Manager, Tetra Tech

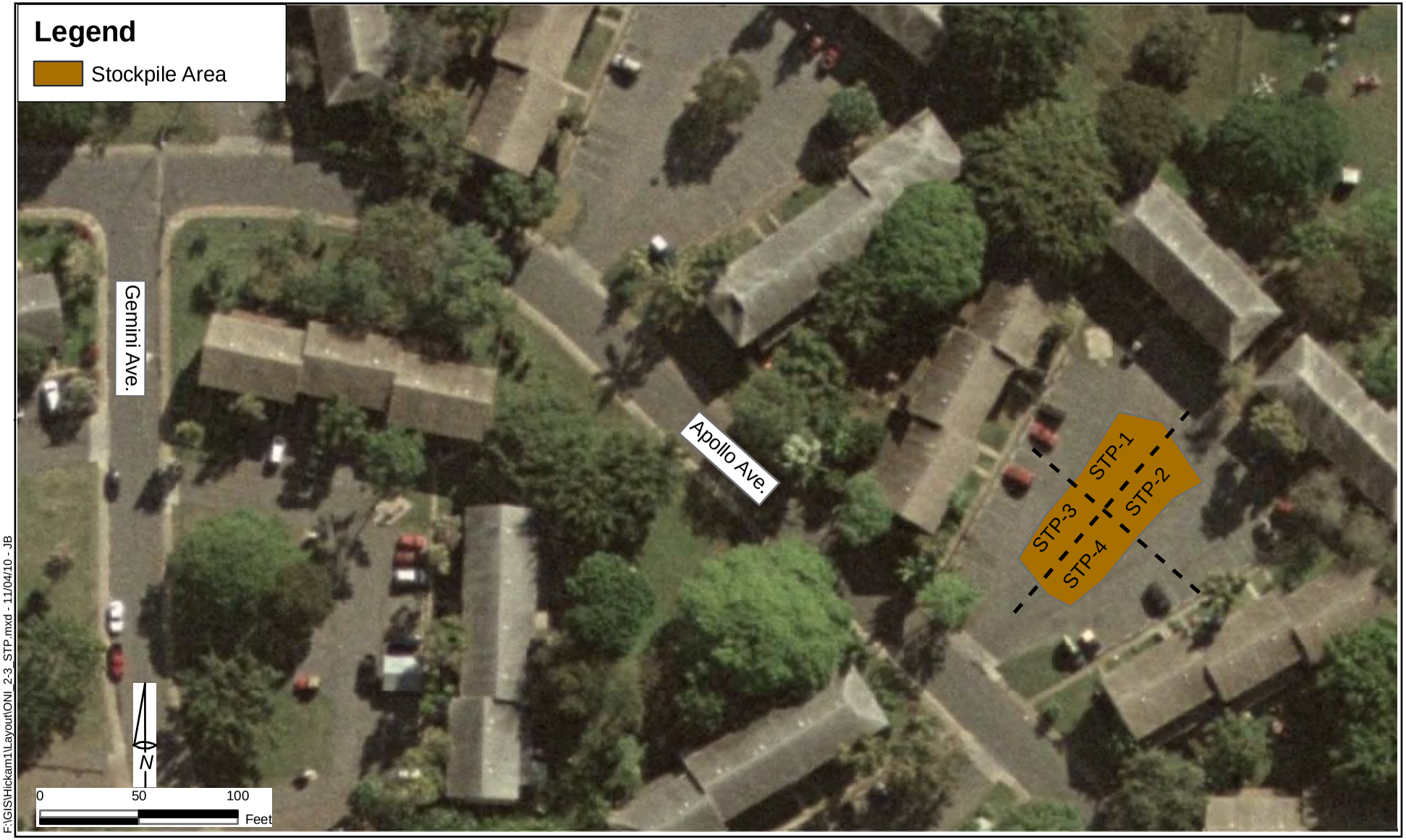
# FIGURES




***Location Map For Stockpiles Near DB Contractor Office***

Hickam Air Force Base, O'ahu, Hawai'i

**Figure 1**

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# *Onizuka II-3 Stockpile Location Map*

Hickam Air Force Base, O'ahu, Hawai'i

Tetra Tech, Inc

**Figure 2**

# TABLE

**Table 1**
**Analytical Results for Pesticides in Soil**
**D/B Contractor Office Stockpile**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Sample Name → | HDOH Tier 1 EAL[1] (mg/kg) | HC Tier 2 EAL[2] (mg/kg) | DB-STP-1 (mg/kg) | DB-STP-2 (mg/kg) | DB-STP-3A (mg/kg) | DB-STP-3B (mg/kg) | DB-STP-3C (mg/kg) |
|---|---|---|---|---|---|---|---|
| ***Sample Date →*** | | | ***10/6/2010*** | ***10/6/2010*** | ***10/6/2010*** | ***10/6/2010*** | ***10/6/2010*** |
| ***Analyte*** | | | | | | | |
| 4,4´-DDD | 2.0 | NE | 0.023 | 0.013 | 0.026 | 0.0057 | 0.0053 |
| 4,4´-DDE | 1.4 | NE | 0.34 | 0.25 | 0.16 | 0.16 | 0.14 |
| 4,4´-DDT | 1.7 | NE | 0.56 | 0.16 | 0.45 | 0.083 | 0.08 |
| Aldrin | 0.029 | 0.42 | 0.0062 | 0.0076 | 0.012 | 0.015 | 0.011 |
| Dieldrin | 0.03 | 0.45 | 0.14 | 0.12 | 0.19 | 0.18 | 0.15 |
| Techncial chlordane[3] | 16 | 23.4 | 0.61 | 0.41 | 0.41 | 0.36 | 0.35 |
| Heptachlor epoxide | 0.046 | NE | 0.0061 | <0.02 | <0.04 | <0.02 | <0.02 |
| | | | | | | | |
| ***Cumulative Risk*** | | | 4 E-06 | 3 E-06 | 5 E-06 | 5 E-06 | 4 E-06 |

***Notes:***

Only detected analytes are shown in this table.

Exceeds HDOH Tier 1 EAL

Exceeds HC Tier 2 EAL

Below 1 x $10^{-5}$ risk threshold

Above 1 x $10^{-5}$ risk threshold

| | |
|---|---|
| HDOH | Hawai`i Department of Health |
| EAL | Environmental Action Level |
| mg/kg | milligram per kilogram |
| < | less than the laboratory reporting limit |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethylene |
| DDT | dichlorodiphenyltrichloroethane |
| NE | not established |
| 1 | HDOH Tier 1 EALs are for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is a non drinking water resource (Table B-1) (HDOH 2009). |
| 2 | Site-specific HC Tier 2 EALs calculated for Hickam Communities property (Tetra Tech 2009). |
| 3 | Technical chlordane. The technical chlordane constituents alpha- and gamma-chlordane not reported in this table. Any detections of alpha- and gamma-chlordane are provided in the laboratory analytical report. |

# APPENDIX A

## FIELD RECORDS

TETRA TECH



# FIELD NOTES

**Project Title:** DB office Stockpile Sampling
**Project #:** 100-SFO-T26535-04
**Date:** 10/6/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities LLC
**Tt Personnel:** J Mollison

**Misc. Personnel:**

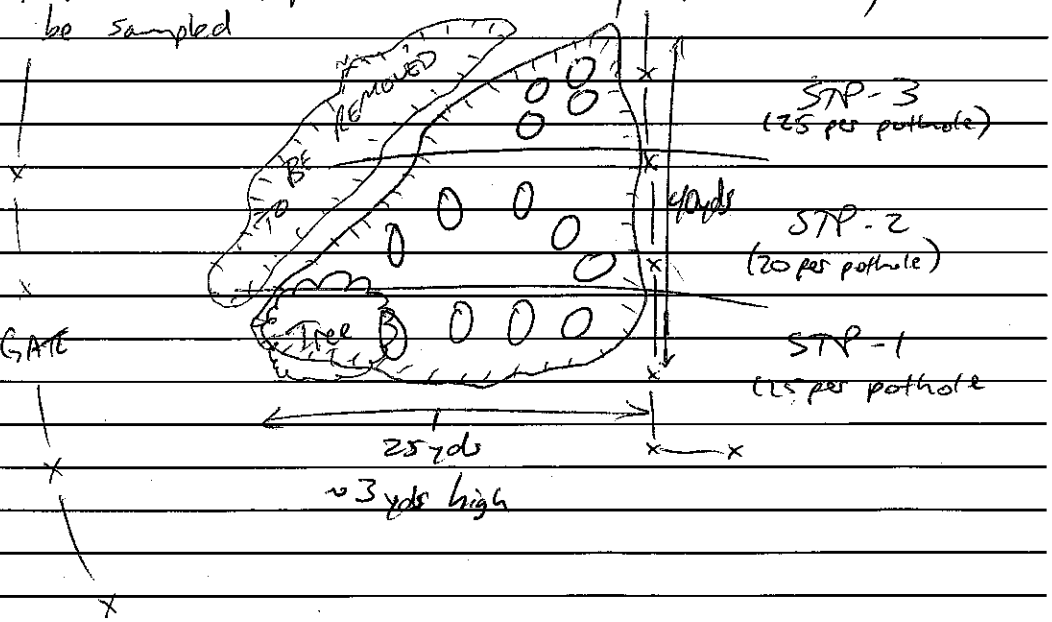
**Statement of Work:** Stockpile soil sampling

**Equipment Used:**

**Weather:** Sunny, breezy

| Time | Project Activity |
|---|---|
| 1000 | Tt arrived on site |
| 1005 | Health & Safety Meeting |

Meet with Stephen "Mac" Mackey to identify soils to be sampled




- Begin collecting samples from outer shell of stockpiles, 50 increments per pile, while waiting for excavator

1035 Excavator arrives on site

1040 Begin collecting interior increments by installing 4 to 5 potholes per DU and collecting 20-25 increments per pothole for a total of 100 interior increments or 150 increments per sample

1055 Collect DB-STP-3A

1100 Collect DB-STP-3B

1105 Collect DB-STP-3C

1130 Collect DB-STP-2

1155 Collect DB-STP-1

1200 off-site

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-SFO-T26535-04
**Project Title:** Oniziuka II-3 Soil Stockpile Sampling
**Date:** 10/8/10
**Time:** 800AM
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** S Mollison

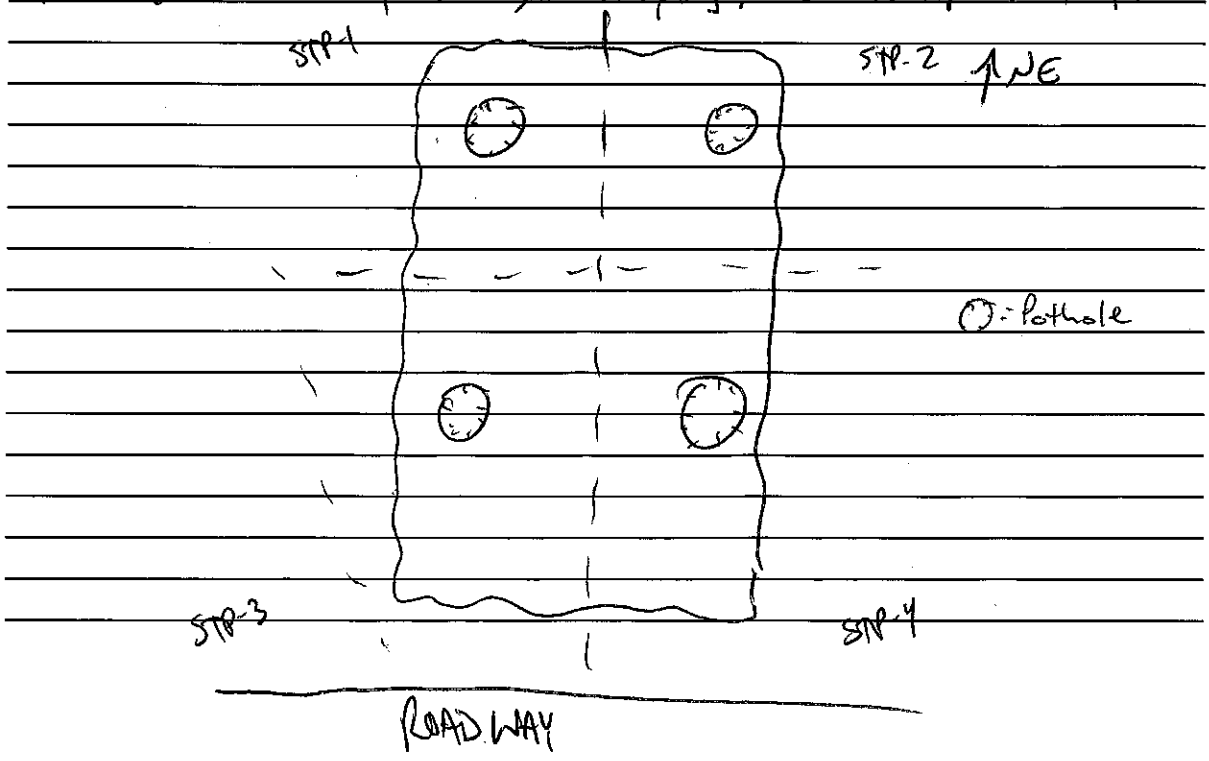
**Misc. Personnel:**

**Statement of Work:** Stockpile sampling

**Equipment Used:**

**Weather:** Sunny, light breeze

| Time | Project Activity |
|---|---|
| | Tt arrived on site |
| | Health & Safety Meeting |
| 700AM | ON-SITE FOR Standard Health & Safety Meeting at DB Contractor office |
| 805 | Arrive on site - Oniziuka II-3 |
| | Co-ordinate with Actus Site Superintendent |
| 845 | Excavator ready to begin sampling, levels at top of stockpile |



10/8/10 DB CONTRACTOR OFFICE

For each DU, the following sample process was used:

1. Install one pothole in the rentroid of the DU
   - Collect 3 increments from every other bucket load removed from the pothole
   - Total of 21 increments collected from interior of the DU
   - Collect 29 increments from the outer shell of the DU
   - Total of 50 increments per sample

900 Sample ON13-STP-1
915 Sample ON13-STP-2
930 Sample ON13-STP-3
945 Sample ON1-STP-4A
950 Sample ON1-STP-4B
955 Sample ON1-STP-4C

1015 off-site

# APPENDIX B

## LABORATORY ANALYTICAL REPORTS

Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306

RE: D/B Contractor Stockpile

Work Order No.: 1010063

Dear Yvonne Parry:

Torrent Laboratory, Inc. received 5 sample(s) on October 07, 2010 for the analyses presented in the following Report.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.

Patti Sandrock

October 14, 2010
Date

**Date:** 10/14/2010

**Client:** Tetra Tech Inc (HI)

**Project:** D/B Contractor Stockpile

**Work Order:** 1010063

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Analytical Comments, General, For all samples -Note:Samples processed under Incremental Sampling Procedure SOP TCI0109. Sample collection date and time is reflective of Hawaiian Standard Time (HST) while all anlaytical dates and times are reflective of Pacific Standard Time (PST).

Analytical Comments for METHOD 8081S_Tetra Tech, ALL SAMPLE, Note: Per client request, whenever possible (where matrix interference does not preclude it),sample data is reported to the MDL. Results reported between the MDL and PQL are qualified with the appropriate "J" flag and should be considered as estimated values

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

**DB-STP-3A** 1010063-001

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 20 | 0.0088 | 0.040 | 0.012 | mg/Kg |
| gamma-Chlordane | SW8081A | 20 | 0.0084 | 0.040 | 0.057 | mg/Kg |
| alpha-Chlordane | SW8081A | 20 | 0.0072 | 0.040 | 0.060 | mg/Kg |
| 4,4'-DDE | SW8081A | 20 | 0.0095 | 0.040 | 0.16 | mg/Kg |
| Dieldrin | SW8081A | 20 | 0.0085 | 0.040 | 0.19 | mg/Kg |
| 4,4'-DDD | SW8081A | 20 | 0.0094 | 0.040 | 0.026 | mg/Kg |
| 4,4'-DDT | SW8081A | 20 | 0.016 | 0.040 | 0.45 | mg/Kg |
| Chlordane | SW8081A | 20 | 0.20 | 0.40 | 0.41 | mg/Kg |

**DB-STP-3B** 1010063-002

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.015 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.050 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.053 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.16 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.18 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0057 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.083 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.36 | mg/Kg |

**DB-STP-3C** 1010063-003

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.011 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.049 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.052 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.14 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.15 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0053 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.080 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.35 | mg/Kg |

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

**DB-STP-2** 1010063-004

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.0076 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.054 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.055 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.25 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.12 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.013 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.16 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.41 | mg/Kg |

**DB-STP-1** 1010063-005

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.0062 | mg/Kg |
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0061 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.085 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.097 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.34 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.14 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.023 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.56 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.61 | mg/Kg |

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-3A | **Lab Sample ID:** | 1010063-001A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 10:55 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0088 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0079 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0073 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0098 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.022 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0088 | 0.040 | 0.012 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0063 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0084 | 0.040 | 0.057 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0072 | 0.040 | 0.060 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.012 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0095 | 0.040 | 0.16 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0085 | 0.040 | 0.19 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.011 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0094 | 0.040 | 0.026 | J | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.031 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.016 | 0.040 | 0.45 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.021 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0098 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.012 | 0.10 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0080 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.20 | 0.40 | 0.41 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.20 | 2.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 20 | 52.5 | 139 | 129 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 20 | 50.2 | 139 | 129 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-3B | **Lab Sample ID:** | 1010063-002A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 11:00 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | 0.015 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0042 | 0.020 | 0.050 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | 0.053 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0048 | 0.020 | 0.16 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0043 | 0.020 | 0.18 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0047 | 0.020 | 0.0057 | J | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0081 | 0.020 | 0.083 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 0.20 | 0.36 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 52.5 | 139 | 124 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 50.2 | 139 | 124 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-3C | **Lab Sample ID:** | 1010063-003A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 11:05 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | 0.011 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0042 | 0.020 | 0.049 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | 0.052 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0048 | 0.020 | 0.14 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0043 | 0.020 | 0.15 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0047 | 0.020 | 0.0053 | J | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0081 | 0.020 | 0.080 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 0.20 | 0.35 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 52.5 | 139 | 117 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 50.2 | 139 | 112 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-2 | **Lab Sample ID:** | 1010063-004A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 11:30 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | 0.0076 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0042 | 0.020 | 0.054 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | 0.055 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0048 | 0.020 | 0.25 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0043 | 0.020 | 0.12 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0047 | 0.020 | 0.013 | J | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0081 | 0.020 | 0.16 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 0.20 | 0.41 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 52.5 | 139 | 123 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 50.2 | 139 | 121 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-1 | **Lab Sample ID:** | 1010063-005A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 11:55 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | 0.0062 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0032 | 0.020 | 0.0061 | J | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0042 | 0.020 | 0.085 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | 0.097 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0048 | 0.020 | 0.34 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0043 | 0.020 | 0.14 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0047 | 0.020 | 0.023 | | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0081 | 0.020 | 0.56 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 0.20 | 0.61 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 52.5 | 139 | 118 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 50.2 | 139 | 122 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1010063 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 10/13/10 | **Prep Batch:** | 1312 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 10/14/10 | **Analytical Batch:** | 402587 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | ND | |
| gamma-BHC | 0.40 | 2.0 | ND | |
| beta-BHC | 0.36 | 2.0 | ND | |
| delta-BHC | 0.49 | 2.0 | ND | |
| Heptachlor | 1.1 | 2.0 | ND | |
| Aldrin | 0.44 | 2.0 | ND | |
| Heptachlor epoxide | 0.32 | 2.0 | ND | |
| gamma-Chlordane | 0.42 | 2.0 | ND | |
| alpha-Chlordane | 0.36 | 2.0 | ND | |
| Endosulfan I | 0.59 | 2.0 | ND | |
| 4,4'-DDE | 0.48 | 2.0 | ND | |
| Dieldrin | 0.43 | 2.0 | ND | |
| Endrin | 0.57 | 2.0 | ND | |
| 4,4'-DDD | 0.47 | 2.0 | ND | |
| Endosulfan II | 1.5 | 2.0 | ND | |
| 4,4'-DDT | 0.81 | 2.0 | ND | |
| Endrin aldehyde | 1.0 | 2.0 | ND | |
| Endosulfan sulfate | 0.49 | 2.0 | ND | |
| Methoxychlor | 0.62 | 5.0 | ND | |
| Endrin Ketone | 0.40 | 2.0 | ND | |
| Chlordane | 10 | 20 | ND | |
| Toxaphene | 10 | 100 | ND | |
| TCMX (S) | | | 105 | |
| DCBP (S) | | | 105 | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1010063 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 10/13/10 | **Prep Batch:** | 1312 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 10/14/10 | **Analytical Batch:** | 402587 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | | 20 | 92.0 | 104 | 12.3 | 44.2 - 125 | 30 | |
| gamma-BHC | 0.40 | 2.0 | | 20 | 89.2 | 100 | 12.1 | 56.9 - 124 | 30 | |
| beta-BHC | 0.36 | 2.0 | | 20 | 93.8 | 106 | 11.6 | 44.2 - 125 | 30 | |
| delta-BHC | 0.49 | 2.0 | | 20 | 85.4 | 97.8 | 13.4 | 61.5 - 116 | 30 | |
| Heptachlor | 1.1 | 2.0 | | 20 | 101 | 114 | 12.3 | 63.6 - 125 | 30 | |
| Aldrin | 0.44 | 2.0 | | 20 | 96.6 | 109 | 12.4 | 53 - 126 | 30 | |
| Heptachlor epoxide | 0.32 | 2.0 | | 20 | 98.7 | 112 | 12.8 | 54.6 - 130 | 30 | |
| gamma-Chlordane | 0.42 | 2.0 | | 20 | 97.0 | 109 | 12.0 | 68.7 - 123 | 30 | |
| alpha-Chlordane | 0.36 | 2.0 | | 20 | 95.2 | 107 | 12.3 | 42.4 - 128 | 30 | |
| Endosulfan I | 0.59 | 2.0 | | 20 | 91.3 | 104 | 12.6 | 61.2 - 119 | 30 | |
| 4,4'-DDE | 0.48 | 2.0 | | 20 | 95.0 | 107 | 12.3 | 45.3 - 123 | 30 | |
| Dieldrin | 0.43 | 2.0 | | 20 | 96.1 | 109 | 12.7 | 44 - 128 | 30 | |
| Endrin | 0.57 | 2.0 | | 20 | 100 | 112 | 10.8 | 44.1 - 126 | 30 | |
| 4,4'-DDD | 0.47 | 2.0 | | 20 | 91.0 | 104 | 13.8 | 39.6 - 123 | 30 | |
| Endosulfan II | 1.5 | 2.0 | | 20 | 81.0 | 91.7 | 12.4 | 56.7 - 112 | 30 | |
| 4,4'-DDT | 0.81 | 2.0 | | 20 | 99.2 | 114 | 14.1 | 52.8 - 134 | 30 | |
| Endrin aldehyde | 1.0 | 2.0 | | 20 | 78.1 | 86.4 | 10.3 | 50.2 - 113 | 30 | |
| Endosulfan sulfate | 0.49 | 2.0 | | 20 | 88.5 | 101 | 13.7 | 62.1 - 116 | 30 | |
| Methoxychlor | 0.62 | 5.0 | | 20 | 105 | 115 | 9.06 | 55.2 - 126 | 30 | |
| Endrin Ketone | 0.40 | 2.0 | | 20 | 78.1 | 93.9 | 18.5 | 53.9 - 120 | 30 | |
| TCMX (S) | | | | 2100 | 91.8 | 105 | | 52.5 - 121 | | |
| DCBP (S) | | | | 2100 | 88.4 | 101 | | 50.2 - 121 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: D/B Contractor Stockpile

Work Order No.: 1010063

Date and Time Received: 10/7/2010 13:30

Received By: NK

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 6 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | | | | |
| pH Checked by: | pH Adjusted by: | | | |

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)
**QC Level:**
**Project Name:** D/B Contractor Stockpile
**TAT Requested:** 3 day:25
**Project # :** 100-SFO-26535-04
**Date Received:** 10/7/2010
**Report Due Date:** 10/14/2010
**Time Received:** 13:30

**Comments:** 3 Day RUSH (plus 2 Days drying)! MI 8081 (OCP)! Report to Yvonne, Gail Jon and Tom! Needs EDD

**Work Order # :** ***1010063***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1010063-001A | DB-STP-3A | 10/06/10 10:55 | Soil | 04/05/11 | | | EDD<br>S_8081MITetra | |
| 1010063-002A | DB-STP-3B | 10/06/10 11:00 | Soil | 04/05/11 | | | S_8081MITetra | |
| 1010063-003A | DB-STP-3C | 10/06/10 11:05 | Soil | 04/05/11 | | | S_8081MITetra | |
| 1010063-004A | DB-STP-2 | 10/06/10 11:30 | Soil | 04/05/11 | | | S_8081MITetra | |
| 1010063-005A | DB-STP-1 | 10/06/10 11:55 | Soil | 04/05/11 | | | S_8081MITetra | |

Torrent LABORATORY, INC.

# CHAIN-OF-CUSTODY RECORD

TETRA TECH

1010063

Client Name/Account #: TetraTech, Inc.
Address: 737 Bishop St., Suite 3020
City/State/Zip: Honolulu, HI 96813
Project Manager: Y. Parry
Telephone Number: (808)533-3366 Fax No.: (808)533-3306
Sampler Name: (Print) Jon Mollison
Sampler Signature:

Report To: Y. Parry, G. Eaton, T. Whitehead, J. Mollison
Invoice To: Y. Parry
Project ID:
Project #:

| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Preservative: Ice | Preservative: $HNO_3$ (Red Label) | Preservative: HCl (Blue Label) | Preservative: NaOH ( Orange Label) | Preservative: $H_2SO_4$ Plastic (Yellow Label) | Preservative: $H_2SO_4$ Glass(Yellow Label) | Preservative: None (Black Label) | Preservative: Other (one MeOH VOA) | Matrix: Groundwater | Matrix: Wastewater | Matrix: Drinking Water | Matrix: Sludge | Matrix: Soil | Matrix: Other (specify): | Analyze For: Multi-Incremental Preparatio | Analyze For: 8081 | RUSH TAT (Pre-Schedule) | Standard TAT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001A | DB-STP-3A | 10/6/10 | 1055 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 002A | DB-STP-3B | 10/6/10 | 1100 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 003A | DB-STP-3C | 10/6/10 | 1105 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 004A | DB-STP-2 | 10/6/10 | 1130 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 005A | DB-STP-1 | 10/6/10 | 1155 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |

RUSH
3 DAYS

Special Instructions: Please proceed with air-drying, sieving and subsampling as per HDOH guidance

Method of Shipment: FEDEX

Laboratory Comments:
Temperature Upon Receipt: 6 °C
VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| Jon Mollison | 10/6/10 | 1300 | FED EX | | |
| Relinquished by: | Date | Time | Received by Torrent: | Date | Time |
| Fed Ex | 10/7/10 | 1:30p | | 10/7/10 | 1:30p |

Page 1 of 1

Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306

RE: Onizuka II-3 Stockpile

Work Order No.: 1010080 Rev: 1

Dear Yvonne Parry:

Torrent Laboratory, Inc. received 6 sample(s) on October 11, 2010 for the analyses presented in the following Report.

Report revised 10/19/10 - See narrative for revision details.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.

Patti Sandrock

October 18, 2010
Date

**Date:** 10/18/2010

**Client:** Tetra Tech Inc (HI)

**Project:** Onizuka II-3 Stockpile

**Work Order:** 1010080

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Analytical Comments, General, For all samples -Note:Samples processed under Incremental Sampling Procedure SOP TCI0109. Sample collection date and time is reflective of Hawaiian Standard Time (HST) while all anlaytical dates and times are reflective of Pacific Standard Time (PST).

Analytical Comments for METHOD 8081S_Tetra Tech, ALL SAMPLE, Note: Per client request, whenever possible (where matrix interference does not preclude it),sample data is reported to the MDL. Results reported between the MDL and PQL are qualified with the appropriate "J" flag and should be considered as estimated values

REVISIONS:

Revised to report all sample data units as mg/Kg rather than ug/Kg (samples 001, 003 and 006 originally reported in ug/Kg). No QC data was affected by this revision.
Rev 1 (10/19/10)

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

**ONI3-STP-1** 1010080-001

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-2** 1010080-002

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-3** 1010080-003

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-4A** 1010080-004

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-4B** 1010080-005

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-4C** 1010080-006

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-1 | **Lab Sample ID:** | 1010080-001A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:00 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 115 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 106 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-2 | **Lab Sample ID:** | 1010080-002A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:15 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 119 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 119 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-3 | **Lab Sample ID:** | 1010080-003A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:30 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 113 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 112 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-4A | **Lab Sample ID:** | 1010080-004A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:45 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 124 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 106 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-4B | **Lab Sample ID:** | 1010080-005A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:50 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 105 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 108 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-4C | **Lab Sample ID:** | 1010080-006A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:55 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 116 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 95.8 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1010080 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 10/16/10 | **Prep Batch:** | 1334 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 10/17/10 | **Analytical Batch:** | 402630 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | ND | |
| gamma-BHC | 0.40 | 2.0 | ND | |
| beta-BHC | 0.36 | 2.0 | ND | |
| delta-BHC | 0.49 | 2.0 | ND | |
| Heptachlor | 1.1 | 2.0 | ND | |
| Aldrin | 0.44 | 2.0 | ND | |
| Heptachlor epoxide | 0.32 | 2.0 | ND | |
| gamma-Chlordane | 0.42 | 2.0 | ND | |
| alpha-Chlordane | 0.36 | 2.0 | ND | |
| Endosulfan I | 0.59 | 2.0 | ND | |
| 4,4'-DDE | 0.48 | 2.0 | ND | |
| Dieldrin | 0.43 | 2.0 | ND | |
| Endrin | 0.57 | 2.0 | ND | |
| 4,4'-DDD | 0.47 | 2.0 | ND | |
| Endosulfan II | 1.5 | 2.0 | ND | |
| 4,4'-DDT | 0.81 | 2.0 | ND | |
| Endrin aldehyde | 1.0 | 2.0 | ND | |
| Endosulfan sulfate | 0.49 | 2.0 | ND | |
| Methoxychlor | 0.62 | 5.0 | ND | |
| Endrin Ketone | 0.40 | 2.0 | ND | |
| Chlordane | 10 | 20 | ND | |
| Toxaphene | 10 | 100 | ND | |
| TCMX (S) | | | 87.7 | |
| DCBP (S) | | | 77.2 | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1010080 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 10/16/10 | **Prep Batch:** | 1334 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 10/17/10 | **Analytical Batch:** | 402630 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | | 20 | 98.9 | 95.6 | 3.51 | 44.2 - 125 | 30 | |
| gamma-BHC | 0.40 | 2.0 | | 20 | 95.5 | 92.6 | 3.12 | 56.9 - 124 | 30 | |
| beta-BHC | 0.36 | 2.0 | | 20 | 103 | 97.5 | 5.45 | 44.2 - 125 | 30 | |
| delta-BHC | 0.49 | 2.0 | | 20 | 90.0 | 85.0 | 5.66 | 61.5 - 116 | 30 | |
| Heptachlor | 1.1 | 2.0 | | 20 | 104 | 99.3 | 4.66 | 63.6 - 125 | 30 | |
| Aldrin | 0.44 | 2.0 | | 20 | 105 | 98.7 | 5.72 | 53 - 126 | 30 | |
| Heptachlor epoxide | 0.32 | 2.0 | | 20 | 102 | 96.3 | 6.29 | 54.6 - 130 | 30 | |
| gamma-Chlordane | 0.42 | 2.0 | | 20 | 105 | 99.1 | 5.83 | 68.7 - 123 | 30 | |
| alpha-Chlordane | 0.36 | 2.0 | | 20 | 104 | 97.6 | 5.85 | 42.4 - 128 | 30 | |
| Endosulfan I | 0.59 | 2.0 | | 20 | 95.9 | 89.0 | 7.61 | 61.2 - 119 | 30 | |
| 4,4'-DDE | 0.48 | 2.0 | | 20 | 102 | 98.3 | 4.15 | 45.3 - 123 | 30 | |
| Dieldrin | 0.43 | 2.0 | | 20 | 101 | 94.1 | 6.62 | 44 - 128 | 30 | |
| Endrin | 0.57 | 2.0 | | 20 | 98.0 | 95.5 | 2.63 | 44.1 - 126 | 30 | |
| 4,4'-DDD | 0.47 | 2.0 | | 20 | 95.3 | 91.6 | 4.22 | 39.6 - 123 | 30 | |
| Endosulfan II | 1.5 | 2.0 | | 20 | 80.5 | 69.7 | 14.4 | 56.7 - 112 | 30 | |
| 4,4'-DDT | 0.81 | 2.0 | | 20 | 103 | 100 | 2.60 | 52.8 - 134 | 30 | |
| Endrin aldehyde | 1.0 | 2.0 | | 20 | 72.9 | 57.0 | 24.6 | 50.2 - 113 | 30 | |
| Endosulfan sulfate | 0.49 | 2.0 | | 20 | 89.1 | 68.7 | 25.7 | 62.1 - 116 | 30 | |
| Methoxychlor | 0.62 | 5.0 | | 20 | 99.1 | 95.2 | 3.88 | 55.2 - 126 | 30 | |
| Endrin Ketone | 0.40 | 2.0 | | 20 | 82.7 | 74.5 | 10.2 | 53.9 - 120 | 30 | |
| TCMX (S) | | | | 2100 | 97.3 | 93.8 | | 52.5 - 121 | | |
| DCBP (S) | | | | 2100 | 91.3 | 87.8 | | 50.2 - 121 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: Onizuka II-3 Stockpile

Work Order No.: 1010080

Date and Time Received: 10/11/2010 10:10

Received By: NGH

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 6 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | | | | |
| pH Checked by: | pH Adjusted by: | | | |

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)

**Project Name:** Onizuka II-3 Stockpile

**Project # :**

**Report Due Date:** 10/18/2010

**QC Level:**

**TAT Requested:** 3 day:25

**Date Received:** 10/11/2010

**Time Received:** 10:10

**Comments:** 3 day Rush! (+2 days for drying) Received 6 soils @ 6'C for multi incremental sampling for 8081. Samples need to be air dried, sieved and subsampled.

**Work Order # :** ***1010080***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1010080-001A | ONI3-STP-1 | 10/08/10 9:00 | Soil | 04/09/11 | | | EDD<br>S_8081MITetra | |
| **Sample Note:** | 3 day Rush! proceed with air-drying, Sieving and subsampling as per HDOH guidance.Multi incremental sampling. | | | | | | | |
| 1010080-002A | ONI3-STP-2 | 10/08/10 9:15 | Soil | 04/09/11 | | | S_8081MITetra | |
| 1010080-003A | ONI3-STP-3 | 10/08/10 9:30 | Soil | 04/09/11 | | | S_8081MITetra | |
| 1010080-004A | ONI3-STP-4A | 10/08/10 9:45 | Soil | 04/09/11 | | | S_8081MITetra | |
| 1010080-005A | ONI3-STP-4B | 10/08/10 9:50 | Soil | 04/09/11 | | | S_8081MITetra | |
| 1010080-006A | ONI3-STP-4C | 10/08/10 9:55 | Soil | 04/09/11 | | | S_8081MITetra | |

Torrent LABORATORY, INC.

# CHAIN-OF-CUSTODY RECORD

TETRA TECH

1010080

Client Name/Account #: TetraTech, Inc.
Address: 737 Bishop St., Suite 3020
City/State/Zip: Honolulu, HI 96813
Project Manager: Y. Parry
Telephone Number: (808)533-3366 Fax No.: (808)533-3306
Sampler Name: (Print) Jon Mollison
Sampler Signature:

Report To: Y. Parry, G. Eaton, T. Whitehead, J. Mollison
Invoice To: Y. Parry
Project ID: Onizuka II-3 Stockpile
Project #:

| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Preservative: Ice | Preservative: $HNO_3$ (Red Label) | Preservative: HCl (Blue Label) | Preservative: NaOH ( Orange Label) | Preservative: $H_2SO_4$ Plastic (Yellow Label) | Preservative: $H_2SO_4$ Glass(Yellow Label) | Preservative: None (Black Label) | Preservative: Other (one MeOH VOA) | Matrix: Groundwater | Matrix: Wastewater | Matrix: Drinking Water | Matrix: Sludge | Matrix: Soil | Matrix: Other (specify): | Analyze For: Multi-Incremental Preparatio | Analyze For: 8081 | RUSH TAT (Pre-Schedule) | Standard TAT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001A | ON13-STP-1 | 10/8/10 | 900 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 002A | ON13-STP-2 | " | 915 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 003A | ON13-STP-3 | " | 930 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 004A | ON13-STP-4A | " | 945 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 005A | ON13-STP-4B | " | 950 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 006A | ON13-STP-4C | ▼ | 955 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |

RUSH
3 DAYS

Special Instructions: Please proceed with air-drying, sieving and subsampling as per HDOH guidance

Method of Shipment: FEDEX

Laboratory Comments:
Temperature Upon Receipt: 6 0
VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| Jon Mollison | 10/8/10 | 1300 | FedEx | | |
| Relinquished by: | Date | Time | Received by Torrent: | Date | Time |
| FedEx | 10-11-10 | 10:10 Am. | | 10-11-10 | 10:10 Am |

Page 1 of 1

TETRA TECH

December 28, 2010

Mladena Yankova Kukin mladena.yankovakukin@actuslendlease.com
Development Manager
Hickam Communities LLC
211 Mercury Street
Honolulu, HI 96818

**Subject: TO#56: Summary of Findings Report on Sampling and Chemical Analysis of the Onizuka II-2 Import Soil Stockpiles, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi**

Dear Ms. Yankova Kukin:

This summary of findings report (SoFR) presents the results of import stockpile soil sampling conducted on behalf of Hickam Communities LLC (HC), on HC property at Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi. Tetra Tech performed the stockpile soil sampling under Task Order #56.

The purpose of this investigation was to evaluate stockpiled soil for the presence of organochlorine pesticides, and to determine the suitability of the soil for import as clean topsoil at the HC project sites located in the Onizuka II-2 and Earhart I-2/I-3 neighborhoods. The soil sampling and evaluation of the analytical results was done in accordance with the *Pesticide Impacted Soils Investigation and Management Program Manual* (Program Manual) (Tetra Tech 2009), and the *Removal Action Work Plan No. 1* (RO# 1) (Tetra Tech 2010a).

This SoFR documents the sampling and analysis of two soil stockpiles located at the Onizuka II-2 Neighborhood (hereinafter the "Site"). The stockpiles have a cumulative volume of approximately 500 cubic yards (CY) and consist of topsoil imported from Hawaiian Earth Products, Ltd. (HIE). The two stockpiles contain 200-CY and 300-CY of topsoil.

## FIELD METHODS

Tetra Tech mobilized to the Site on November 22, 2010. All soil sampling activities were conducted in accordance to the Sampling Analysis Plan (SAP) prepared for this event (Tetra Tech 2010b). A copy of the field records is provided in Appendix A.

Before beginning the soil sampling effort, each stockpile was designated as a single decision unit (DU) as shown in Figure 1. The 200-CY stockpile was designated HIE-STP-1, and the 300-CY stockpile was designated HIE-STP-2. Tetra Tech followed the MI soil sampling protocols recommended by Hawai'i Department of Health (HDOH) for this event (HDOH 2009a). For each stockpile DU, Tetra Tech collected one multi-incremental (MI) soil sample, consisting of 75 soil increments (subsamples). The subsamples were collected from the outer layer of the stockpiles using dedicated stainless steel spoons. Since the height of both stockpiles was less than 5-feet above grade, an excavator was not used to access deeper portions of the stockpiles; to access soil inside the stockpiles Tetra Tech used hand tools and soil probes. For quality assurance/quality control purposes, a triplicate sample (one MI sample and two replicates) from HIE-STP-2.

The collected soil was composited in the field by placing the subsamples for each MI soil sample into a 1-gallon sealable plastic bag. To preserve sample integrity during sample collection and transport, the MI soil sample bag was sealed, labeled, and placed into an ice-cooled insulated chest for transport under a chain-of-custody to the analytical laboratory.

## ANALYTICAL METHODS

A total of four MI soil samples (two MI soil samples and two replicates) were submitted to Torrent Laboratory, Milpitas, California for analysis. The MI soil samples were prepared according to the HDOH MI sub-sampling protocol (HDOH 2009a). Material from each 1-gallon bag was air dried at room temperature, sieved through a 2 millimeter (mm) sieve. The sieved material was then spread out and thirty sub-samples collected by the laboratory were combined into one MI sample and prepared for analysis. Each MI soil sample was analyzed for:

- Organochlorine Pesticides by US Environmental Protection Agency (EPA) Method 8081A;
- Resource Conservation and Recovery Act (RCRA) 8 Metals (arsenic, barium, cadmium, total chromium, lead, mercury, silver, and selenium) by EPA Method 6010; and
- Total Petroleum Hydrocarbons (TPH) as diesel and motor oil by EPA Method 8015B, with silica gel cleanup.

## ANALYTICAL RESULTS

The analytical results were compared to the following screening levels:

- The HDOH Tier 1 Environmental Action Levels (EALs) for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is not a drinking water resource (Table B-1) (HDOH 2009b);
- The Site-specific Tier 2 EALs for aldrin, dieldrin, and technical chlordane established for HC property (Tetra Tech 2009); and
- The Tier 2-based cumulative risk was calculated for organochlorine pesticides and compared to the 1 x $10^{-5}$ cumulative risk threshold established for HC property (Tetra Tech 2009).

The laboratory analytical results are summarized below, and presented in Table 1. A copy of the analytical report is provided Appendix B. Only analytes detected at or above the laboratory reporting limit are shown in Table 1.

### Pesticides

- Chlordane was detected in all four MI soil samples at concentrations ranging from 0.016 milligrams per kilogram (mg/kg) to 0.017 mg/kg. These detections are below the Tier 1 EAL for chlordane (16 mg/kg)..
- Dieldrin was detected in all four MI soil samples at concentrations ranging from 0.012 mg/kg to 0.015 mg/kg. These detections are below the Tier 1 EAL for dieldrin (0.03 mg/kg)..
- Heptachlor epoxide was detected in all four MI soil samples at concentrations ranging from 0.0051 mg/kg to 0.0071 mg/kg. There is no Tier 1 or Tier 2 established for heptachlor epoxide.
- Minor concentrations of 4,4–dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyldichloroethane (DDE), and 4,4'-dichlorodiphenyltrichloroethane (DDT) were detected in all four MI soil samples. These detections are below the respective Tier 1 EALs. There is no Tier 2 EAL established for DDD, DDE, or DDT.

### Metals

- Arsenic was detected in all four MI soil samples at concentrations ranging from 6.4 mg/kg to 7.9 mg/kg. These detections are below the Tier 1 EAL for arsenic (20 mg/kg).

- Lead was detected in all four MI soil samples at concentrations ranging from 13 mg/kg to 14 mg/kg. These detections are below the Tier 1 EAL for lead (200 mg/kg).

### Petroleum Hydrocarbons

- TPH as motor oil was detected in all four MI soil samples at concentrations ranging from 180 mg/kg to 200 mg/kg. These detections are below the Tier 1 EAL (500 mg/kg).

## CUMULATIVE RISK

Cumulative risk is the sum of the carcinogenic risks of the individual compounds. For HC sites, the calculated Tier 2-based cumulative risk posed by aldrin, chlordane, and dieldrin is compared to the $1 \times 10^{-5}$ risk threshold established for HC (Tetra Tech 2009). The cumulative risk can be exceeded even if there are no detections above the HC Tier 2 EALs. If the calculated cumulative risk exceeds the risk threshold, the soil is designated as pesticide-impacted (PI) soil.

- The calculated Tier 2-based cumulative risk does not exceed the $1 \times 10^{-5}$ risk threshold in any of the four MI soil samples collected from the HIE stockpiles.

## CONCLUSIONS

For the MI soil samples collected from the HIE stockpiles at the Site:

- Organochlorine compounds were detected at concentrations above the laboratory reporting limits in all four of the MI soil samples. There were no detections of organochlorine pesticides exceeding the respective Tier 1 or Tier 2 EALs.
- The RCRA-8 metals lead and arsenic were detected at concentrations at or above the laboratory reporting limits in all four of the MI soil samples. There were no detections exceeding the respective Tier 1 EALs.
- TPH as motor oil was detected in all four MI soil samples. None of these detections exceeded the Tier 1 EAL. No other petroleum hydrocarbons were detected in the MI soil samples collected from the HIE stockpiles.
- The Tier 2-based calculated cumulative risk for all four MI soil samples is below the $1 \times 10^{-5}$ risk threshold.

Based on Tetra Tech's evaluation of the analytical results, and in accordance with the project plans (Tetra Tech 2009 and 2010a), Tetra Tech concludes that the soil in both HIE stockpiles located at the Site **is not PI soil** and is therefore suitable for unrestricted use on HC property.

## REFERENCES

CFR (Code of Federal Regulations). 2010. CFR Title 40: 261.24 Table 1—Maximum Concentration of Contaminants for the Toxicity Characteristic. Accessed at internet website URL: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9b8d30a98d2bd8ffe90e6b8042d2ffc6&rgn=div8&view=text&node=40:25.0.1.1.2.3.1.5&idno=40

HDOH (Hawai'i Department of Health). 2009a. *Interim Final Technical Guidance Manual for Implementation of the Hawaii State Contingency Plan.* Prepared by: Hawai'i Department of Health Environmental Management Division. June 21.

HDOH (Hawai'i Department of Health). 2009b. HDOH Environmental Action Levels, Supplemental Models in Excel Format, EAL Surfer. March 2009. Accessed at internet website URL: http://hawaii.gov/health/environmental/hazard/eal2005.html

Tetra Tech. 2009. *Pesticide-Impacted Soils Investigation and Management Program Manual, Hickam Air Force Base, O'ahu, Hawai'i.* Prepared for Hickam Community Housing LLC. May 2009.

Tetra Tech. 2010a. *Removal Action Work Plan No. 1, Immediate Actions for Pesticide-Impacted Soil, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, O'ahu Hawai'i.* Prepared for Hickam Communities, LLC. DCN 2653504.001.F05. October 11, 2010.

Tetra Tech. 2010b. *Sampling and Analysis Plan, Stockpile Sampling, Onizuka II-2, Hickam Air Force Base, Hawai'i.* Prepared for Prepared for Hickam Communities LLC. November 22, 2010.

If you have any questions or comments about this report, please do not hesitate to contact me at (415) 490-2975 or Yvonne Parry in our Honolulu office, at (808) 533-3366. Tetra Tech appreciates the opportunity to provide continued environmental support to HC.

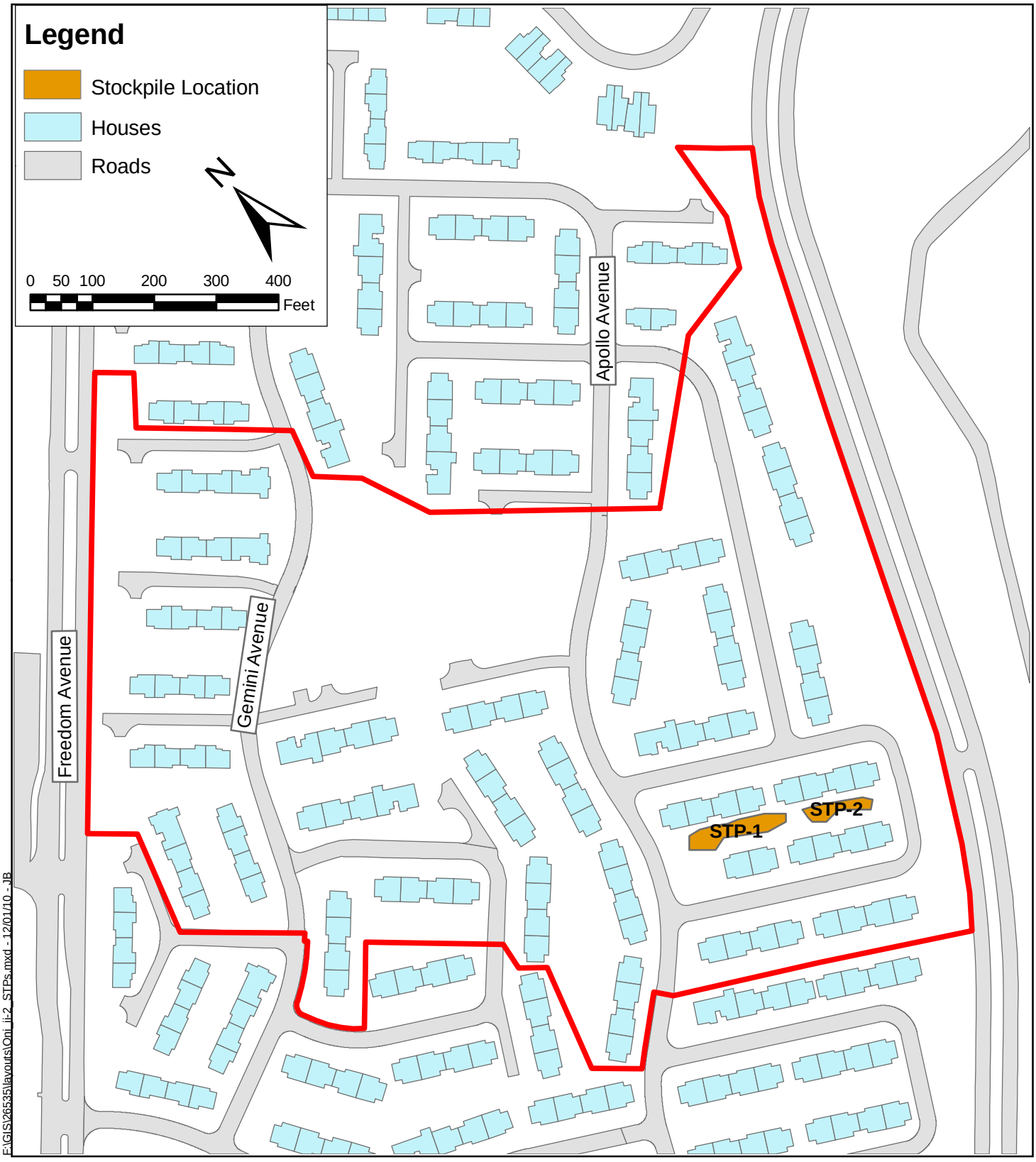
Sincerely,
**TETRA TECH**

Gail Eaton, P.G.
Senior Geologist
Tetra Tech

Attachments:
Figure 1 – Onizuka II-2 Stockpile Location
Table 1 – Analytical Results for Soil, Onizuka II-2 Import Stockpiles.
Appendix A – Field Records
Appendix B – Laboratory Analytical Reports

cc: Gary Floyd, Program Manager, Tetra Tech
Tom Whitehead C.HG., Technical Lead, Tetra Tech
Yvonne Parry, Project Manager, Tetra Tech

# FIGURE




# *Onizuka II-2 Confirmation Sampling Decision Unit Map*

Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i

# TABLE

**Table 1**
**Hickam Communities**
**Analytical Results for Soil**
**Onizuka II-2 Import Stockpiles**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Sample ID → | HDOH Tier 1 EAL[1] (mg/kg) | HC Tier 2 EAL[2] (mg/kg) | HIE-STP-1 (mg/kg) | HIE-STP-2A (mg/kg) | HIE-STP-2B (mg/kg) | HIE-STP-2C (mg/kg) |
|---|---|---|---|---|---|---|
| ***Sample Date →*** | | | ***11/22/2010*** | ***11/22/2010*** | ***11/22/2010*** | ***11/22/2010*** |
| **Analyte** | | | | | | |
| 4,4´-DDD | 2.0 | NE | 0.0099 | 0.0084 | 0.0091 | 0.0095 |
| 4,4´-DDE | 1.4 | NE | 0.039 | 0.033 | 0.038 | 0.032 |
| 4,4´-DDT | 1.7 | NE | 0.041 | 0.031 | 0.038 | 0.03 |
| Chlordane[3] | 16 | 23.4 | 0.16 | 0.16 | 0.17 | 0.16 |
| Dieldrin | 0.03 | 0.45 | 0.015 | 0.012 | 0.015 | 0.014 |
| Heptachlor epoxide | NE | NE | 0.0079 | 0.0068 | 0.0063 | 0.0051 |
| | | | | | | |
| ***Cumulative Risk*** | | | 4.E-07 | 3.E-07 | 4.E-07 | 4.E-07 |
| *RCRA 8 Metals* | | | | | | |
| Arsenic | 20 | NE | 6.6 | 6.4 | 7.9 | 6.8 |
| Lead | 200 | NE | 14 | 13 | 14 | 14 |
| *Petroleum Hydrocarbons* | | | | | | |
| TPH as Motor Oil | 500 | NE | 180 | 200 | 200 | 190 |

***Notes:***

Only detected analytes are shown in this table.

Sample HIE-STP-2 is a triplicate.

Exceeds HDOH Tier 1 EAL

Exceeds HC Tier 2 EAL

At or below 1 x $10^{-5}$ risk threshold

Above 1 x $10^{-5}$ risk threshold

| | |
|---|---|
| HDOH | Hawai'i Department of Health |
| HC | Hickam Communities LLC |
| HIE | Hawaiian Earth Produces, Ltd. |
| STP | stockpile |
| EAL | Environmental Action Level |
| mg/kg | milligram per kilogram |
| < | less than the laboratory reporting limit |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethylene |
| DDT | dichlorodiphenyltrichloroethane |
| NE | not established |
| RCRA | Resource Conservation and Recovery Act |
| 1 | HDOH Tier 1 EALs are for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is a non drinking water resource (Table B-1) (HDOH 2009). |
| 2 | HC Tier 2 EALs established for Hickam Communities LLC Tetra Tech 2009). |
| 3 | Technical chlordane constituents alpha- and gamma-chlordane not reported in this table. Detections of these compounds are provided in the laboratory analytical report. |

# APPENDIX A

## FIELD RECORDS

TETRA TECH



# FIELD NOTES

**Project Title:** ONIZUKA II-2
**Project #:** 26535-04
**Date:** 11/22/10 **Time:** 1215
**Location:** ONIZUKA II-2
**Client:**
**Tt Personnel:** J. BARNES

**Misc. Personnel:**

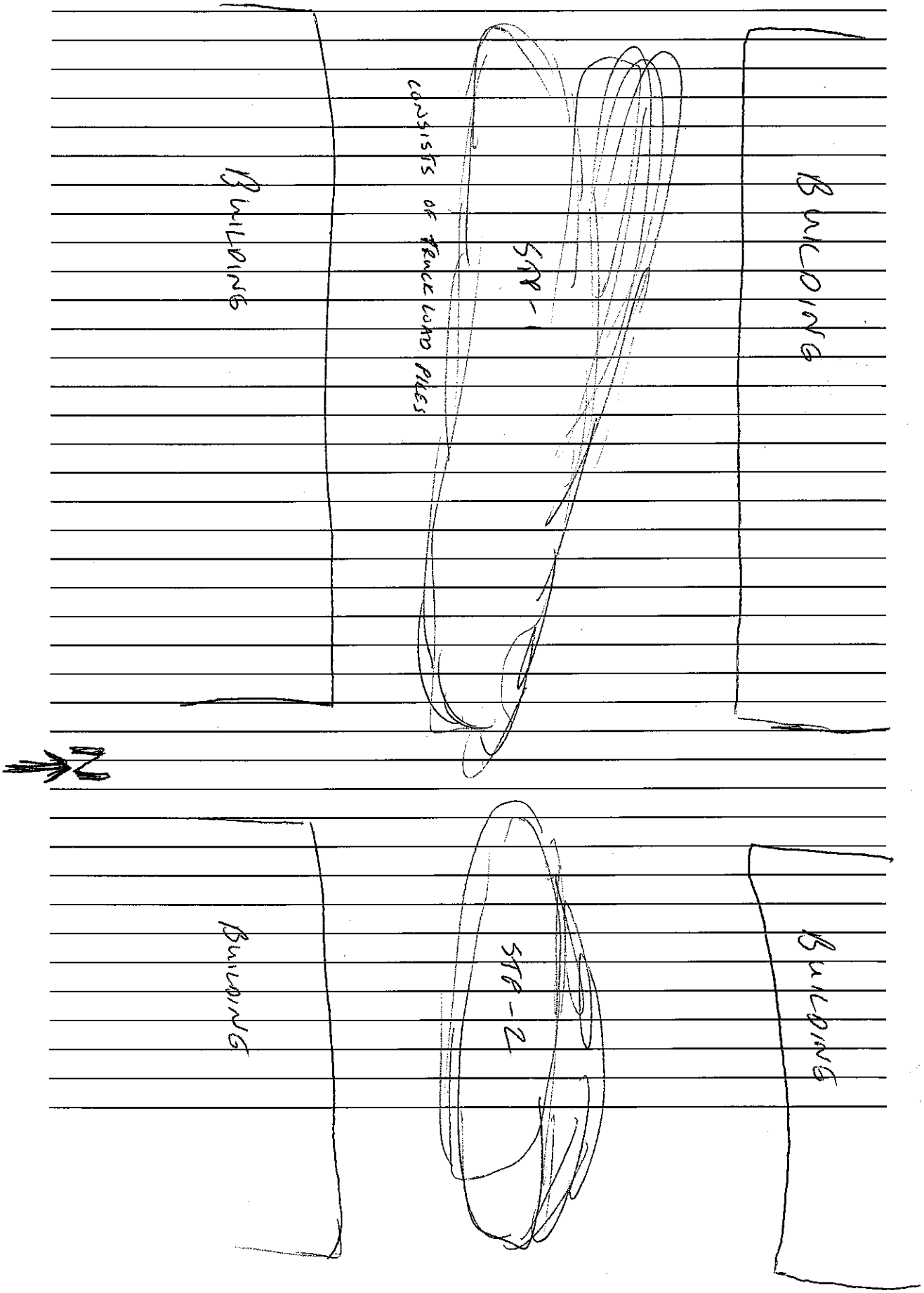
**Statement of Work:** STOCKPILE SAMPLING

**Equipment Used:** SPOONS + SOIL PROBES

**Weather:** SUNNY ≈ 85°

| Time | Project Activity |
|---|---|
| 1215 | Tt arrived on site |
| 1220 | Health & Safety Meeting |
| 1221 | CALLED PAUL AND MEL OF ACTNS TO GET LOCATION OF STOCKPILES. |
| 1230 | MEL (ACTNS) ESCORTS TT JBS TO STOCKPILES. STOCKPILES ARE FAIRLY SPREAD OUT AND NOT TOO CONCENTRATED NO EXCAVATOR OR DEEP DIGGING TOOLS WILL BE REQUIRED. MAXIMUM HEIGHT IS 5'. (SEE DRAWING FOR REFERENCE) |
| 1240 | BEGIN SAMPLING HIE-STP-1 |
| 1317 | HIE-STP-1 SAMPLE COLLECTED 75 increments |
| 1319 | BEGIN SAMPLING HIE-STP-2 (TRIPLICATE) |
| 1425 | HIE-STP-2A SAMPLE COLLECTED |
| 1430 | HIE-STP-2B SAMPLE COLLECTED |
| 1435 | HIE-STP-2C SAMPLE COLLECTED |
| 1437 | DECON EQUIPMENT. |
| 1442 | TT OFF-SITE |

SEE SKETCH ON BACK


BUILDING
STR-1
CONSISTS OF FENCE AND PILES
BUILDING
BUILDING
STR-2
BUILDING
N

# APPENDIX B

## LABORATORY ANALYTICAL REPORTS

Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306

RE: Onizuka II-2 HIE Stockpiles

Work Order No.: 1011186

Dear Yvonne Parry:

Torrent Laboratory, Inc. received 4 sample(s) on November 24, 2010 for the analyses presented in the following Report.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.

Patti Sandrock

December 03, 2010
Date

**Date:** 12/3/2010

**Client:** Tetra Tech Inc (HI)

**Project:** Onizuka II-2 HIE Stockpiles

**Work Order:** 1011186

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Analytical Comments, General, For all samples -Note:Samples processed under Incremental Sampling Procedure SOP TCI0109. Sample collection date and time is reflective of Hawaiian Standard Time (HST) while all anlaytical dates and times are reflective of Pacific Standard Time (PST).

Analytical Comments for METHOD 8081S_Tetra Tech, ALL SAMPLE, Note: Per client request, whenever possible (where matrix interference does not preclude it),sample data is reported to the MDL. Results reported between the MDL and PQL are qualified with the appropriate "J" flag and should be considered as estimated values

Analytical Comments for method SW6010B, For MS/MSD, QC Analytical Batch ID 403173, Note:The % recoveries for Arsenic and Lead are outside of laboratory control limits but are within % RPD limits. The associated LCS/LCSD % recoveries and % RPD are within limits. No corrective action required.

Analytical Comments for method 8081MI For MS, QC Analytical Batch ID 403179, Note:The % recovery for DDT in the MS is outside of laboratory control limits but within % RPD limits. The associated LCS/LCSD % recoveries and % RPD are within limits. No corrective action required.

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

**HIE-STP-1** 1011186-001

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0079 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.022 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.016 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.039 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.015 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0099 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.041 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.16 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 2 | 3.6 | 7.9 | 180 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 6.6 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 14 | mg/Kg |

**HIE-STP-2A** 1011186-002

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0068 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.020 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.016 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.033 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.012 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0084 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.031 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.16 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 2 | 3.6 | 7.9 | 200 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 6.4 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 13 | mg/Kg |

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

**HIE-STP-2B** 1011186-003

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0063 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.021 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.018 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.038 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.015 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0091 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.038 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.17 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 2 | 3.6 | 7.9 | 200 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 7.9 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 14 | mg/Kg |

**HIE-STP-2C** 1011186-004

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0051 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.020 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.017 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.032 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.014 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0095 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.030 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.16 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 2 | 3.6 | 7.9 | 190 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 6.8 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 14 | mg/Kg |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-1 | **Lab Sample ID:** | 1011186-001A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 13:17 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0560 | 0.34 | 6.6 | | mg/Kg | 403173 | 1650 |
| Lead | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0740 | 0.260 | 14 | | mg/Kg | 403173 | 1650 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| gamma-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| beta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| delta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Aldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor epoxide | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0032 | 0.020 | 0.0079 | J | mg/Kg | 403179 | 1647 |
| gamma-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0042 | 0.020 | 0.022 | | mg/Kg | 403179 | 1647 |
| alpha-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | 0.016 | J | mg/Kg | 403179 | 1647 |
| Endosulfan I | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDE | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0048 | 0.020 | 0.039 | | mg/Kg | 403179 | 1647 |
| Dieldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0043 | 0.020 | 0.015 | J | mg/Kg | 403179 | 1647 |
| Endrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDD | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0047 | 0.020 | 0.0099 | J | mg/Kg | 403179 | 1647 |
| Endosulfan II | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDT | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0081 | 0.020 | 0.041 | | mg/Kg | 403179 | 1647 |
| Endrin aldehyde | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Endosulfan sulfate | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Methoxychlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 403179 | 1647 |
| Endrin Ketone | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 0.20 | 0.16 | J | mg/Kg | 403179 | 1647 |
| Toxaphene | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 403179 | 1647 |
| TCMX (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 52.5 | 139 | 107 | | % | 403179 | 1647 |
| DCBP (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 50.2 | 139 | 135 | | % | 403179 | 1647 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-1 | **Lab Sample ID:** | 1011186-001A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 13:17 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 1.5 | 4.0 | ND | | mg/Kg | 403184 | 1651 |
| TPH as Motor Oil (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 3.6 | 7.9 | 180 | | mg/Kg | 403184 | 1651 |
| Pentacosane (S) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 61.5 | 133 | 99.6 | | % | 403184 | 1651 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2A | **Lab Sample ID:** | 1011186-002A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:25 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0560 | 0.34 | 6.4 | | mg/Kg | 403173 | 1650 |
| Lead | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0740 | 0.260 | 13 | | mg/Kg | 403173 | 1650 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| gamma-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| beta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| delta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Aldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor epoxide | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0032 | 0.020 | 0.0068 | J | mg/Kg | 403179 | 1647 |
| gamma-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0042 | 0.020 | 0.020 | | mg/Kg | 403179 | 1647 |
| alpha-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | 0.016 | J | mg/Kg | 403179 | 1647 |
| Endosulfan I | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDE | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0048 | 0.020 | 0.033 | | mg/Kg | 403179 | 1647 |
| Dieldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0043 | 0.020 | 0.012 | J | mg/Kg | 403179 | 1647 |
| Endrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDD | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0047 | 0.020 | 0.0084 | J | mg/Kg | 403179 | 1647 |
| Endosulfan II | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDT | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0081 | 0.020 | 0.031 | | mg/Kg | 403179 | 1647 |
| Endrin aldehyde | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Endosulfan sulfate | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Methoxychlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 403179 | 1647 |
| Endrin Ketone | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 0.20 | 0.16 | J | mg/Kg | 403179 | 1647 |
| Toxaphene | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 403179 | 1647 |
| TCMX (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 52.5 | 139 | 123 | | % | 403179 | 1647 |
| DCBP (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 50.2 | 139 | 112 | | % | 403179 | 1647 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2A | **Lab Sample ID:** | 1011186-002A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:25 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 1.5 | 4.0 | ND | | mg/Kg | 403184 | 1651 |
| TPH as Motor Oil (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 3.6 | 7.9 | 200 | | mg/Kg | 403184 | 1651 |
| Pentacosane (S) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 61.5 | 133 | 99.4 | | % | 403184 | 1651 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2B | **Lab Sample ID:** | 1011186-003A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:30 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0560 | 0.34 | 7.9 | | mg/Kg | 403173 | 1650 |
| Lead | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0740 | 0.260 | 14 | | mg/Kg | 403173 | 1650 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| gamma-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| beta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| delta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Aldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor epoxide | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0032 | 0.020 | 0.0063 | J | mg/Kg | 403179 | 1647 |
| gamma-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0042 | 0.020 | 0.021 | | mg/Kg | 403179 | 1647 |
| alpha-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | 0.018 | J | mg/Kg | 403179 | 1647 |
| Endosulfan I | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDE | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0048 | 0.020 | 0.038 | | mg/Kg | 403179 | 1647 |
| Dieldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0043 | 0.020 | 0.015 | J | mg/Kg | 403179 | 1647 |
| Endrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDD | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0047 | 0.020 | 0.0091 | J | mg/Kg | 403179 | 1647 |
| Endosulfan II | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDT | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0081 | 0.020 | 0.038 | | mg/Kg | 403179 | 1647 |
| Endrin aldehyde | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Endosulfan sulfate | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Methoxychlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 403179 | 1647 |
| Endrin Ketone | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 0.20 | 0.17 | J | mg/Kg | 403179 | 1647 |
| Toxaphene | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 403179 | 1647 |
| TCMX (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 52.5 | 139 | 103 | | % | 403179 | 1647 |
| DCBP (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 50.2 | 139 | 130 | | % | 403179 | 1647 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2B | **Lab Sample ID:** | 1011186-003A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:30 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 1.5 | 4.0 | ND | | mg/Kg | 403184 | 1651 |
| TPH as Motor Oil (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 3.6 | 7.9 | 200 | | mg/Kg | 403184 | 1651 |
| Pentacosane (S) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 61.5 | 133 | 99.9 | | % | 403184 | 1651 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2C | **Lab Sample ID:** | 1011186-004A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:35 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0560 | 0.34 | 6.8 | | mg/Kg | 403173 | 1650 |
| Lead | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0740 | 0.260 | 14 | | mg/Kg | 403173 | 1650 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| gamma-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| beta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| delta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Aldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor epoxide | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0032 | 0.020 | 0.0051 | J | mg/Kg | 403179 | 1647 |
| gamma-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0042 | 0.020 | 0.020 | J | mg/Kg | 403179 | 1647 |
| alpha-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | 0.017 | J | mg/Kg | 403179 | 1647 |
| Endosulfan I | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDE | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0048 | 0.020 | 0.032 | | mg/Kg | 403179 | 1647 |
| Dieldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0043 | 0.020 | 0.014 | J | mg/Kg | 403179 | 1647 |
| Endrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDD | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0047 | 0.020 | 0.0095 | J | mg/Kg | 403179 | 1647 |
| Endosulfan II | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDT | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0081 | 0.020 | 0.030 | | mg/Kg | 403179 | 1647 |
| Endrin aldehyde | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Endosulfan sulfate | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Methoxychlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 403179 | 1647 |
| Endrin Ketone | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 0.20 | 0.16 | J | mg/Kg | 403179 | 1647 |
| Toxaphene | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 403179 | 1647 |
| TCMX (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 52.5 | 139 | 103 | | % | 403179 | 1647 |
| DCBP (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 50.2 | 139 | 112 | | % | 403179 | 1647 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2C | **Lab Sample ID:** | 1011186-004A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:35 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 1.5 | 4.0 | ND | | mg/Kg | 403184 | 1651 |
| TPH as Motor Oil (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 3.6 | 7.9 | 190 | | mg/Kg | 403184 | 1651 |
| Pentacosane (S) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 61.5 | 133 | 99.1 | | % | 403184 | 1651 |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1647 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403179 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.00044 | 0.0020 | ND | |
| gamma-BHC | 0.00040 | 0.0020 | ND | |
| beta-BHC | 0.00036 | 0.0020 | ND | |
| delta-BHC | 0.00049 | 0.0020 | ND | |
| Heptachlor | 0.0011 | 0.0020 | ND | |
| Aldrin | 0.00044 | 0.0020 | ND | |
| Heptachlor epoxide | 0.00032 | 0.0020 | ND | |
| gamma-Chlordane | 0.00042 | 0.0020 | ND | |
| alpha-Chlordane | 0.00036 | 0.0020 | ND | |
| Endosulfan I | 0.00059 | 0.0020 | ND | |
| 4,4'-DDE | 0.00048 | 0.0020 | ND | |
| Dieldrin | 0.00043 | 0.0020 | ND | |
| Endrin | 0.00057 | 0.0020 | ND | |
| 4,4'-DDD | 0.00047 | 0.0020 | ND | |
| Endosulfan II | 0.0015 | 0.0020 | ND | |
| 4,4'-DDT | 0.00081 | 0.0020 | ND | |
| Endrin aldehyde | 0.0010 | 0.0020 | ND | |
| Endosulfan sulfate | 0.00049 | 0.0020 | ND | |
| Methoxychlor | 0.00062 | 0.0050 | ND | |
| Endrin Ketone | 0.00040 | 0.0020 | ND | |
| Chlordane | 0.010 | 0.020 | ND | |
| Toxaphene | 0.010 | 0.10 | ND | |
| TCMX (S) | | | 105 | |
| DCBP (S) | | | 103 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3050B_MI | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1650 |
| **Matrix:** | Soil | **Analytical Method:** | SW6010B | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403173 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| Arsenic | 0.0560 | 0.34 | 0.15 | |
| Lead | 0.0740 | 0.260 | 0.21 | |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545_TPHSG | **Prep Date:** | 12/02/10 | **Prep Batch:** | 1651 |
| **Matrix:** | Soil | **Analytical Method:** | SW8015B(M) | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403184 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier | |
|---|---|---|---|---|---|
| TPH as Diesel (SG) | 0.76 | 2.0 | ND | | |
| TPH as Motor Oil (SG) | 1.8 | 4.0 | ND | | |
| Pentacosane (S) | | | 90.9 | | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1647 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403179 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | ND | 20 | 105 | 99.4 | 5.03 | 44.2 - 125 | 30 | |
| gamma-BHC | 0.40 | 2.0 | ND | 20 | 103 | 95.8 | 7.29 | 56.9 - 124 | 30 | |
| beta-BHC | 0.36 | 2.0 | ND | 20 | 109 | 98.5 | 10.2 | 44.2 - 125 | 30 | |
| delta-BHC | 0.49 | 2.0 | ND | 20 | 81.9 | 85.8 | 4.48 | 61.5 - 116 | 30 | |
| Heptachlor | 1.1 | 2.0 | ND | 20 | 106 | 99.6 | 6.74 | 63.6 - 125 | 30 | |
| Aldrin | 0.44 | 2.0 | ND | 20 | 109 | 102 | 6.54 | 53 - 126 | 30 | |
| Heptachlor epoxide | 0.32 | 2.0 | ND | 20 | 110 | 100 | 9.35 | 54.6 - 130 | 30 | |
| gamma-Chlordane | 0.42 | 2.0 | ND | 20 | 110 | 99.5 | 10.5 | 68.7 - 123 | 30 | |
| alpha-Chlordane | 0.36 | 2.0 | ND | 20 | 111 | 101 | 10.3 | 42.4 - 128 | 30 | |
| Endosulfan I | 0.59 | 2.0 | ND | 20 | 90.0 | 97.7 | 8.20 | 61.2 - 119 | 30 | |
| 4,4'-DDE | 0.48 | 2.0 | ND | 20 | 111 | 98.5 | 11.5 | 45.3 - 123 | 30 | |
| Dieldrin | 0.43 | 2.0 | ND | 20 | 110 | 98.8 | 10.7 | 44 - 128 | 30 | |
| Endrin | 0.57 | 2.0 | ND | 20 | 108 | 97.3 | 9.99 | 44.1 - 126 | 30 | |
| 4,4'-DDD | 0.47 | 2.0 | ND | 20 | 104 | 93.0 | 11.2 | 39.6 - 123 | 30 | |
| Endosulfan II | 1.5 | 2.0 | ND | 20 | 75.8 | 92.0 | 19.1 | 56.7 - 112 | 30 | |
| 4,4'-DDT | 0.81 | 2.0 | ND | 20 | 117 | 94.7 | 20.7 | 52.8 - 134 | 30 | |
| Endrin aldehyde | 1.0 | 2.0 | ND | 20 | 68.8 | 89.5 | 25.8 | 50.2 - 113 | 30 | |
| Endosulfan sulfate | 0.49 | 2.0 | ND | 20 | 79.0 | 94.7 | 18.1 | 62.1 - 116 | 30 | |
| Methoxychlor | 0.62 | 5.0 | ND | 20 | 94.5 | 77.8 | 19.4 | 55.2 - 126 | 30 | |
| Endrin Ketone | 0.40 | 2.0 | ND | 20 | 92.0 | 93.3 | 1.43 | 53.9 - 120 | 30 | |
| TCMX (S) | | | ND | 2100 | 101 | 94.2 | | 52.5 - 121 | | |
| DCBP (S) | | | ND | 2100 | 103 | 91.4 | | 50.2 - 121 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3050B_MI | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1650 |
| **Matrix:** | Soil | **Analytical Method:** | SW6010B | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403173 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.056 | 0.34 | 0.15 | 10 | 98.72 | 97.8 | 0.97 | 75 - 125 | 30 | |
| Lead | 0.074 | 0.26 | 0.21 | 10 | 105.9 | 105 | 0.57 | 75 - 125 | 30 | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545_TPHSG | **Prep Date:** | 12/02/10 | **Prep Batch:** | 1651 |
| **Matrix:** | Soil | **Analytical Method:** | SW8015B(M) | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403184 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | 0.76 | 2.0 | ND | 33.33 | 80.1 | 84.7 | 5.58 | 50.8 - 111 | 30 | |
| Pentacosane (S) | | | ND | 100 | 92.4 | 98.4 | | 61.5 - 133 | | |

Torrent LABORATORY, INC.

# MS/MSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3050B_MI | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1650 |
| **Matrix:** | **Soil** | **Analytical Method:** | SW6010B | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403173 |
| **Spiked Sample:** | 1011186-001A | | | | | | |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Sample Conc. | Spike Conc. | MS % Recovery | MSD % Recovery | MS/MSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.0560 | 0.34 | 0.66 | 10 | 47.9 | 44.3 | 3.30 | 75 - 125 | 30 | S |
| Lead | 0.0740 | 0.260 | 1.4 | 10 | 34.7 | 1240 | 155 | 75 - 125 | 30 | S,R |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1647 |
| **Matrix:** | **Soil** | **Analytical Method:** | SW8081A | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403179 |
| **Spiked Sample:** | 1011186-002A | | | | | | |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Sample Conc. | Spike Conc. | MS % Recovery | MSD % Recovery | MS/MSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Aldrin | 4.4 | 20 | 0.12 | 20 | 109 | 103 | 4.56 | 53.9 - 142 | 30 | |
| gamma-BHC | 4.0 | 20 | 0.14 | 20 | 75.1 | 101 | 27.1 | 56.9 - 120 | 30 | |
| Heptachlor | 11 | 20 | 0.08 | 20 | 102 | 101 | 1.11 | 52.2 - 117 | 30 | |
| Dieldrin | 4.3 | 20 | 1.18 | 20 | 120 | 121 | 0.103 | 29.2 - 130 | 30 | |
| Endrin | 5.7 | 20 | 0.00 | 20 | 111 | 102 | 7.78 | 44.1 - 121 | 30 | |
| 4,4'-DDT | 8.1 | 20 | 3.13 | 20 | 142 | 130 | 4.10 | 24.6 - 134 | 30 | S |
| TCMX (S) | | | | 2100 | 119 | 110 | | 52.5 - 139 | | |
| DCBP (S) | | | | 2100 | 118 | 116 | | 50.2 - 139 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: Onizuka II-2 HIE Stockpiles

Work Order No.: 1011186

Date and Time Received: 11/24/2010 10:40

Received By: NG

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 4 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | | | | |
| pH Checked by: | pH Adjusted by: | | | |

Torrent LABORATORY, INC.

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)
**QC Level:**
**Project Name:** Onizuka II-2 HIE Stockpiles
**TAT Requested:** 3 day:25
**Project # :** 100-SFO-T26535-04
**Date Received:** 11/24/2010
**Report Due Date:** 12/3/2010
**Time Received:** 10:40

**Comments:** 3 Day TAT (plus 2 days drying) 4 soils rece'd at 4'C ! Report to Yvonne, Gail and Tom! MI for 8081, TPHDOSG and Lead and Arsenic! Needs EDD!

**Work Order # :** ***1011186***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1011186-001A | HIE-STP-1 | 11/22/10 13:17 | Soil | 05/23/11 | | | S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |
| **Sample Note:** | 3 day Rush! Proceed with air-drying, sieving and subsampling as per HDOH guidance. 8081, TPHD/MoSG,Pb,As for all samples. | | | | | | | |
| 1011186-002A | HIE-STP-2A | 11/22/10 14:25 | Soil | 05/23/11 | | | S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |
| 1011186-003A | HIE-STP-2B | 11/22/10 14:30 | Soil | 05/23/11 | | | S_6010BMI<br>S_TPHDOSG<br>S_8081MITetra | |
| 1011186-004A | HIE-STP-2C | 11/22/10 14:35 | Soil | 05/23/11 | | | S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |

Torrent LABORATORY, INC.

RUSH 3-DAY TAT

# CHAIN-OF-CUSTODY RECORD

TETRA TECH

1011186

Client Name/Account #: TetraTech, Inc.

Address: 737 Bishop St., Suite 3020

City/State/Zip: Honolulu, HI 96813

Project Manager: Y. Parry

Report To: Y. Parry, G. Eaton, T. Whitehead

Telephone Number: (808)533-3366 Fax No.: (808)533-3306

Invoice To: Y. Parry

Sampler Name: (Print) J. Barlos

Project ID: Onizuka II-2 HIE Stockpiles

Sampler Signature:

Project #: 100-SFO-T26535-04

| | | | | | | | | Preservative | | | | | | | | Matrix | | | | | | Analyze For: | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Ice | $HNO_3$ (Red Label) | HCl (Blue Label) | NaOH ( Orange Label) | $H_2SO_4$ Plastic (Yellow Label) | $H_2SO_4$ Glass(Yellow Label) | None (Black Label) | Other (one MeOH VOA) | Groundwater | Wastewater | Drinking Water | Sludge | Soil | Other (specify): | Multi-Incremental Preparatic | 8081 | 8015B TPH Diesel and Motor Oil + silica gel clean up | Lead & Arsenic (6010) | | | | | | | RUSH TAT (Pre-Schedule | Standard TAT | | |
| 001A | HIE-STP-1 | 11/22/10 | 1317 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | | |
| 002A | HIE-STP-2A | 11/22/10 | 1425 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | | |
| 003A | HIE-STP-2B | 11/22/10 | 1430 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | | |
| 004A | HIE-STP-2C | 11/22/10 | 1435 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RUSH
3 DAYS

**Special Instructions:**

Please proceed with air-drying, sieving and subsampling as per HDOH guidance

Method of Shipment: FEDEX

**Laboratory Comments:**

Temperature Upon Receipt: 4° C

VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| Jaymes Barlos | 11/23/2010 | 1200 | FedEx | 11/23/2010 | 1200 |
| Relinquished by: | Date | Time | Received by Laboratory: | Date | Time |
| FedEx | 11-24-10 | 10:40 Am. | NAVIN G. | 11-24-10 | 10:40 Am |

Page 1 of 1

# APPENDIX D

## Residential Dust and Air Monitoring Memorandum

TETRA TECH

**MEMORANDUM**

TETRA TECH PROJECT: T26545.04

TO: Gary Floyd, Program Manager

Cc: Matt Horrigan, Risk Assessor
Tom Whitehead, CHG, Senior Technical Lead
Randy Westhaus, PE, Remedial Engineer

FROM: Gail Eaton, PG, Senior Geologist
Dr. Kay Johnson, Risk Assessor
Yvonne Parry, Project Manager

**SUBJECT: Hickam Communities Residential Dust and Air Monitoring Results for Removal Action No. 1, October and November 2010, Earhart I-2, Earhart I-3, and Soil Stockpiling Area, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi.**
**DCN# 2653504.009.F01**

February 8, 2011

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## INTRODUCTION

The purpose of this memorandum is present the results of residential dust and air monitoring for the removal action that was conducted at the Earhart I-2 and Earhart I-3 Neighborhoods, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi (hereinafter the "Site"). The residential dust and air monitoring was done in support of the removal action at the Site, and conducted in accordance with the Removal Action Work Plan No. 1 (RO #1) (Tetra Tech 2010). This memorandum includes a summary of the field methods used to collect dust and air monitoring samples in October and November 2010, and the analytical results which were reported by Quinn Consultants, Inc. (QCI) (QCI 2011). The dust and air monitoring samples were collected from the excavation areas at the Site, and the temporary soil stockpiling area located south of the Earhart I-4 Neighborhood, across Ohana Nui Circle.

Tetra Tech
737 Bishop Street, Suite 3020, Honolulu, HI 96813
Tel 808.533.3366 Fax 808.533.5306 www.tetratech.com

## RO #1 IMPLEMENTATION: FIELD METHODS

Tetra Tech contracted with QCI to conduct residential dust and air monitoring during excavation activities at the Site on October 15, 18 through 22, 25 through 28 and November 9, 12, 15 and 23, 2010. Two dust monitors were used at Site excavations to collect the dust monitoring data.

- The dust monitoring samples were collected at a rate of one reading per minute over an 8-hour work day (Quinn 2011). Due to problems with on-site dust monitoring equipment, there is no available dust monitoring data for the November activities (QCI 2011).

- Up to three air monitors for collection of samples for analysis of airborne organochlorine pesticides (aldrin, dieldrin, chlordane, and heptachlor) were used at the Site. The air monitoring samples were collected on filter cassettes at a rate of approximately 1 liter of air/minute over an 8-hour work day (QCI 2011).

A summary of the field and analytical methods are provided in this section; a detailed description of the field and analytical methods is provided in the QCI report (QCI 2011). A copy of the QCI report is provided in Attachment A of this memorandum. The analytical results are summarized below and provided in Tables 1 and 2.

### Monitor Locations

The dust and air monitoring samples were collected during excavation activities conducted under the RO #1. In order to collect representative samples, air monitoring stations were placed at the perimeter of the excavation areas. A personal sampler for the collection of airborne pesticide samples was worn by select Site personnel working within some of the excavation areas.

The air monitors were placed at two stations around the excavation perimeters. One was "reasonably" upwind of the soil removal activities, outside of the immediate vicinity of the excavation, but sufficiently close enough to ensure that monitoring data were representative of the neighborhood. Samplers were also placed downwind of key activity areas and as close to the affected housing units as feasible, such that the collected air samples are as representative as possible of potential exposures of nearby residents. The air sampling locations are provided in Figures 1 through 3.

- Earhart I-2 DUs. Monitoring stations were placed at DU-6b, DU-9d and e, DU-42c, and DU-52b. The monitor locations shown at DU-42c were changed based on whether excavations were being conducted in the front yard of building 6375 or the area between buildings 6375 and 6376. No air monitoring samples were collected at DU-15d.

- Earhart I-3 DUs. Monitoring stations were placed at DU-2a.

- Soil Stockpile Area. One monitoring station was installed daily on a post near the access gate, and one was installed in the southeast corner of the stockpile area.

## RO #1 IMPLEMENTATION: ANALYTICAL METHODS AND RESULTS

The collected air samples for airborne pesticides were submitted to INALAB, Inc. of Honolulu for analysis of organochlorine pesticides. Upon receipt, QCI provided draft reports to Tetra Tech; however, the initial laboratory reporting limits exceeded the site-specific thresholds for pesticides in air. Tetra Tech and QCI subsequently worked with the analytical laboratory to provide analytical reports for pesticides in air reported to the method detection limits (MDLs), which are below the site-specific exposure goals (REGs). The analytical results are summarized below and provided in Tables 1 and 2. The details for air monitoring are provided in a copy QCIs report in Attachment A.

Airborne dust and pesticide data were compared to the following environmental screening levels:

**Environmental Screening Levels for Airborne Dust and Pesticides**

| Constituent[1] | Screening Level [2, 3] (µg/m$^3$) | Basis for Screening Level |
|---|---|---|
| ***Dust*** | | |
| Dust, as Particulate Matter ($PM_{10}$) | 150 | 24-hour National Ambient Air Quality Standard |
| ***Airborne Pesticides*** | | |
| Aldrin | 0.075 | REG-Site-specific, risk-based concentration |
| | 250 | OSHA PEL –8-hour average |
| Chlordane | 3.60 | REG-Site-specific, risk-based concentration |
| | 500 | OSHA PEL –8-hour average |
| Dieldrin | 0.0795 | REG-Site-specific, risk-based concentration |
| | 250 | OSHA PEL –8-hour average |
| Heptachlor | 0.285 | REG-Site-specific, risk-based concentration |
| | 50 | ACGIH TLV –8-hour average |

µg/m$^3$ = micrograms per cubic meter.
$PM_{10}$ = Ambient Air Quality Standard for 10 micrometer particulate matter.
[1] Aldrin, chlordane, dieldrin, and heptachlor are organochlorine pesticide compounds.
[2] The pesticide screening levels are the site specific residential exposure goals (REG) developed for residential areas outside the excavation area. The OSHA PELs are applied to worker exposure within the excavation area only.
[3]There is no OSHA PEL established for heptachlor. The ACGIH TLV is referenced instead.

As noted in the table *Environmental Screening Levels for Airborne Dust and Pesticides* above, the environmental screening level for dust is based on the National Ambient Air Quality Standard (NAAQS) for 10 micrometer (µm) particulate matter ($PM_{10}$), while those for the pesticides are based on site-specific determinations of risk-based air concentrations. The REGs are site-specific thresholds which were determined using the standard US Environmental Protection Agency (EPA) approach for calculating acceptable airborne chemical concentrations, a target risk of $1 \times 10^{-5}$, and site-specific exposure parameters. For the Site, it was assumed that residents could potentially be exposed to airborne pesticides (via inhalation) for 8-hours per day (i.e., during excavation activities) for 6 years (i.e., the residency period for military housing [U.S. AFRL, 1998]).

For workers within the excavation area, the Occupational Safety and Health Administration (OSHA) Permissible Exposure Levels (PELs) (for aldrin, dieldrin, and chlordane) and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) (for heptachlor)[1] are applied. These screening levels are 8-hour time-weighted average concentrations.

***Airborne Dust***

The dust monitoring results from October 2010 were compared to the NAAQS $PM_{10}$ screening level for airborne dust. The results were reported as average, minimum, and maximum values for each 8-hour monitoring period, where the dust readings were collected at a rate on one reading per minute. These results are summarized below:

- The average dust concentrations ranged from 7 to 24 $\mu g/m^3$, all of which are below the NAAQS $PM_{10}$ standard (150 $\mu g/m^3$).
- The minimum dust concentrations ranged from 0 to 36 micrograms per cubic meter ($\mu g/m^3$), all of which are below the NAAQS $PM_{10}$ standard.
- The maximum dust concentrations ranged from 15 to 1,206 $\mu g/m^3$. Three of the upwind samples and four of the downwind samples had detections exceeding the NAAQS $PM_{10}$ standard.

***Airborne Pesticides***

The analytical results for airborne pesticides in the residential areas outside the excavation perimeters are summarized below.

- Aldrin was detected in two of the 33 residential air monitoring samples at concentrations of 0.012 $\mu g/m^3$ and 0.01 $\mu g/m^3$. These detections are below the risk-based REG for aldrin (0.075 $\mu g/m^3$). One of these detections was at a

[1] The ACGIH TLV is applied for heptachlor since an OSHA PEL has not been established for heptachlor.

concentration below the laboratory reporting limit but above the MDL, this detection is flagged as an estimated value in the laboratory report.

- Chlordane was not detected in any of the 33 air monitoring samples collected at the Site during the RO #1 excavation.
- Dieldrin was detected in two of the 33 air monitoring samples at concentrations of 0.016 and 0.056 µg/m$^3$, which are below the risk-based REG for dieldrin (0.0795 µg/m$^3$).
- Heptachlor was detected in one of the 33 air monitoring samples at a concentration of 0.007 µg/m$^3$. This detection is below the risk-based REG for heptachlor (0.285 µg/m$^3$). Since this detection was at a concentration below the laboratory reporting limit but above the MDL, this detection is flagged as an estimated value in the laboratory report.

The analytical results for airborne pesticides, collected from personal monitors within the excavation perimeters are summarized below.

- Chlordane and heptachlor were not detected in the air samples collected from the personal monitors.
- Aldrin was detected in two air samples collected from personal monitors at concentrations of 0.029 and 0.01 µg/m$^3$. These detections are below the PEL (250 µg/m$^3$) and the REG (0.075 µg/m$^3$) for aldrin.
- Dieldrin was detected in two air samples collected from personal monitors at concentrations of 0.026 and 0.093 µg/m$^3$. These detections are below the PEL (250 µg/m$^3$) for dieldrin; one detection exceeds the REG (0.0795 µg/m$^3$) for dieldrin.

## DISCUSSION

The average and minimum dust levels for excavation activities conducted under the RO #1 are below the NAAQS $PM_{10}$ threshold for particulate dust. The maximum dust detections exceeded the $PM_{10}$ threshold in three of the upwind samples and four of the downwind samples; however since the dust samples were collected at a rate of one reading per minute over an 8-hour day, the exceedances in the maximum detections are likely due short dust emission bursts and not the result of prolonged dust emissions. This is supported by the average daily readings being below the $PM_{10}$ threshold. Even though no dust monitoring data was available for excavation activities conducted at the Site in November, based on the dust monitoring results from October, the best management practices (BMPs) implemented to control fugitive dust emissions, and observations from Tetra Tech's environmental oversight, and QCI (QCI 2011), dust concentrations were likely within acceptable levels.

Although the airborne pesticide concentrations detected in samples collected from the residential air monitors placed at the excavation perimeters were below REGs, there was one detection from a personal monitor which slightly exceeded the REG for dieldrin. Since the REGs are conservative thresholds that are calculated to be protective for long-term residential exposures (e.g., 6 years), the one-day exceedance of the REG in a sample from workers involved in active excavation indicates there was limited potential for prolonged exposure to airborne pesticides by nearby residents.. For the excavation workers potentially impacted by the airborne pesticides, all of the detections were below the OSHA PELs.

## REFERENCES

QCI (Quinn Consultants, Inc.). 2011. *Revised Report on Pesticide Air Monitoring and Dust Samples Collected During Excavation of Pesticide-Impacted Soil by Delta Construction in Various Tetra Tech-Selected Locations in the Earhart I-2 and I-3 Neighborhoods at Hickam Air Force Base.* Prepared for Tetra Tech. January 27, 2011.

Quinn, Kevin. 2011. Email subject: *Re: Followup-Hickam/Dust Data / Collection interval from Dust Track Monitors.* January 31, 2011.

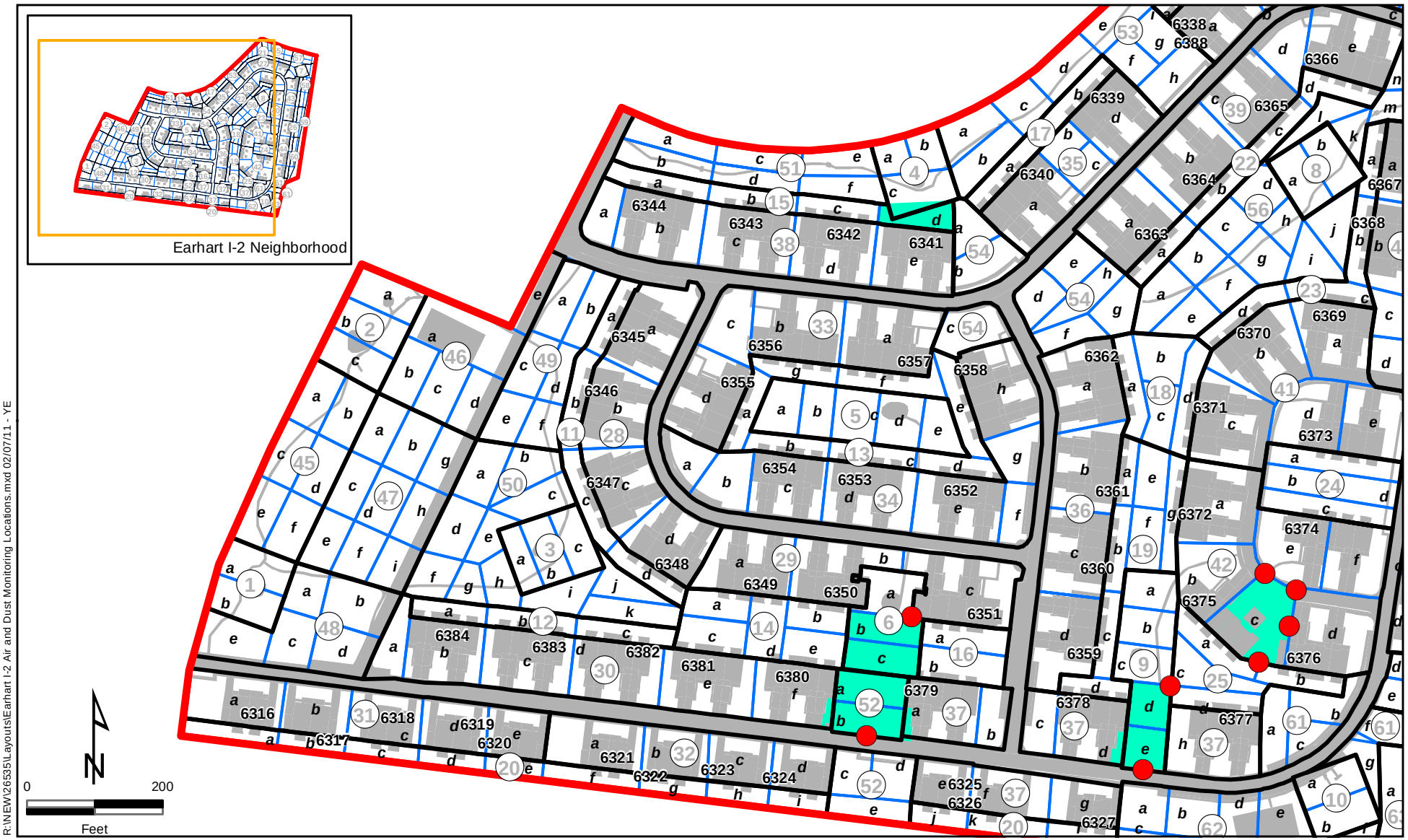
Tetra Tech. 2010. *Removal Action Work Plan No. 1, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl-Harbor Hickam, Oʻahu, Hawaiʻi.* Prepared for Hickam Communities LLC. October 11, 2010.

US AFRL (US Air Force Research Laboratory). 1998. *Military-Specific Exposure Factors Study. Final*. AFRL-HE-WP-TR-1998-0127. September.

Attachments:

| | |
|---|---|
| Figure 1. | Dust and Air Monitoring Stations -2010, Earhart I-2 |
| Figure 2. | Dust and Air Monitoring Stations -2010, Earhart I-3 |
| Figure 3. | Dust and Air Monitoring Stations -2010, Soil Stockpiling Area |
| Table 1. | Analytical Results for Dust in Air, October 2010, Residential Air Monitoring at the Earhart I-2, Earhart I-3, and Soil Stockpile Area. |
| Table 2. | Analytical Results for Pesticides in Air, October and November 2010, Residential Air Monitoring at the Earhart I-2, Earhart I-3, and Soil Stockpile Area |
| Attachment A. | Quinn Consultants, Inc. Report |

# FIGURES

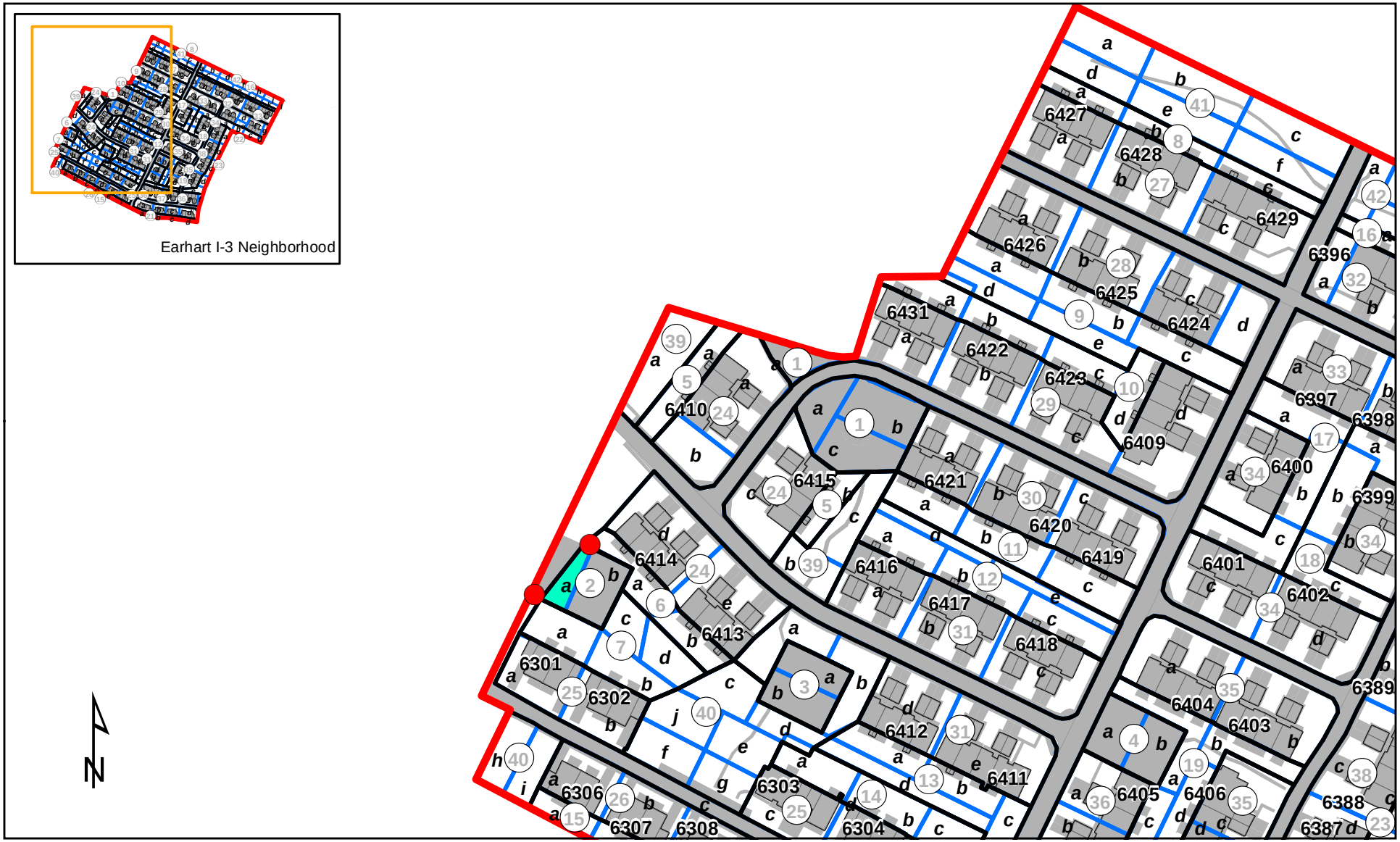



# *Dust and Air Monitoring Locations - 2010*
# *Earhart I-2 Neighborhood*

Joint Base Pearl Harbor-Hickam, Hawai'i

TETRA TECH

**Figure 1**

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# *Dust and Air Monitoring Locations - 2010*
# *Earhart I-3 Neighborhood*

Joint Base Pearl Harbor-Hickam, Hawai'i

- Earhart Village I-2
- Hardscapes
- P.I. Soil Excavation Area
- *b* Decision Units
- 10 Grouped Decision Units
- Perimeter Dust/Air Monitoring Stations

TETRA TECH

**Figure 2**

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# *Dust and Air Monitoring Locations - 2010*
# *Soil Stockpiling Area*

● Perimeter Dust/Air Monitoring Stations

Joint Base Pearl Harbor-Hickam, Hawai'i

TETRA TECH

**Figure 3**

# TABLES

**Table 1**
**Analytical Results for Airborne Dust, October 2010**
**Resitential Air Monitoring**
**at the Earhart I-2, Earhart I-3, and Soil Stockpile Area**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Dust Monitor Location | Sample Date | Dust Concentration[1] | | |
|---|---|---|---|---|
| | | Average ($\mu g/m^3$) | Minimum ($\mu g/m^3$) | Maximum ($\mu g/m^3$) |
| **Upwind Monitor** | 10/19/2010 | 24 | 0 | **424** |
| | 10/20/2010 | 7 | 1 | **225** |
| | 10/21/2010 | 8 | 2 | 65 |
| | 10/22/2010 | 9 | 6 | 19 |
| | 10/25/2010 | 7 | 2 | 16 |
| | 10/26/2010 | 7 | 1 | **169** |
| | 10/27/2010 | 8 | 5 | 114 |
| | 10/28/2010 | 8 | 3 | 15 |
| **Downwind Monitor** | 10/19/2010 | 68 | 33 | **1,206** |
| | 10/20/2010 | 63 | 7 | **541** |
| | 10/21/2010 | 53 | 3 | 95 |
| | 10/22/2010 | 28 | 0 | 85 |
| | 10/25/2010 | 21 | 6 | **785** |
| | 10/26/2010 | 60 | 36 | **874** |
| | 10/27/2010 | 28 | 0 | 28 |
| | 10/28/2010 | NA | NA | NA |
| ***NAAQS $PM_{10}$*** | | ***150*** | | |
| ***OSHA PEL*** | | ***15,000*** | | |
| ***HDOH Monitoring Station[2]*** | | ***2 to 10 (monthy 24 hour average)<br>18 to 34 (24 hour average)*** | | |

***Notes:***

**Bolded** values are detections exceeding the $PM_{10}$ standard

| | |
|---|---|
| $\mu g/m^3$ | microgram per cubic meter |
| NA | not available |
| $PM_{10}$ | National Ambient Air Quality Standard (NAAQS) for 10 millimeter (mm) particulate matter |
| OSHA | Occupational Safety and Health Adminstration |
| PEL | permissible exposure limit; over an 8-hour day |
| HDOH | Hawai'I Department of Health |
| 1 | Dust readings collected from two separate monitors at a rate of one per minute over an 8-hour work day. |
| 2 | Kinau Hale HDOH Monitoring Station: Range of 2 to 10 $\mu g/m^3$ (monthly 24-hour average $PM_{10}$ concentration) for 2009; the maximum average 24-hour average $PM_{10}$ concentration ranges form approximately 18 to 34 $\mu g/m^3$ |

**Table 2**
**Analytical Results for Airborne Pesticides, October and November 2010**
**Residential Air Monitoring at the Earhart I-2, Earhart I-3, and Soil Stockpile Area**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Sample ID | Sample Description | Sample Date | Lab Report | Aldrin ($\mu g/m^3$) | Chlordane [1] ($\mu g/m^3$) | Dieldrin ($\mu g/m^3$) | Heptachlor ($\mu g/m^3$) |
|---|---|---|---|---|---|---|---|
| | ***EARHART I-2*** | | | | | | |
| **Earhart101510-1** | upwind, residential PI soil abatement | 10/15/2010 | 20103074rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **Earhart101510-2** | downwind, residential PI soil abatement | 10/15/2010 | 20103074rev | **0.012** | <0.006 | **0.056** | <0.006 |
| **E12101810-1** | upwind, residential PI soil abatement | 10/18/2010 | 20103074rev | <0.005 | <0.005 | <0.005 | <0.005 |
| **E12101810-2** | downwind, residential PI soil abatement | 10/18/2010 | 20103074rev | <0.005 | <0.005 | **0.016** | <0.005 |
| **E12101910-1** | upwind, residential PI soil abatement | 10/19/2010 | 20103132rev | <0.004 | <0.004 | <0.004 | <0.004 |
| **E12101910-2** | downwind, residential PI soil abatement | 10/19/2010 | 20103132rev | <0.004 | <0.004 | <0.004 | <0.004 |
| **E12102010-1** | upwind, residential PI soil abatement | 10/20/2010 | 20103132rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102010-1 (D)** | upwind, residential PI soil abatement (Duplicate) | 10/20/2010 | 20103132rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102010-2** | downwind, residential PI soil abatement | 10/20/2010 | 20103132rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102110-1** | upwind, residential PI soil abatement | 10/21/2010 | 20103132rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **E12102110-2** | downwind, residential PI soil abatement | 10/21/2010 | 20103132rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **E12102210-1** | upwind, residential PI soil abatement | 10/22/2010 | 20103159 rev | <0.008 | <0.008 | <0.008 | <0.008 |
| **E12102210-2** | downwind, residential PI soil abatement | 10/22/2010 | 20103159 rev | <0.008 | <0.008 | <0.008 | <0.008 |
| **E12102510-1** | upwind, residential PI soil abatement | 10/25/2010 | 20103199rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102510-1 (D)** | upwind, residential PI soil abatement (Duplicate) | 10/25/2010 | 20103199rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102510-2** | downwind, residential PI soil abatement | 10/25/2010 | 20103199rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102610-1** | upwind, residential PI soil abatement | 10/26/2010 | 20103199rev | <0.007 | <0.007 | <0.007 | <0.007 |
| **E12102610-2** | downwind, residential PI soil abatement | 10/26/2010 | 20103199rev | <0.007 | <0.007 | <0.007 | <0.007 |
| **E12102710-1** | upwind, residential PI soil abatement | 10/27/2010 | 20103251rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **E12102710-2** | downwind, residential PI soil abatement | 10/27/2010 | 20103251rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **E12102810-1** | upwind, residential PI soil abatement | 10/28/2010 | 20103251rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102810-1 (D)** | upwind, residential PI soil abatement (Duplicate) | 10/28/2010 | 20103251rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102810-2** | downwind, residential PI soil abatement | 10/28/2010 | 20103251rev | **0.01 J** | <0.01 | <0.01 | <0.01 |
| | ***EARHART I-3*** | | | | | | |
| **E13112310-1** | upwind, residential PI soil abatement | 11/23/2010 | 20103550rev | <0.0008 | <0.0008 | <0.0008 | <0.0008 |
| **E13112310-2** | downwind, residential PI soil abatement | 11/23/2010 | 20103550rev | <0.0008 | <0.0008 | <0.0008 | <0.0008 |
| | ***SOIL STOCKPILING AREA*** | | | | | | |
| **EI3110910-1** | upwind, PI soil stockpile area | 11/9/2010 | 20103416 rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **EI3110910-1 (D)** | upwind, PI soil stockpile area (Duplicate) | 11/9/2010 | 20103416 rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **EI3110910-2** | downwind, PI soil stockpile area | 11/9/2010 | 20103416 rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **EI3111210-1** | upwind, PI soil stockpile area | 11/12/2010 | 20103416 rev | <0.007 | <0.007 | <0.007 | <0.007 |
| **EI3111210-2** | downwind, PI soil stockpile area | 11/12/2010 | 20103416 rev | <0.007 | <0.007 | <0.007 | **0.007 J** |
| **EI3111510-1** | upwind, PI soil stockpile area | 11/15/2010 | 20103492 rev | <0.008 | <0.008 | <0.008 | <0.008 |
| **EI3111510-2** | downwind, PI soil stockpile area | 11/15/2010 | 20103492 rev | <0.008 | <0.008 | <0.008 | <0.008 |
| | ***Worker Exposure Monitoring (Personal Monitors)*** | | | | | | |
| **Earhart101510-3** | site worker personal monitor; residential PI soil abatement | 10/15/2010 | 20103074rev | **0.01** | <0.006 | **0.056** | <0.006 |
| **Earhart101510-4** | site worker personal monitor; residential PI soil abatement | 10/15/2010 | 20103074rev | **0.029** | <0.006 | **0.093** | <0.006 |
| **E12101810-3** | site worker personal monitor; residential PI soil abatement | 10/18/2010 | 20103074rev | <0.005 | <0.005 | **0.028** | <0.005 |
| **E12101810-4** | site worker personal monitor; residential PI soil abatement | 10/18/2010 | 20103074rev | <0.005 | <0.005 | **0.026** | <0.005 |
| **E12101910-3** | site worker personal monitor; residential PI soil abatement | 10/19/2010 | 20103132rev | <0.004 | <0.004 | <0.004 | <0.004 |
| **E12101910-4** | site worker personal monitor; residential PI soil abatement | 10/19/2010 | 20103132rev | <0.004 | <0.004 | <0.004 | <0.004 |
| **E12102010-3** | site worker personal monitor; residential PI soil abatement; equipment operator | 10/20/2010 | 20103132rev | <0.005 | <0.005 | <0.005 | <0.005 |
| | ***Site-Specific Residential Exposure Goal [2]*** | | | ***0.075*** | ***3.60*** | ***0.0795*** | ***0.285*** |
| | ***OSHA PEL (Worker Exposure)*** | | | ***250*** | ***500*** | ***250*** | ***NE*** |
| | ***ACGIH TLV (Worker Exposure)*** | | | ***250*** | ***50*** | ***250*** | ***50*** |

***Notes:***

**Bolded** values indicate detected concentrations of airborne pesticides

$\mu g/m^3$ microgram per cubic meter
< less than the laboratory reporting limit/minimum detection limit
J estimated value
PI pesticide-impacted
NE not established
OSHA Occupational Safety and Health Administration
PEL permissible exposure limit; over an 8-hour day
ACGIH American Conference of Governmental Industrial Hygienists
TLV threshold limit value; over an 8-hour day
1 reported as gamma-chlordane
2 The site-specific Residential Exposure Goals (REGs) were developed for monitoring of airborne pesticides in the residential neighborhoods outside of the excavation area during RO #1 implementation. Concentrations for personal monitors should be compared to the OSHA PELs.

# ATTACHMENT A

**Quinn Consultants, Inc.**
*Environmental, Health and Safety*

Mr. Gary Floyd
Vice President
Tetra Tech
737 Bishop Street
Honolulu, Hawaii 96813-3202

January 27, 2011

Subject: Revised Report on Pesticide Air Monitoring and Dust Samples Collected During Excavation of Pesticide-Impacted Soil by Delta Construction in Various Tetra Tech-Selected Locations in the Earhart I-2 and I-3 Neighborhoods at Hickam Air Force Base

Dear Mr. Floyd:

On October 15, 18-22, October 25-28, November 9, 12, 15 and 23, 2010, Quinn Consultants, Inc. (QCI) collected air samples for airborne organo-chlorine pesticides (aldrin, chlordane, dieldrin and heptachlor) at Tetra Tech-selected locations at the Earhart I-2 and I-3 neighborhoods. Ambient dust readings were collected concurrently at these same Tetra Tech-selected locations on October 19-22, October 25-27 (upwind and downwind), and October 28, 2010 (upwind only), at Hickam Air Force Base, during pesticide-impacted soil excavation by Delta Construction. The purpose of the sampling was to evaluate Delta employee and public exposure to the above-listed pesticides, and also to ambient dust levels during the excavation of pesticide-impacted soil. Aldrin, chlordane, dieldrin and heptachlor were sampled because Tetra Tech confirmed their presence through extensive soil testing.

During the monitoring periods, QCI observed that the sod-covered soil at the pesticide-impacted soil sites was sufficiently moist that no visible dust emissions were seen. In several locations, QCI observed standing water on the ground within and adjacent to the soil excavation sites. In addition, occasional rains fell during the sampling period. All of these factors minimized airborne dust.

Airborne Pesticides

The methodology QCI used for the pesticide air monitoring was modified National Institute of Occupational Safety and Health Method 5510. Pesticide air samples were collected using Gilian personnel sampling pumps calibrated by a primary standard Bios Dry-Cal calibrator to run at approximately 1 liter of air/minute; 37-mm MCE filter cassettes were used as the sampling media without using an additional absorptive sampling media due to the tendency of the pesticides to adhere to the soil particles and not have a significant vapor component.

QCI submitted the pesticide air samples to Inalab, Inc., Honolulu, Hawaii, for analyses. Inalab, Inc., of Honolulu, Hawaii, analyzed the pesticide air samples. Inalab is American Industrial Hygiene Association (AIHA) Industrial Hygiene Laboratory Accreditation Program (IHLAP)-accredited. Inalab analyzed the samples following Environmental Protection Agency (EPA) Laboratory Analytical Method 8081-A (Gas Chromatography – ECD). Modifications were made to both the field sampling methodology and the laboratory reporting limit methodology to accommodate Tetra Tech's request for detection limits that would fit their risk assessment algorithm. For the field sampling, both the air collection sample flow rate and the total air volume were above the upper limits indicated in the NIOSH method.

Although this sampling was not conducted for comparison to Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs), it may be useful to list the OSHA limits for the various pesticides of concern at this site. The PELs are as follows: aldrin (0.25 milligram/cubic meter [$m^3$]), chlordane (0.5 $mg/m^3$), and dieldrin (0.25 $mg/m^3$). For heptachlor, for which there is no OSHA PEL, the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for an 8-hour time-weighted average (TWA) was referenced (0.05 $mg/m^3$). For dust, the PEL for total dust is 15 $mg/m^3$). All of the sample results were well below the OSHA limits.

Results for the pesticide air sampling are attached to this report. Based upon the Inalab reports, the following samples had detectable concentrations of organochlorine pesticides:

- 0.01 microgram/ $m^3$, heptachlor, collected on October 26, 2010, upwind of the pesticide-impacted (PI) soil excavation.
- 0.01 microgram/ $m^3$, chlordane, collected on October 20, 2010, downwind of the PI soil excavation.
- 0.04 microgram/ $m^3$, chlordane, collected on October 19, 2010, downwind of the PI soil excavation.
- 0.004 microgram/ $m^3$, dieldrin, collected on October 19, 2010, upwind of the PI soil excavation.
- 0.009 microgram/ $m^3$, dieldrin, collected on October 19, 2010, downwind of the PI soil excavation.
- 0.004 microgram/ $m^3$, dieldrin, collected on October 19, 2010, on a personnel sample during PI soil excavation.
- 0.009 microgram/ $m^3$, dieldrin, collected on October 21, 2010, upwind of the PI soil excavation.

Dust

Dust samples were collected using two TSI DustTrak 8520 particulate monitors operating inside environmental enclosures to protect them from moisture. The DustTrak monitors detect particulate in the range of 0.1 to approximately 10 micrometers aerodynamic diameter. Particulate concentrations are reported in a range from 0.001to 100 milligrams/cubic meter.

Note that although the DustTrak monitors were operated on October 28, 2010 and November 9, 12, 15, and 23, 2010, both upwind and downwind data from the November dates and downwind data from October 28 could not be retrieved by both QCI and the equipment supplier. The data from these dates is not available.

Table 1 (next page) summarizes the upwind and downwind dust data and compares the readings at Earhart I-2 and I-3 to data from 2009 (the most recent available data) collected at the Hawaii State Department of Health ambient air monitoring station at Kinau Hale on Punchbowl Street near downtown Honolulu.

Table 1: Earhart I-2 and I-3 Earhart I-2 and I-3 Dust Monitoring Data in Comparison to 2009 Data Hawaii State Department of Health (DOH) Ambient $PM_{10}$ Monitoring Station Located at Kinau Hale (micrograms/cubic meter [ug/$m^3$])*

| QCI's Sampling Date | Upwind, Earhart I-2/I-3 Sites | Downwind, Earhart I-2/I-3 Sites | Kinau Hale DOH Monitoring Station |
|---|---|---|---|
| October 19, 2010 | Minimum: 0<br>Maximum: 424<br>Average: 24 | Minimum: 33<br>Maximum: 1206<br>Average: 68 | Range of 2-10 (monthly 24-hour average $PM_{10}$ concentration) for 2009; the maximum average 24-hour average $PM_{10}$ concentration ranges from approximately 18-34 |
| October 20, 2010 | Minimum: 1<br>Maximum: 225<br>Average: 7 | Minimum: 7<br>Maximum: 305<br>Average: 63 | |
| October 21, 2010 | Minimum: 2<br>Maximum: 65<br>Average: 8 | Minimum: 3<br>Maximum: 541<br>Average: 53 | |
| October 22, 2010 | Minimum: 6<br>Maximum: 19<br>Average: 9 | Minimum: 0<br>Maximum: 95<br>Average: 28 | |
| October 25, 2010 | Minimum: 2<br>Maximum: 16<br>Average: 7 | Minimum: 6<br>Maximum: 85<br>Average: 21 | |
| October 26, 2010 | Minimum: 1<br>Maximum: 169<br>Average: 7 | Minimum: 36<br>Maximum: 785<br>Average: 60 | |
| October 27, 2010 | Minimum: 5<br>Maximum: 114<br>Average: 8 | Minimum: 0<br>Maximum: 874<br>Average: 28 | |
| October 28, 2010 | Minimum: 3<br>Maximum: 15<br>Average: 8 | Data not available | |

*Source: State of Hawaii Annual Summary 2009 Air Quality Data. Note that $PM_{10}$ refers to particulate matter under 10 micrometers in aerodynamic diameter. These are considered "coarse" particulates, generally from sources such as road and windblown dust and crushing and grinding activities. For comparison, the State of Hawaii 24-hour average $PM_{10}$ concentration Standard is 150 ug/$m^3$.

The pesticide and dust monitoring data should be evaluated in light of the following points:

- The downwind dust monitoring station was located adjacent to streets with considerable vehicular traffic that may have influenced the concentration of particulates indicated by the downwind monitor.
- Events that occurred during the monitoring period included mowing, landscape maintenance and gusty winds; these may have influenced the particulate counts.
- The project site is located within approximately one-half mile of the Honolulu International Airport, a significant source of particulate emissions. Also, major construction sites and heavily- trafficked roadways are located within approximately one mile of the site. These sites may also have influenced the amount of particulate measured.
- Pre-excavation background dust and pesticide air sampling data was not requested of QCI, and thus, this data is not available for comparison to the above-listed data.
- Department of Health ambient dust monitoring data available are not available for this location and this data is not available for comparison to the above-listed data.
- Based upon hundreds of air sampling data points with similarly wet conditions at other sites that QCI has collected, it was highly unlikely that airborne pesticide exposure would have resulted from the Earhart I-2 and I-3 sites. It was more likely that detected levels, particularly of the dust, came from off-site.
- This monitoring did not account for indoor residential exposure to dust and pesticide concentrations that should be considered an integral portion of human exposure assessment in residential settings.

- Collection of the pesticide air samples followed a modified sampling procedure that did not fit the NIOSH standard. As mentioned earlier, these modifications were made in order to meet the risk assessment algorithm. It is unclear how these modifications to the sampling standard altered the sample collection efficiencies.
- Note that the above-listed results were not 24-hour average concentrations of dust and pesticides. QCI's monitoring lasted for the duration of excavation work. However, the short duration of the excavation work, coupled with the need to remove the equipment daily from these residential areas, constrained the length of time that samples could be collected. The maximum sampling period was 8 hours. The remaining 16 hours of each day produced little or no additional exposure because no active disturbance of PI soil was occurring and care had been taken to minimize off-hours exposure to the excavated areas. Thus, the work-shift sampling period sampling does not provide an accurate representation of a 24-hour time-weighted average.

Based upon the above-listed factors, the air concentrations of pesticides and dust measured during QCI's sampling may have been influenced by a number of factors that could have considerably influenced the results. Care must be taken in applying these results to a risk assessment algorithm. In addition, as with any air sampling, detectable air concentrations of contaminants do not equate to actual human exposure.

If you have any questions or need further information, please do not hesitate to contact me.

Sincerely,

Kevin L. Quinn, MPH, CIH, CSP
Quinn Consultants, Inc.

INALAB, Inc.

*Serving Hawaii for 33 years*

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**Monday, October 25, 2010**

**3615 Harding Avenue, Ste. 308, Honolulu, Hawaii 96816**
**VOICE: (808) 735-0422 / FAX: (808) 735-0047**
**WWW.INALAB.COM**

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 LAB # 101812

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL LEAD ISO/IEC 17025:2005 LAB # 101812

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE ISO/IEC 17025:2005 LAB # 101812

Mr. Kevin Quinn
Quinn Consultants, Inc.
4784 Analii St.

Honolulu HI 96821

**Phone Number:** (808) 780-9081
**Facsimile:** (808) 373-1818
**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103074
**Your Project:** Earhart I-2, PI Soil Excavation 10/18/10,10/15/10

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019001** | **E12101810-1 upwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019002** | **E12101810-2 downwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019003** | **E12101810-3 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019004** | **E12101810-4 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019005** | **Earhart101510-1 upwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019006** | **Earhart101510-2 downwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019007** | **Earhart101510-3 personnel Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019008** | **Earhart101510-4 personnel,Lindsey, Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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**Your Project:** Earhart I-2, PI Soil Excavation 10/18/10,10/15/10

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019001** | **E12101810-1 upwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019002** | **E12101810-2 downwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019003** | **E12101810-3 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019004** | **E12101810-4 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019005** | **Earhart101510-1 upwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019006** | **Earhart101510-2 downwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019007** | **Earhart101510-3 personnel Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019008** | **Earhart101510-4 personnel,Lindsey, Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019001** | **E12101810-1 upwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019002** | **E12101810-2 downwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019003** | **E12101810-3 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019004** | **E12101810-4 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019005** | **Earhart101510-1 upwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019006** | **Earhart101510-2 downwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019007** | **Earhart101510-3 personnel Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019008** | **Earhart101510-4 personnel,Lindsey, Residential PI Soil Abatement 10-15-10** | UNK | 0.09 | ug/m3 | 10/19/2010 | 10/20/2010 |

Comments

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## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019001** | **E12101810-1 upwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019002** | **E12101810-2 downwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019003** | **E12101810-3 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019004** | **E12101810-4 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019005** | **Earhart101510-1 upwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019006** | **Earhart101510-2 downwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019007** | **Earhart101510-3 personnel Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019008** | **Earhart101510-4 personnel,Lindsey, Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |

Comments

**All Quality Control data are acceptable unless otherwise noted.**

**General Comments**
**All analysts participate in interlaboratory quality control testing to continuously document profiency. The samples analyses subject of this analytical report were conducted in general accordance with the procedures associated with the" analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sampl relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. This report is not to be duplicated except in full without the expressed written permission of INALAB, Inc. This report should not be construed as an endorsement for a product or a service by the AIHA or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. For air samples, results are calculated based on the reported air volumes. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.**

**Results and Symbols Definitions**
**UNK = sample submitted for this evaluation / analysis.**
**DUP = duplicate sample analysis of the UNK sample.**
**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
**Tr = TRACE, i.e., the analyte of interest was, to a reasonable degree of scientific certainty present, but was BELOW the quantifiable limits of this determination (stated).**
**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
**# = Analytical methods marked with an "#" are not within our AIHA Scope of Accreditation.**
**MRL = Method Reporting Limit.**

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Kimberly Llanos**
**Laboratory Manager**

INALAB, Inc.

*Serving Hawaii for 33 years*

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**30 November 2010 issued a corrected report to replace original report dated 27 October 2010.**

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**INALAB Job No:** 20103132
**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021046** | **E12102010-1 Upwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021046** | **E12102010-1 Upwind 10/20/10** | DUP | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021047** | **E12102010-2 Downwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021048** | **E12102010-3 Equipment operator 10/20/10** | UNK | < 0.005 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.005 ug/m3 | | | | | |

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## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021049** | **E12101910-1 Upwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021050** | **E12101910-2 Downwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021051** | **E12101910-3 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021052** | **E12101910-4 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021053** | **E12102110-1 Upwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101021054** | **E12102110-2 Downwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021046** | **E12102010-1 Upwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021046** | **E12102010-1 Upwind 10/20/10** | DUP | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021047** | **E12102010-2 Downwind 10/20/10** | UNK | 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021048** | **E12102010-3 Equipment operator 10/20/10** | UNK | < 0.005 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.005 ug/m3 | | | | | |
| **20101021049** | **E12101910-1 Upwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021050** | **E12101910-2 Downwind 10/19/10** | UNK | 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021051** | **E12101910-3 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |

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## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021052** | **E12101910-4 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021053** | **E12102110-1 Upwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101021054** | **E12102110-2 Downwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103132
**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021046** | **E12102010-1 Upwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021046** | **E12102010-1 Upwind 10/20/10** | DUP | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021047** | **E12102010-2 Downwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021048** | **E12102010-3 Equipment operator 10/20/10** | UNK | < 0.005 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.005 ug/m3 | | | | | |
| **20101021049** | **E12101910-1 Upwind 10/19/10** | UNK | 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021050** | **E12101910-2 Downwind 10/19/10** | UNK | 0.009 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021051** | **E12101910-3 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |

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## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021052** | **E12101910-4 Personnel 10/19/10** | UNK | 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021053** | **E12102110-1 Upwind 10/21/10** | UNK | 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101021054** | **E12102110-2 Downwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021046** | **E12102010-1 Upwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021046** | **E12102010-1 Upwind 10/20/10** | DUP | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021047** | **E12102010-2 Downwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021048** | **E12102010-3 Equipment operator 10/20/10** | UNK | < 0.005 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.005 ug/m3 | | | | | |
| **20101021049** | **E12101910-1 Upwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021050** | **E12101910-2 Downwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021051** | **E12101910-3 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |

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## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021052** | **E12101910-4 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021053** | **E12102110-1 Upwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101021054** | **E12102110-2 Downwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103132
**Your Project:** Excavation of PI soil by Delta Construction in selected areas

**General Comments**
**All analysts participate in interlaboratory quality control testing to continuously document profiency. The samples analyses subject of this analytical report were conducted in general accordance with the procedures associated with the" analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sampl relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. This report is not to be duplicated except in full without the expressed written permission of INALAB, Inc. This report should not be construed as an endorsement for a product or a service by the AIHA or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. For air samples, results are calculated based on the reported air volumes. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.**

**Results and Symbols Definitions**
**UNK = sample submitted for this evaluation / analysis.**
**DUP = duplicate sample analysis of the UNK sample.**
**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
**Tr = TRACE, i.e., the analyte of interest was, to a reasonable degree of scientific certainty present, but was BELOW the quantifiable limits of this determination (stated).**
**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
**# = Analytical methods marked with an "#" are not within our AIHA Scope of Accreditation.**
**MRL = Method Reporting Limit.**

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Jennifer Hsu**
**Laboratory Manager**

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**WWW.INALAB.COM**

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**30 November 2010 issued a corrected report to replace original report dated 29 October 2010.**

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 LAB # 101812

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL LEAD ISO/IEC 17025:2005 LAB # 101812

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103159
**Your Project:** Earhart I-2 PI Soil Excavation, 10/22/10

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101025022** | **E12102210-1 Upwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |
| **20101025023** | **E12102210-2 Downwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |

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**INALAB Job No:** 20103159
**Your Project:** Earhart I-2 PI Soil Excavation, 10/22/10

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101025022** | **E12102210-1 Upwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |
| **20101025023** | **E12102210-2 Downwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |

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## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101025022** | **E12102210-1 Upwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |
| **20101025023** | **E12102210-2 Downwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
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**INALAB Job No:** 20103159
**Your Project:** Earhart I-2 PI Soil Excavation, 10/22/10

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
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| Comments | MDL = 0.008 ug/m3 | | | | | |
| **20101025023** | **E12102210-2 Downwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |

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**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
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**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
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DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Jennifer Hsu**
**Laboratory Manager**

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INALAB, Inc.

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | DUP | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026065** | **E12102510-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026066** | **E12102610-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101026067** | **E12102610-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | DUP | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026065** | **E12102510-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026066** | **E12102610-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101026067** | **E12102610-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | DUP | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026065** | **E12102510-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026066** | **E12102610-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101026067** | **E12102610-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

**All Quality Control data are acceptable unless otherwise noted.**

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | DUP | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026065** | **E12102510-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026066** | **E12102610-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101026067** | **E12102610-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

**General Comments**
**All analysts participate in interlaboratory quality control testing to continuously document profiency. The samples analyses subject of this analytical report were conducted in general accordance with the procedures associated with the" analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sampl relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. This report is not to be duplicated except in full without the expressed written permission of INALAB, Inc. This report should not be construed as an endorsement for a product or a service by the AIHA or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. For air samples, results are calculated based on the reported air volumes. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.**

**Results and Symbols Definitions**
**UNK = sample submitted for this evaluation / analysis.**
**DUP = duplicate sample analysis of the UNK sample.**
**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
**Tr = TRACE, i.e., the analyte of interest was, to a reasonable degree of scientific certainty present, but was BELOW the quantifiable limits of this determination (stated).**
**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
**# = Analytical methods marked with an "#" are not within our AIHA Scope of Accreditation.**
**MRL = Method Reporting Limit.**

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Jennifer Hsu**
**Laboratory Manager**

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**6 December 2010 issued amended report to replace original report dated 4 November 2010.**

*Serving Hawaii for 33 years*

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | DUP | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029056** | **E12102810-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029057** | **E12102710-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029058** | **E12102710-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | DUP | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029056** | **E12102810-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029057** | **E12102710-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101029058** | **E12102710-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | DUP | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029056** | **E12102810-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
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| **20101029057** | **E12102710-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
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| **20101029058** | **E12102710-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | DUP | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
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| **20101029056** | **E12102810-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029057** | **E12102710-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101029058** | **E12102710-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

**General Comments**
**All analysts participate in interlaboratory quality control testing to continuously document profiency. The samples analyses subject of this analytical report were conducted in general accordance with the procedures associated with the" analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sampl relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. This report is not to be duplicated except in full without the expressed written permission of INALAB, Inc. This report should not be construed as an endorsement for a product or a service by the AIHA or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. For air samples, results are calculated based on the reported air volumes. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.**

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**DUP = duplicate sample analysis of the UNK sample.**
**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
**Tr = TRACE, i.e., the analyte of interest was, to a reasonable degree of scientific certainty present, but was BELOW the quantifiable limits of this determination (stated).**
**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
**# = Analytical methods marked with an "#" are not within our AIHA Scope of Accreditation.**
**MRL = Method Reporting Limit.**

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Jennifer Hsu**
**Laboratory Manager**

INALAB, Inc.

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**6 December 2010 issued amended report to replace original report dated 19 November 2010.**

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**INALAB Job No:** 20103416
**Your Project:** Earhart I-3, PI Soil Air Monitoring

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | DUP | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115004** | **EI3110910-2 Downwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115005** | **EI3111210-1 Upwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103416
**Your Project:** Earhart I-3, PI Soil Air Monitoring

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115006** | **EI3111210-2 Downwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

**All Quality Control data are acceptable unless otherwise noted.**

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | DUP | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115004** | **EI3110910-2 Downwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115005** | **EI3111210-1 Upwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101115006** | **EI3111210-2 Downwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103416
**Your Project:** Earhart I-3, PI Soil Air Monitoring

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | DUP | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115004** | **EI3110910-2 Downwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115005** | **EI3111210-1 Upwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101115006** | **EI3111210-2 Downwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103416
**Your Project:** Earhart I-3, PI Soil Air Monitoring

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | DUP | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115004** | **EI3110910-2 Downwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115005** | **EI3111210-1 Upwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101115006** | **EI3111210-2 Downwind, PI Soil Stockpile 11-12-10** | UNK | 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
**# = Analytical methods marked with an "#" are not within our AIHA Scope of Accreditation.**
**MRL = Method Reporting Limit.**

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Jennifer Hsu**
**Laboratory Manager**

INALAB, Inc.

*Serving Hawaii for 33 years*

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**Tuesday, November 30, 2010**

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AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL LEAD ISO/IEC 17025:2005 LAB # 101812

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE ISO/IEC 17025:2005 LAB # 101812

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103492
**Your Project:** Earhart I-3 PI, Soil Stockpile, Hickam AFB

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101122067** | **EI3111510-1 upwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |
| **20101122068** | **EI3111510-2 downwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |

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**INALAB Job No:** 20103492
**Your Project:** Earhart I-3 PI, Soil Stockpile, Hickam AFB

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101122067** | **EI3111510-1 upwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |
| **20101122068** | **EI3111510-2 downwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |

**All Quality Control data are acceptable unless otherwise noted.**

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101122067** | **EI3111510-1 upwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |
| **20101122068** | **EI3111510-2 downwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |

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**INALAB Job No:** 20103492
**Your Project:** Earhart I-3 PI, Soil Stockpile, Hickam AFB

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101122067** | **EI3111510-1 upwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |
| **20101122068** | **EI3111510-2 downwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |

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**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
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**> This testing result is greater than the numerical value listed.**
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**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
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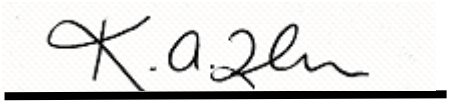

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Kimberly Llanos**
**Laboratory Manager**

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# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**Thursday, December 02, 2010**

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**INALAB Job No:** 20103550
**Your Project:** EARHART I-3

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101129014** | **E13112310-1 Upwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
| Comments | | | | | | |
| **20101129015** | **E13112310-2 Downwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
| Comments | | | | | | |

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**INALAB Job No:** 20103550
**Your Project:** EARHART I-3

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101129014** | **E13112310-1 Upwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
| Comments | | | | | | |
| **20101129015** | **E13112310-2 Downwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
| Comments | | | | | | |

**All Quality Control data are acceptable unless otherwise noted.**

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101129014** | **E13112310-1 Upwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
| Comments | | | | | | |
| **20101129015** | **E13112310-2 Downwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
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**INALAB Job No:** 20103550
**Your Project:** EARHART I-3

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101129014** | **E13112310-1 Upwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
| Comments | | | | | | |
| **20101129015** | **E13112310-2 Downwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
| Comments | | | | | | |

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**Laboratory Manager**

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# APPENDIX D

## Photographic Documentation for Removal Action No. 2 and No. 3

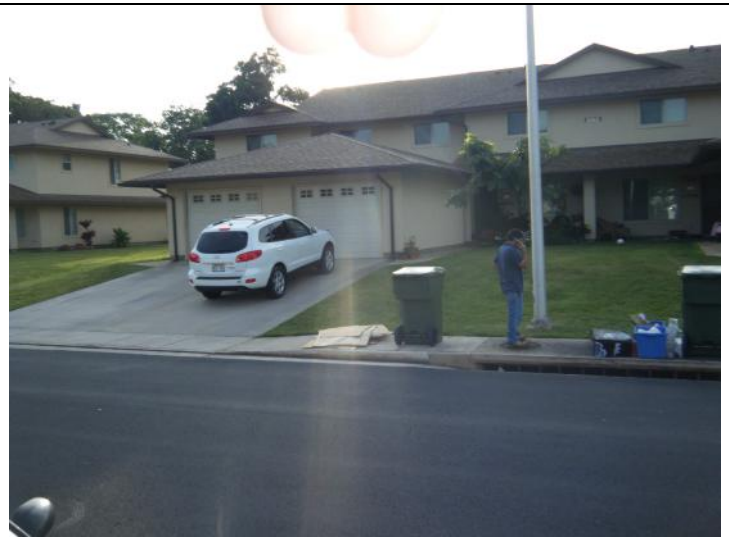

Photo 1: Front yard, Du 39A, bldg. 6363

Photo 2: Painters, unit 791, bldg.6336, removing immature paints.

Photo 3: Laying bester tile doing on planters at unit 791

Photo 4: Laying gravel on top of geotextile at unit 791

Photo 5: Finished product, unit 791.

Photo 6: Planters with blur lights and red wood chips at unit 797

Photo 7: Jacobsen workers rinsing immature plants at unit 797

Photo 8: Fencing going up at unit 39A

Photo 9: Laying geotextile at planters at unit 797

Photo 10: Laying gravel at planters at unit 797 at bldg. 6336

Photo 11: Planters at unit 797 at bldg. 6336

Photo 12: Laying gravel + geotextile at unit 797

Photo 13: Construction fence on west end of bldg. 6363 Du. 39A

Photo 14: Construction fence at Du. 39A bldg. 6363

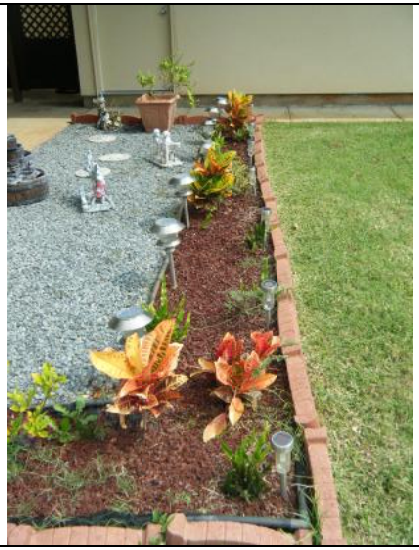

Photo 15: Planters at unit 797

Photo 16: Gravel + Geotextile at unit 811, bldg. 6338

Photo 17: Planters almost done at unit 811, bldg. 6338

Photo 18: Planters at unit 811, bldg. 6338, Almost complete.

Photo 19: Jacobsen backfilling gravel at planter at unit 811

Photo 20: Delta workers excavating PI soil from DU 39A.

Photo 21: Delta workers excavating PI soil from DU 39A.

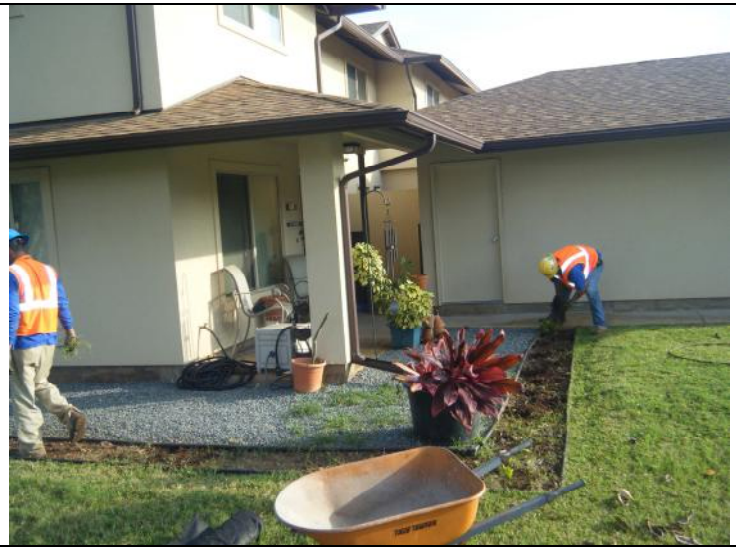

Photo 22: Jacobsen workers removing plants at unit 817

Photo 23: Jacobsen workers laying geotextile at planters at unit 817

Photo 24: Delta having truck backing onto Du 39A.

Photo 25: Delta excavating & loading truck at Du 39A.

Photo 1: Excavation of PI soil, DU 38d, bldg. 6342

Photo 2: Underground utility markings at DU-15b, bldg. 6343.

Photo 3: Truck dumping soil from DU-27D at Earhart I-4 stockpile area.

Photo 4: Final excavation depth at DU-27d, view to the east.

Photo 5: Soil excavation and loading at DU-29a, view to the northwest

Photo 6: Completed excavation and geotextile cover at DU-38d, bldg 6342.

Photo 7: Grading of clean soil over geotextile cover at DU-42b, view to the southwest.

Photo 8: Backfilling clean soil at DU-23b.

| | |
|---|---|
| | |
| Photo 9: Truck unloading PI soil in stockpile area. | Photo 10: Completed backfill at DU-29a, view to the south. |
| | |
| Photo 11: Backfilling of clean soil over geotextile cover at DU-29a. | Photo 12: Covered PI soil in stockpile area, view to the southeast. |

# APPENDIX E

## Field Records for Removal Action No. 1, No. 2, and No. 3

1111

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/2/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor Oversight

**Equipment Used:**

**Weather:** Sunny

| Time | Project Activity |
|---|---|
| 745 | Tt arrived on site, deliver PTP form Health & Safety Meeting<br>Delta currently attending all hands health & safety meeting at community center. |
| 830 | Delta arrives on site, sets up for day's activity<br>- Two trucks on-site for soil hauling<br>- Soil removal begins in ~~SW~~ SE corner of DU-52 |
| 1015 | Excavator fuel truck on-site |
| 1025 | Jeff Edmonson on-site for status update for 5-minutes |
| 1030 | Lunch |
| 1200 | Return to work<br>- No soil import occurring at DU-9, screener is still inoperable<br>- Attempted to save small bush in front yard of 562 (Building 6379) fails. No way to clear all P.I. soil to depth without risking exposure |
| 1545 | Delta Completes soil load-out from DU-6/52,<br>- Total of 2.5 truck loads removed<br>- Begin to lay out remainder of geotextile |
| 1615 | Off-site |

# FIELD NOTES

**Project Title:** Earhart I-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/3/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** PI Soil Removal

**Equipment Used:**

**Weather:** Overcast, scattered showers

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, ~~drop off PTP form~~ Health & Safety Meeting |
| | - Delta uncovering plastic sheeting from stockpile area - only room for 8-10 truckloads of soil unless the stockpile is regraded to consolidate soil to a greater height |
| | - Delta performing dry decontamination on excavator within DU-6/52 in preparation of moving it to DU-15 using flat bed trailer |
| | - Import soil being hauled into DU-9 and being graded to ~~within 2" of~~ (5m) depth of 10" |
| 930 | Jeff Edmonson on-site to review work so far |
| | Trailer on-site to move excavator over to DU-15 |
| | Light rain begins falling |
| 945 | Stockpiled soil consolidated to create more room for soil from DU-15 leaving 6"-12" of soil over front (gate-side) of enclosure |
| | Delta concerned about tracking mud when driving into and out of stockpile due to wet soil |
| | Heavy rubber mats laid out on lawn approaching DU-15 |
| 1015 | Grading continues at DU-9 |
| 1100 | Delta begins removing 6' chain link fencing from DU-9 |

11/3/10 Earhart 1-2 RAP Remediation

1130 Lunch

1600 Return to site

Remainder of afternoon spent grading DU to ensure 10" of clean fill

1530 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/5/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor oversight

**Equipment Used:**

**Weather:**

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site. drop off PTP form |
| | Health & Safety Meeting |
| | Delta laying out heavy rubber sheeting on grass from Ohauna Nui Circle to backyard of building 6341 |
| | Stockpile still covered by plastic sheeting |
| | No fencing around DU-2 in Earhart 1-3 |
| 830 | Delta on stand by due to car blocking pathway to DU, recieve call from Jeff Edmonson, he has contacted Hickam Communities to locate owner |
| 900 | Car moved out of the way - work begins on excavation. Digging begins in western portion of the DU work proceeds slowly due to tight quarters of houses |
| | Geotextile laid out over eastern portion of DU so that truck doesn't track soil in and out |
| 1030 | Fuel truck on-site for excavator |
| | One stretch of soil at base of stockpile needs to be covered - Delta is moving geotextile back as the leading edge of the stockpiled soil piles approaches the entry gate |
| 1130-1200 | Break for lunch |
| | Delta Covering stockpile (including plastic cover) with geotextile sheets and additional sand bag weights. Geotextile also secured with wire ties driven into the soil |

11/5/10 Earhart 1-2 RAP Remediation

~~1300~~ 1230 While excavation eastern portion of DU-15 the excavator struck a sewer line cleanout. Delta removed the concrete curtain and upper 4" of 4"-diameter piping, marked the damaged pipe with a hi-vis yellow shirt and continued excavation

Eastern portion of DU has very little maneuver room, haul out truck placed alongside perimeter fence outside of DU-15 for loading

1300 Discuss plans for DU-2 with Delta - They have no plans to excavate in Earhart 1-3. No construction fencing in place these. Delta plans to demob after completion of all backfilling at Earhart 1-2. Call Yvonne & ~~Jeff~~ E. to discuss

1315 Verify excavation depth of 12" within DU-15. Straight cut along perimeter except along back lanai where 3" cut at top and 1:1 slope down to 12"

Extra caution used along back of DU where 4"-diameter water line for irrigation is present at a depth of approximately 12". Hand tools used along the line

1430 Excavation completed, Delta begins decon of excavator treads in preparation for moving it off-site.

1500 Excavator loaded onto flat bed trailer along with all of the heavy rubber mats

Recommend to Delta that they re-secure geotextile in DU-52 where it is not fully secured.

1600 off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/9/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny, low 80s

| Time | Project Activity |
|---|---|
| 800 | Tt arrived on site |
| | Health & Safety Meeting |
| | Delta active at DU-6/52. Bobcat moved from DU-9, currently levelling out imported soil at DU-6/52 |
| | - Irrigation lines installed at DU-6/52. Two trucks hauling soil from Onizuka to Earhart, dumping soil at entrance to DU in SE corner. Then the Bobcat spreads soil through DU. Delta also has one crewman using hand tools to do detail work around edges and plants |
| 1000 | Kevin Q. on-site to inquire about dust monitoring at I-3, DU-2 and at stockpile. I informed him that Delta was still mobilizing and that Tt would contact him before work begins. After talking to Yvonne: Kevin is to collect data from stockpile area today, even though the pile is covered. This is to gather background numbers before work starts for comparison later |
| 1030 | Observed that no irrigation lines are installed in the SW corner of site. Delta to halt work after eastern portion of DU is backfilled |

11/9/10 Earhart I-2 RAP Remediation

1050 Follow dump truck to Orizuka to confirm imported soil is coming from correct source

1130 Delta breaks for lunch

1200 Resume work

Actor landscaping crew on-site installing additional irrigation lines on western portion of the DU-6/SZ

Delta has removed debris encountered during excavation - only unused construction fence rolls remain on-site

3 Soil trucks still importing material to site

1350 YCP on-site for rental car/administrative renewal

1320 YCP returns to site

Mark K. of Delta on-site to discuss status of irrigation lines. HC crew likely will not be complete by day's end, but will have enough completed to allow for backfilling in NW corner tomorrow. Delta expects to work tomorrow.

1445 HC clears piping and equipment, completed work and off-site

With piping in place, backfilling starts on western section of DU.

1500 Cast backfill Delivery

1530 off-site

TETRATECH



# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/10/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor oversight

**Equipment Used:**

**Weather:** Partly cloudy, scattered light rain

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, deliver PTP form to DB contactor office |
| | Health & Safety Meeting |
| | - Stockpile is covered, no dust monitoring installed yet |
| | - No activity at DU-2, 9, or 15 |
| | - Backfilling continues at DU-6/52 |
| | 3 Trucks loading soil from Onizuka. Bobcat used to grade soil |
| | Survey stakes in place, blue tape marks 12" above level of geotextile |
| 1100 - 1130 | Lunch |
| | Irrigation lines being installed in DU-15 by Actus, one truck shifted from hauling soil to DU-6/52 is now hauling to DU-15. Bobcat working at DU-6/52 along with laborer doing detail work with hand tools. |
| 1330 | Trucks done hauling soil to DU-6/52, now hauling to DU-15, soil will be left inside DU-15 until grading is complete and Bobcat can move to new DU. |
| 1400 | Mark K. on-site to review work at DU-15, still no word on timeframe for excavation at DU-2 |

11/10/10 Earhart I-2 RAP Remediation

1500 Delta completes soil import to both areas, need to complete grading fine detail work

1530 Water truck cleans surface of road outside D4-15

1545 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 10/11/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny, warm

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, deliver PTP form to DB office |
| | Health & Safety Meeting |
| | Delta has two man crew working at DU-15 to remove 6' chain link fencing. They replace it with 4' plastic orange construction fencing |
| | - Extra caution, exercising care with grading around broken clean-out. |
| | - Delta expresses some concern regarding drainage. They are matching original grade due to narrow width of DCA |
| 1130-1700 | Break for lunch |
| 1230 | Delta off-site due to ~~pers~~ family emergency with crew. Off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/2/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Partly sunny

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site |
| | Health & Safety Meeting |
| | Delta doing final detail work at DU-15, |
| 815 | Delta "decons" imported sand and soil inside DU using hand tools and broom, then moves work over to DU-6/52 |
| | At day's start there are two small stockpiles of soil staged on site. Some areas (in NW corner) of DU still have exposed geotextile. |
| 1030 | Maintenance truck on-site for Bobcat fueling |
| 1045 | Resume grading of soil, Bobcat completes NW quandrant, only detailing work remains in that portion of the site |
| 1120 | Photodocument current status of grading. Identify several low spots that need grading, especially along drainage swale west of building 6379. Discuss with Delta crew, they are doing general grading, will return to do fine smoothing after all stockpiles graded out and all geotextile covered |
| 1130-1200 | Lunch break |
| | Delta resumes grading operations |

11/12/10 Earhart 1-2 RAP Remediation

1230 off-site, Marlena Overton on-site for oversight
1430 Return to site
1530 off site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-2 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/15/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Light rain scattered

| Time | Project Activity |
|---|---|
| 715 | Tt arrived on site<br>Health & Safety Meeting |
| 745 | Delta arrives on site, begins installing orange construction fence along Ohana Nui Circle. Two man crew at work |
| 830 | Delta delivers additional fencing supplies to crew.<br>Using Bobcat to grade base open areas, hand tools to grade around perimeter |
| 930 | Delta moves to DU-9, installs additional fencing and details out grading |
| 1000 | Rain clears to partly cloudy |
| 1130 | Break for lunch |
| 1200 | Return to site<br>Work crew not present - call Mark K, but recieve no response - wait 30 minutes for return call |
| 1245 | Off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-3 RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 11/23/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor oversight - backfilling of DU-2

**Equipment Used:**

**Weather:** Sunny, warm

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site |
| | Health & Safety Meeting |
| | - Work resumes backfilling on north side of sidewalk, grading continues with bobcat |
| | - Backfill source is stockpile on Orizuka II-3, follow truck to verify |
| | - Trucks are brushing clean backfill off after filling to prevent spillage on roadway. Soil is covered with tarp during transit |
| 820 | Maintenance truck on-site to refuel bobcat |
| | Kevin Quinn on-site to implement air monitoring |
| 830 | Work starts on south side of sidewalk |
| 900 | Last truck delivers soil to DU. Detail work begins to ensure minimum of 10" depth |
| 1000 | Delta completes grading operations |
| 1030 | YKP and Jeff on-site for brief update on status |
| 1100 | Off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-3 RAP Remediation
**Project #:** ~~205~~ 100-SFO-T26535-04
**Date:** 11/22/10 **Time:**
**Location:** Hickam Communities AFB
**Client:** Hickam Communities
**Tt Personnel:** S Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny, no breeze

| Time | Project Activity |
|---|---|
| 930 | Tt arrived on site |
| | Health & Safety Meeting |
| | - Delta is currently digging area south of sidewalk at DU-2 Bench and waste/rubbish can left in place, excavated around concrete support |
| | - Hickam Communities has crew installing irrigation piping on northern side of sidewalk |
| | - Delta elects to excavate to sidewalk south side of DU-2 |
| | Trucks are being loaded from DU, they are parked on the sidewalk with geotextile laid out below |
| | No air monitoring set up at DU-2 or stockpiles |
| 1120 | Soil load-out complete, truck sent off-site |
| 1130 - 1200 | Break for lunch |
| 1230 | Delta delivers a load of backfill to north of sidewalk, Bobcat brought down to DU-2 to begin grading |
| | When not grading backfill Delta is using hand tools to scrape dry soil off of front-end loaders. Decon proceeds without water. |

TETRA TECH



11/22/10 Earhart 1-3 RAP Remediation

1340 Front end loader removed from site and parked within gate at ~~topsoil~~ JMP stockpiled soil yard

Delta laying out geotextile over south side of DU - HC prepping PVC for installation

1530 off-site

TETRA TECH



# FIELD NOTES

**Project Title:** 100-SFO-T26535
**Project #:** Earhart 1-3 RAP Remediation
**Date:** 11/18/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Soil removal at DU-2

**Equipment Used:**

**Weather:** Partly sunny

| Time | Project Activity |
|---|---|
| 715 | Tt arrived on site<br>Health & Safety Meeting |
| 730 | Delta on site removing fence, orange fencing<br>Excavation starts on north side of DU. Dump truck parks on south corner of DU. Geotextile fabric laid out in loading area to prevent dump truck from tracking PI soil out of DU |
| 830 | Shane (Delta) Mark Tt on-site to discuss extent of digging. Excavator to stay inside DU as marked out to prevent cross contamination. If excavator encounters geotextile before extent of DU, digging will halt in that area. Delta will not excavate soils placed on geotextile during construction of Earhart 1-4 neighborhood. |
| 900 | Single dump truck hauling soil to stockpile area, which has been uncovered on loading (west) side |
| 945 | Delta excavates out along western DU boundary to locate extent of geotextile/clean fill. Boundary is approximately 3' beyond stake |
| 1130-1200 | Lunch break |

11/18/10 EARHART 1-3 RAP Remediation

1215 Mark M on-site, requests clafification of extent of excavation we talk with excavator - will excavate everything inside DU and extend out to west until either clean fill (coral sands) or geotextile

1330 Delta begins to lay out geotextile in excavated portion of DU - most soil north of playground and sidewalk

1400 Delta completes excavating, no more truckloads pulled out - begins covering stockpile and excavated area with geotextile

12 Truckloads removed from DU-2

1530 off-site

738-8825

TETRA TECH



# FIELD NOTES

**Project Title:** 100-HFD-T26555
**Project #:** Earhart I-3 RAP Remediation
**Date:** 11/17/10 **Time:**
**Location:** Earhart I-3, Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor oversight

**Equipment Used:**

**Weather:** Sunny and warm

| Time | Project Activity |
|---|---|
| 800 | Tt arrived on site |
| | Health & Safety Meeting |
| | - GP arrives on site to install 6' chain link fence at DU-2, discuss placement with Mark and Shane and GP crew, fence to be installed along sidewalk and 2' out from all stakes. Satellite dish in NE corner to be outside fence line |
| | - Stockpile has been completely covered by geotextile over plastic sheeting |
| 1030 | GP completes (SM) installation of fencing from Earhart I-2, ~~DU-6/52~~ DU-42 and DU-9. Fencing still down at DU-15, notify GP crew of location of that fencing |
| 1100 | GP moves to DU-6/52 and begins removing 6' construction fencing. 4' fence to remain in place |
| 1200 | GP off for lunch |
| 1230 | GP returns, picks up dismantled fencing from DU-15 |
| 1300 | off-site |

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-570-4
**Project Title:** Earhart 1-2 and Earhart 1-3
**Date:** December 9, 2010
**Time:** 822
**Location:** Joint Base Pearl Harbor Hickam (JBPHH)
**Client:**
**Tt Personnel:** MOverton & A. Ungerleider

**Misc. Personnel:**

**Statement of Work:** Pesticide impacted (PI) soil Management oversight
**Equipment Used:** Camera

**Weather:** Upper 70

| Time | Project Activity |
|---|---|
| 822 | Tt arrived on site MO on site |
| 822 | Health & Safety Meeting |
| 8 | Truck observed off-loading soil in area between bldg 6377 and 6378 - (DU-E) (37 D+E) |
| 825 | A. Ungerleider on site MO & AU discuss soil backfill areas. TWO trucks bringing soil for backfill. Soil is from behind the ACTUS office. |
| 840 | - Trucks on site but not off loading soil. |
| 844 | - MO calls Y. Parry to ask why trucks are not off-loading soil. Y. Parry tells MO soil is coming from behind office but waiting on Frank Frietas to confirm that NO other soil added. |
| 907 | MO offsite |
| 0908 | Orange geotextile fabric is layed down at entrance to backfill area. |
| 0915 | Trucks resume hauling in and dumping soil onto this backfill area between bldgs 6377 and 6378. TWO trucks are hauling in soil. One is a Kamaili truck and the other is a "Hanson Construction truck. |
| 0935 | Jacobson workers backfill area with bobcat and rakes. They are spreading around the soil brought in by the trucks. |

TETRA TECH



0940 Tt Au mobilizes to stockpile area behind Actus offices.

0945 Tt Au observes Dozer loading "Amazon" truck with Soil from large stockpile. Stockpile is located between the 1st and second entrance to the Yard, on the Street side of the Yard up against the Fence. When Au enters the site, Kamalii truck is leaving the Yard with full load of soil.

0955 Tt Au observes same dozer/loader loading the "Amazon" truck heading for I-II loading an RHS Lee truck with different material from a different stockpile. This material is very rocky and is located just to the right of the 1st entrance to the yard

1005 Tt Au calls Tt MO + YP to identify the material being hauled out by RHS Lee and neither can identify it or know where it is going.

1020 Tt Au returns to I-2 and notices that material is being dumped in 2nd backfill area between buildings 6380 and 6379, at a+b of decision unit 52 and b+c of decision unit 6. Orange geotextile material is also placed here at the entrance to the fenced area.

1030 Tt Au returns to decision unit 37 where in d+E backfilling of soil is continuing by bobcat. This area is close to being completed.

1050 Tt Au returns to decision units 6+52 to observe continued dumping and backfilling of material

1100 Workers break for lunch.

1115 Jacobson worker informs Au that roughly 14 more loads of soil are needed hereat du's 52+6.

1200 Tt Au off to lunch + to get Hickam I.D. card renewed. Tt Au notices that at this point roughly 4 loads of soil have been dropped at Du's 52+6.

1300 Tt Au back on site.

1305 Tt Au observes backfilling continuing at DU 37(D+E).

1327 Backfilling 2" of soil at DU 37(D+E) has been completed. Bobcat mobilizes to Du's 52+6. Visual site check looks as if soil was backfilled 2" on top of the coral material that was previously backfilled to 10".

1340 Tt Au observes backfilling being conducted at DU's 52 and 6. Bobcat being used to spread soil left by hauling trucks.

1352 Tt Au observes hauling trucks continuing to dump soil at Du's 52 (A+B) + 6 (B+C).

1435 Tt Au observes hauling trucks continuing to dump soil at Du's 52(A+B) and 6 (B+C). Bobcat is spreading the soil in the NE section of the area.

1445 Tt Au observes Jacobson worker spreading soil at DU 37(D+E) with a rake in areas that needed it.

1527 Tt Au notices small area by Ohana nui circle at DU 37 that needs to be backfilled beside sidewalk. Worker is still present spreading with rake.

1535 Tt Au off site. Operators are staying until 1730 but no more trucks are hauling in material.

NOTE: Times on Camera are 4:14 before time that appears on Camera up until Image ID 180-0584 due to time setting on camera being incorrect.

TETRA TECH



# PHOTOGRAPHIC LOG

**Project Title:** Earhart I-2 & Earhart I-3

**Date:** December 9, 2010

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 0839 | 180-0569 | Soil stockpiled for backfilling @ DU 37 | | |
| 0842 | 180-0570 | Jacobson workers laying orange geotextile at | | |
| | | entrance to DU 37. | | |
| 0915 | 180-0571 | Hauling truck dumping soil at DU 37. | | |
| 0934 | 180-0573 | Jacobson workers spreading backfill material | | |
| | | with bobcat and rake @ DU 37 | | |
| 0954 | 180-0575 | "Amazon" hauling truck used for hauling material | | |
| | | to DU 37 in Earhart I-2 getting soil | | |
| | | from stockpile @ Yard behind Artis office. | | |
| 0958 | 180-0577 | RHS Lee truck getting loaded with different | | |
| | | "rocky" material from different stockpile at the | | |
| | | same Yard. Same loader used for I-2 | | |
| | | trucks is loading the RHS truck. | | |
| 1025 | 180-0580 | hauling truck dumping soil at DU's 52+6. | | |
| 1032 | 180-0582 | Bobcat backfilling soil at DU 37. | | |
| 1327 | 180-0584 | DU 37 completely backfilled. | | |
| 1340 | 180-0585 | DU's 52 & 6 being backfilled. | | |
| 1520 | 180-0586 | Stockpiles from dumped loads at DU's 52&6. | | |
| 1527 | 180-0587 | Small area yet to be backfilled at DU 37. | | |
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TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 and Earhart I-3
**Project #:** 100-SFO-T
**Date:** December 13, 2010 **Time:** 0800
**Location:** Earhart neighborhood, Hickam AFB
**Client:** HCH/Aetus
**Tt Personnel:** Aron Ungerleider

**Misc. Personnel:** Louie (Jacobson)

**Statement of Work:** PI soil management oversight

**Equipment Used:** Camera

**Weather:** Hot, sunny

| Time | Project Activity |
|---|---|
| 0800 | Tt arrived on site |
| 0805 | Health & Safety Meeting |
| 0810 | Tt AU drives around Earhart I-2 and Earhart I-3 to check where Jacobson personnel are working today. Tt AU notices that personnel are only at decision units 52+6. |
| 0825 | Tt AU notices that Jacobson workers are backfilling decision units 52+6. All of the stockpiles that were present at the end of the day last Thursday are still present. bobcat is being used for backfilling. |
| 0835 | Tt AU notices that corner closest to Earhart and ohana mi circle at decision unit 37 still needs some soil. Recent rain may have created small gaps where more backfilling is needed. |
| 0850 | Tt AU meets with Louie (Jacobson) who tells him that no soil will be hauled in today due to dampness of soil. He said soil will most likely be hauled in tomorrow. |
| 1000 | Jacobson workers continue to backfill soil in decision units 52+6 primarily working in 6B. Bobcat is used as well as rake. |
| 1100 | workers break for lunch. |
| 1145 | workers resume backfilling at 52+6 still working primarily at 6B. |
| 1205 | Tt AU offsite. |

TETRA TECH



## Photographic Log

| Time | Image I.D. | Description |
|---|---|---|
| 826 | 180-0588 | Decision unit 52+6. w/ soil stockpiles |
| 826 | 180-0589 | Decision unit 52+6 w/ soil stockpiles |
| 0832 | 180-0590 | SE corner of decision unit 37 |
| 1143 | 180-0591 | Decision unit 52+6. |
| 1143 | 180-0592 | SE corner of DU 52+6 (previously 52b) in foreground. |
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TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 & I-3
**Project #:** 100-SFO-T
**Date:** December 14, 2010 **Time:** 0800
**Location:** Earhart I-2 + I-3, Joint base Pearl Harbor Hickam (JBPHH)
**Client:** ACH / (Actus)
**Tt Personnel:** Aron Ungerleider

**Misc. Personnel:**

**Statement of Work:** PI Soil management oversight.

**Equipment Used:** Camera

**Weather:** Hot, Sunny.

| Time | Project Activity |
|---|---|
| 0800 | Tt arrived on site |
| 0805 | Health & Safety Meeting |
| 0810 | Tt Au drives around both Earhart I-2 and Earhart I-3 |
| | Tt Au notices Jacobsen personnel only at DU 52+6. |
| 0818 | Tt Au observes workers backfilling soil at DU's 52+6 with bobcat and rake. |
| 0820 | Tt Au observes there are no more "gaps" in backfill at southeast corner of building 37. |
| 0822 | Tt Au speaks on the phone with Louie from Jacobson he says today they won't haul in stuff from the yard behind the Actus offices, but instead they will use their flatbed to haul extra soil from 52+6 to DU 15. He says they will begin doing this at 10:00 AM. |
| 0840 | Tt Au observes workers backfilling soil with bobcat and rake at DU's 52+6. |
| 0944 | Tt Au observes bobcat operator refueling the bobcat on the DU. No leak or spill is observed. |
| 1000 | Tt Au observes Jacobsen flatbed truck arrive at DU 52+6. Bobcat begins to load the flatbed with soil stockpiled for backfilling at DU 52+6. workers lay down tarp on curb to catch fallen / loose soil falling onto the curb. |
| 1012 | Tt Au observes that the flatbed has a full load of soil now, the load has been covered with a blue plastic tarp. |
| 1015 | Jacobsen flatbed departs DU 52+6, drives to DU 15 (D) behind bldg. 6341 in Earhart I-2. Jacobsen backs into DU and dumps soil onto DU. |
| 1050 | Jacobsen flatbed arrives at DU 15 (D) for 2nd load of soil brought from DU 52+6. |
| 1100 | Workers break for lunch, Tt Au offsite for lunch. |
| 1200 | Tt Au onsite at DU 52+6. |

TETRA TECH



Jacobsen workers continue to backfill DU 52+6. Flatbed continues to bring soil to DU 15(d).

1230 Flatbed dumps load of soil at DU 15(d).

1257 Flatbed dumps another load of soil from DU 52+6 at DU 15.

1324 Flatbed dumps another load of soil at DU 15.

1330 Flatbed driver tells T+A that they are finished bringing soil to DU 15 and that they will begin to bring soil to DU 2.

1357 Flatbed arrives with 1st load of soil from 52+6 at DU 2.

1359 Flatbed dumps soil on DU 2. (behind bldg. 6301)

1421 Flatbed dumps second load of soil from 52+6 at DU 2.

1427 T+A mobilizes to DU 52+6. Flatbed is being loaded with soil to take to DU 2. Several stockpiles still remain on the DU.

1435 T+A offsite.

TETRA TECH



# PHOTOGRAPHIC LOG

Project Title: Earhart I-3 and I-2

DATE: Dec. 14, 2010

| Time | Photo I.D. | Description |
|---|---|---|
| 0818 | 180-0593 | Du 52+6. |
| 0819 | 180-0594 | SE corner of DU 37. |
| 0851 | 180-0595 | looking west on Du 52+6. |
| 0944 | 180-0596 | refueling bobcat on Du 52+6. |
| 1005 | 180-0598 | loading soil from Du 52+6 onto Jacobsen flatbed. |
| 1005 | 180-0599 | loading soil from Du 52+6 onto Jacobsen flatbed. |
| 1013 | 180-0601 | Covering flatbed soil load with tarp |
| 1019 | 180-0602 | Du 15(2) behind bldg. 6341. |
| 1025 | 180-0603 | dumping soil onto Du 15 |
| 1214 | 180-0604 | Du 52+6. |
| 1216 | 180-0605 | loading soil from Du 52+6 into flatbed over geotextile. |
| 1230 | 180-0606 | Dumping soil at Du 15 |
| 1230 | 180-0607 | Dumping soil at Du 15 |
| 1257 | 180-0608 | Dumping soil at Du 15 |
| 1324 | 180-0609 | Dumping soil at Du 15. |
| 1330 | 180-0610 | Du 52+6. |
| 1357 | 180-0611 | Driving into Du 2 to dump soil brought from Du 52+6. |
| 1359 | 180-0612 | Dumping soil from 52+6 Du at Du 2. |
| 1421 | 180-0613 | Dumping soil at Du 2. |
| 1427 | 180-0614 | Du 52+6 w/ remaining stockpiles. |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 & Earhart I-3
**Project #:** 100-SFO-T
**Date:** December 15, 2010 **Time:** 0800
**Location:** Joint Base Pearl Harbor Hickam (JBPHH)
**Client:** HCH/ACTUS
**Tt Personnel:** Aron Ungerleider

**Misc. Personnel:**

**Statement of Work:** PI Soil management oversight

**Equipment Used:** Camera

**Weather:** Hot, sunny

| Time | Project Activity |
|---|---|
| 0800 | Tt arrived on site |
| 0805 | Health & Safety Meeting |
| 0810 | Tt Av drives around the decision units to see where Jacobsen personnel are working today And to check on the backfill status for each decision unit. Tt Av notices several stockpiles on DU 2 that haven't been spread yet. Tt Av notices personnel using bobcat to backfill DU 52+6 which is almost entirely backfilled. Tt Av notices DU 37 is still completely backfilled. Tt Av notices workers using rake And Mini bobcat at DU 15 which is About ½ complete. |
| 0830 | Tt Av remains At DU 15 watching workers backfill this decision unit. |
| 0915 | Tt Av mobilizes to DU 52+6 where workers continue to backfill with A bobcat. Unit is 95% complete. |
| 1020 | Tt Av mobilizes back to DU 15. Watches workers finish this DU. |
| 1030 | Tt observes Jacobsen workers leave this DU As they have completed backfilling it. A small pile remains in the center of the DU beside a slight depression where A water valve exists. Workers are leaving this unbackfilled for plumbing access. |
| 1041 | Tt Av mobilizes to DU 2 where workers begin spreading soil that is Already stockpiled on the DU using Mini bobcat And rake. |
| 1100 | Workers break for lunch. Tt Av offsite lunch. |
| 1145 | Tt Av back onsite at DU 2. Workers continue to spread soil on this DU with rake and mini bobcat. |
| 1202 | Tt Av calls Lexie (Jacobsen) who tells him they won't be having soil out of the yard behind the Actus building today. |
| 1230 | Tt Av mobilizes to DU 52+6. Backfilling has been completed at this DU. |
| 1240 | Tt Av offsite. |

TETRA TECH



## Photographic Log

Date: 12-15-2010

| Time | Photo I.D. | Description |
|---|---|---|
| 0821 | 180-0615 | DU 2. |
| 0825 | 180-0616 | DU 52+6. backfilling w/ bobcat. |
| 0829 | 180-0617 | DU 15. Backfilling w/ mini bobcat |
| 0830 | 180-0618 | DU 15. backfilling w/ rake + mini. bobcat. |
| 0927 | 180-0619 | DU 15. backfilling w/ rake + mini bobcat |
| 0949 | 180-0620 | DU 52+6. Backfilling w/ bobcat |
| 1031 | 180-0621 | DU 15. |
| 1050 | 180-0622 | DU 2. Backfilling |
| 1229 | 180-0623 | DU 2. Backfilling |
| 1233 | 180-0624 | DU 52+6. Completed w/ backfilling. |
| | | |
| | | |
| | | |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 & I-3
**Project #:** 100-SFO-T
**Date:** December 16, 2010 **Time:** 0800
**Location:** Earhart neighborhood, JBPHH
**Client:** HCH/Actus
**Tt Personnel:** Aron Ungerleider, Yvonne Pant

**Misc. Personnel:**

**Statement of Work:** PI soil management oversight

**Equipment Used:** Camera

**Weather:** Hot, sunny

| Time | Project Activity |
|---|---|
| 0800 | Tt arrived on site |
| 0805 | Health & Safety Meeting |
| 0810 | Tt A drives around all sites at I-2 and I-3 to see where workers are and what progress has been made at each site. |
| 0824 | Tt A notices that backfilling has been completed at DU 2. |
| 0828 | Tt A notices that backfilling has been completed at DU 52+6. |
| 0829 | Tt A notices JAcobsen workers taking soil at DU 37. workers are also working on sprinklers or some sort of irrigation lines. |
| 0830 | Tt A arrives at DU 42(C) to check on status of the DU. No soil has been left here yet although mini bobcat is here. Tt A waits here for workers to arrive. |
| 0840 | After no workers arrive Tt A mobilizes to Yard behind Actus offices to see if flatbed is loading soil from stockpiles. |
| 0845 | Tt A arrives at the Yard. NO JAcobsen vehicles present. Tt A calls Louie (JAcobsen) to inquire as to today's planned work. He says they will begin hauling soil out of the Actus Yard soon to DU 42(C). |
| 0905 | Tt A returns to DU 37 where workers are still raking and conducting irrigation work. |
| 0945 | JAcobsen flatbed makes 1st trip to Actus Yard. Tt A follows in his personal vehicle. |
| 1000 | JAcobsen flatbed loads 1st load of soil from screened stockpile in the Yard. Takes it to DU 42. |
| 1011 | JAcobsen flatbed dumps soil at DU 42. Operator on mini bobcat spreads soil around the DU. |

TETRA TECH



| | |
|---|---|
| 1020 | Jacobsen flatbed makes 2nd trip to get soil from Acres Yard |
| 1024 | Jacobsen flatbed arrives at Yard. loader loads him with soil. |
| 1036 | Jacobsen flatbed dumps 2nd load of soil at DU 42. operator on Mini bobcat spreads soil around the DU. |
| 1045 | Jacobsen flatbed arrives at Acres Yard to get 3rd load of soil. |
| 1100 | workers break for lunch. Tt Av ~~[illegible]~~ A offsite lunch. |
| 1150 | Tt Av onsite @ DU 42 to meet Tt YP. workers are not working. |
| 1220 | After waiting for work to resume at DU 42, Tt Av departs DU to go fill out photo log before leaving for the day. |
| 1300 | Tt Av offsite. |

## Photographic Log

| Time | Photo I.D. | Description |
|---|---|---|
| 0824 | 180-0625 | DU 2. Completed. |
| 0828 | 180-0626 | DU 37. workers caking. |
| 0828 | 180-0627 | DU 37. workers caking. |
| 0830 | 180-0628 | DU 42. Yet to commence work. |
| 0830 | 180-0629 | DU 42. Yet to commence work. |
| 1010 | 180-0630 | DU 42. 1st load of soil being dumped. |
| 1011 | 180-0631 | DU 42 1st load of soil being dumped. |
| 1014 | 180-0632 | Mini bobcat being used to spread soil around DU 42. |
| 1024 | 180-0633 | 2nd load of soil being loaded at Acres Yard. |
| 1027 | 180-0634 | Soil stockpile that is used for backfilling DU's @ I-2 & I-3. |
| 1036 | 180-0635 | 2nd load of soil being dumped at DU 42. |
| 1046 | 180-0636 | Jacobsen truck at Acres Yard ready to be loaded with soil. |
| 1047 | 180-0637 | Jacobsen flatbed being loaded with 3rd soil load of day. |

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-sto-

**Project Title:** Earhart 1-2

**Date:** December 17, 2010

**Time:** 1230

**Location:** Joint Base Pearl Harbor-Hickam (JBPHH) / ~~Earhart~~ 1-2

**Client:** Hickam Communities (HC) / ACTUS

**Tt Personnel:** M. Overton

**Misc. Personnel:**

**Statement of Work:** Pesticide-Impacted (PI) Soil Management oversight

**Equipment Used:** Camera

**Weather:** 80's sunny - partly cloudy

| Time | Project Activity |
|---|---|
| 1230 | Tt arrived on site MO on site |
| 1230 | Health & Safety Meeting |
| | - Jacobsen working in area between bldg #6379 & . Installing sprinklers using trencher (DU ) |
| | - Between bldg #6376 & #6375 - soil backfilled |
| | - Between driveways at bldg 6375 - soil backfilled |
| | MO offsite. |
| 1240 | MO offsite. |

TETRA TECH



# PHOTOGRAPHIC LOG

**Project Title:** Earhart 1-2

**Date:** December 17, 2010

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 1235 | 158-6788 | Between bldg 6379 & installing sprinklers | – | Landscapers |
| 1239 | 158-6789 | Between bldg # 6376 & 6375 | - soil backfilled | |
| 1240 | 158-6790 | Between driveways at bldg 6375 | soil backfilled | |

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-sto-
**Project Title:** Earhart 1-2 & Earhart 1-3
**Date:** December 20, 2010
**Time:** 1043
**Location:** Joint Base Pearl Harbor-Hickam (JBPHH
**Client:** Hickam Communities (HC) / Actus
**Tt Personnel:** M. overton

**Misc. Personnel:**

**Statement of Work:** Pesticide-Impacted (PI) Soil Management Oversight
**Equipment Used:** camera
**Weather:** 80's overcast, rainy

| Time | Project Activity |
|---|---|
| 1043 | Tt arrived on site MO on site |
| 1043 | Health & Safety Meeting |

- Area between bldg 6378 & 6380 - backfilled and hydroseeded
- Area between bldg 6378 & 6377 - backfilled and hydroseeded
- Area between bldg 6376 & 6375 - backfilled and hydroseeded
- Area between driveways of bldg 6375 backfilled and hydroseeded
- Area behind bldg 6341 backfilled & hydroseeded, small area excavated & stockpiled next to excavation. Does not appear orange geotextile penetrated
- Area across from bldg. 6457 - backfilled & hydroseeded.

All areas however backfilled & hydroseeded however rain has caused some rill erosion in multiple areas. MO talks to David (Actus) on site and is told that rain cause some soil/hydroseed to come out into roadway & hydroseeder on site today filled w/

water to clean off sidewalk & roadways.
1112 - M10 offsite.

TETRA TECH



## PHOTOGRAPHIC LOG

**Project Title:** Earhart 1-2 & Earhart 1-3

**Date:** December 20, 2010

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 1052 | 159-6816 | Between bldg 6379 & 6380 - backfilled & hydroseeded | | |
| 1055 | 159-6817 | Between bldg 6378 & 6377 - backfilled & hydroseeded | | |
| 1059 | 159-6818 | Between bldg 6376 & 6375 - backfilled & hydroseeded | | |
| 1059 | 159-6819 | Between driveways at bldg 6375 - backfilled & hydroseeded | | |
| 1104 | 159-6820 | Bldg 6341 - backfilled & hydroseeded (small excavation area) | | |
| 1104 | 159-6821 | Bldg 6341 - backfilled & hydroseeded | | |
| 1111 | 159-6822 | Across from bldg 6457 - backfilled & hydroseeded. | | |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-2 & 1-3 Neighborhoods
**Project #:** 100-SFO-T26535
**Date:** 11/4/2014 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Inspection of ground cover at planters

**Equipment Used:**

**Weather:** Partly cloudy

| Time | Project Activity |
|---|---|
| 830 | Tt arrived on site |
| | Health & Safety Meeting |
| | Begin inspection of Earhart 1-3 in SW corner |
| | Note: DU-2a has healthy growth of grass, but very little organic topsoil. Numerous large white coral stones at surface |
| 945 | Move to center portion of Earhart 1-3 |
| 1100 | Off site for lunch |
| 1145 | Return to site |
| | Place pin flags at all planter boxes needing excavation |
| | Begin inspection of planter boxes in Earhart 1-2 |
| 1320 | Residents at building 6380 express concern about topsoil washed away from DU-52/6. Inform them that Tt did inspect the area and HC is working on developing a solution |
| 1430 | Complete planter box installation inspection. Begin inspecting grass cover at west end of site |
| 1545 | off-site |

TETRA TECH



# PHOTOGRAPHIC LOG

**Project Title:** Earhart 1-2 & 1-3 Inspection

**Date:** 1/4/2014

1-3

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 913 | 100-1845 | NE Corner of Bldg 6303 - No gravel | | SW |
| 918 | 100-1846 | Front of Bldg 6305 - Bare Planter | | S |
| 929 | 100-1847 | Bare earth beneath trees in DU-1c | | SW |
| 934 | 100-1848 | No gravel along back of Bldg 6410 | | N |
| 938 | 100-1849 | Bare earth in DU-2b | | S |
| 941 | 100-1850 | Status of DU-2a soil cover | | ~~SW~~ SW |
| ~~1001~~ 1001 | 100-1851 | Bare earth alongside Bldg ~~6426~~ 6426 | | N |
| ~~1001~~ 1001 | 100-1852 | " " " | | N |
| 1001 | 100-1853 | Bare earth behind bldg 6406 | | E |
| 1014 | 100-1854 | Front of Bldg 6405 - Example of | | N |
| 1016 | | adequate ground cover | | |

1-2

| | | | | |
|---|---|---|---|---|
| 1040 | 100-1855 | Landscaping on west side of bldg 6397 | | S |
| 1043 | 100-1856 | Landscaping on west side of bldg 6391 | | S |
| 1044 | 100-1857 | Landscaping on east side of bldg 6391 | | S |
| 1048 | 100-1858 | Bare earth NW of bldg 6385 | | N |
| 1051 | 100-1859 | Bare earth beneath swings behind bldg 6393 | | S |
| 1058 | 100-1860 | Bare patches N of bldg 6401 | | S |
| 1103 | 100-1861 | NW corner of Bldg 6303 Landscape | | |
| 1248 | 100-1862 | Front of building 6379 | | S |
| 1250 | 100-1863 | SW corner of building 6379 | | N |
| 1256 | 100-1864 | SW corner of bldg 6380 | | N |
| 1301 | 100-1865 | NW corner of 6349 | | SE |
| 1306 | 100-1866 | SE corner of 6353 | | NW |
| 1308 | 100-1867 | SW corner of 6353 | | NE |
| 1313 | 100-1868 | Front of building 6356 | | SE |
| 1316 | 100-1869 | Front of building 6357 | | S |
| 1319 | 100-1870 | Front of building 6342 | | N |
| 1326 | 100-1871 | Front of building 6347 | | N |
| 1336 | 100-1872 | NE corner of bldg 6372 | | W |
| 1338 | 100-1873 | SE corner of bldg 6372 | | NW |
| 1341 | 100-1874 | N side of bldg 6360 | | S |
| 1344 | 100-1875 | Front of bldg 6359 | | ~~E~~ E |
| 1346 | 100-1876 | South side of 6359 | | E |
| 1351 | 100-1877 | Building 6340 | | N |

TETRA TECH



# PHOTOGRAPHIC LOG

**Project Title:** Earhart 1-2 & 1-3 Inspection

**Date:** 1/4/2011

1-2

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 1358 | 100-1878 | SW corner of bldg 6338 | | N |
| 1400 | 100-1879 | SE corner of bldg 6338 | | |
| 1402 | 100-1880 | W side of bldg 6336 | | S |
| 1404 | 100-1881 | E side of bldg 6336 | | N |
| 1408 | 100-1882 | E side of bldg 6339 | | N |
| 1454 | 100-1883 | Bare patch NE of playground, behind bldg 6347 | | E |
| 1507 | 100-1884 | Bare earth in DU-14d | | N |
| 1513 | 100-1885 | Rough grassy area in DU-29b | | W |
| 1523 | 100-1886 | Bare patches between buildings 6346 & 6347 | | E |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart 1-2 Grass Cover Inspection
**Project #:** 100-SFO-T26535-04
**Date:** 1/5/2011 **Time:**
**Location:** Hickam ~~Communities~~ AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny and hot

| Time | Project Activity |
|---|---|
| 800 | Tt arrived on site |
| | Health & Safety Meeting |
| | Begin grass cover inspections in Earhart 1-2 |
| | - Generally, grass is much more healthy and full than it did during sampling event in the dry season (June and July). Areas where tool sheds were in place but since removed are currently covered by healthy lawns |
| | - HC is doing work along eastern berm - bare earth shows signs of work, the ruts being filled in, and caution tape surrounding areas. Did not flag these areas for work |
| | - Check on stockpile - no standing water present in bermed area - evidence of ponded water present previously |
| 1120 | Off site |
| 300pm | Return to site to remove pink pinflags from planters that need replacement |
| 1600 | off-site |

TETRA TECH



# PHOTOGRAPHIC LOG

**Project Title:** Earhart I-2 Grass Cover Inspection

**Date:** 1/5/2011

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 837 | 100-1887 | Bare patch behind bldg 6355 (DU-13a) | | N |
| 843 | 100-1888 | Bare earth behind bldg 6353 (DU-13c) | | S |
| 852 | 100-1889 | Bare earth behind bldg 6343 (DU-15b) | | NE |
| ~~852~~ 902 | 100-1890 | Bare earth behind bldg 6373 (DU-24b) | | W |
| ~~857~~ 903 | 100-1891 | Bare soil behind bldg 6374 (DU-24c) | | N |
| ~~926~~ | 100-1892 | Soil exposed inside yard of the year | | E |
| 947 ~~939~~ | 100-~~1893~~ 1894 | Exposed soil beneath swing set (DU-23b) | | N |
| 940 | 100-~~1894~~ 1893 | Exposed soil near playground (DU-56j) | | W |
| ~~1045~~ 1045 | 100-1895 | Ongoing work along sound barrier berm | | S |
| | 100-1896 | Large area of thin grass in NE corner of neighborhood (DU-58b) | | |

| Decision Unit | Sub DU | VSI Date | Inspector | Contiguous Bare Spots >200 sq ft | Bare spots < 200 sq ft | Comments | Reseeding Completion Date |
|---|---|---|---|---|---|---|---|
| 14 | a | 03/15/11 | JMM | No | Yes | 3 x 3 patch in swale behind building 6303 | |
| 1 | c | 03/15/11 | JMM | No | Yes | Area surrounding tree trunks, 20' x 40' of pathy grass | |
| 2 | b | 03/15/11 | JMM | No | Yes | Patchy grass adjacent to trunk of papaya tree | |
| 28 | a | 03/15/11 | JMM | No | Yes | Patchy grass along west side of building 6426 | |
| 19 | d | 03/15/11 | JMM | No | Yes | 5' x 10' area beneath child's play table behind building 6406 | |
| 19 | d | 03/15/11 | JMM | No | Yes | 5' x 15' area along back patch of building 6406 | |
| 35 | d | 03/15/11 | JMM | No | Yes | Patchy grass adjacent to HiTel and TV boxes behind building 6407 | |
| 20 | b | 03/15/11 | JMM | No | Yes | Patchy grass adjacent to HiTel and TV boxes behind building 6407 | |
| 16 | d | 03/15/11 | JMM | No | Yes | Bare earth beneath childrens swings behind building 6393 | |

| Decision Unit | Sub DU | VSI Date | Inspector | Contiguous Bare Spots >200 sq ft | Bare spots < 200 sq ft | Comments | Reseeding Completion Date |
|---|---|---|---|---|---|---|---|
| 3 | c | 03/15/11 | JMM | No | Yes | Bare earth due east of playground | |
| 3 | c | 03/15/11 | JMM | No | Yes | Area is about 30 feet northeast of playground | |
| 14 | d | 03/15/11 | JMM | No | Yes | Area north of and between buildings 6380 and 6381 | |
| 29 | b | 03/15/11 | JMM | No | Yes | Area consists of roughly 50% soil and 50% patchy grass | |
| 13 | a | 03/15/11 | JMM | No | Yes | Bare earth surrounds tree behind building 6355 | |
| 13 | c | 03/15/11 | JMM | No | Yes | Adjacent to back lanai of building 6353 | |
| 15 | b | 03/15/11 | JMM | No | Yes | Area contiguous and behind back lanai of building 6343 | |
| 24 | b | 03/15/11 | JMM | No | Yes | Soil beneath tree in two large patches behind building 6373 | |
| 24 | c | 03/15/11 | JMM | No | Yes | Small patch behind building 6374 | |
| 25 | d | 03/15/11 | JMM | No | Yes | Adjacent to lanai inside “Yard of the Year” | |
| 23 | b | 03/15/11 | JMM | No | Yes | Soil exposed beneath swing set behind building 6368 | |
| 56 | j | 03/15/11 | JMM | No | Yes | Bare earth beneath basketball net behind building 6368 | |
| 58 | b | 03/15/11 | JMM | No | Yes | Large area with patchy grass cover in northeast corner of neighborhood. | |

TETRA TECH



# FIELD NOTES

**Project Title:** RAP Remediation
**Project #:** 100-SFO-T26535
**Date:** 3/15/11 **Time:**
**Location:** Earhart Neighborhood
**Client:** Hickam Communities
**Tt Personnel:** J. Mollison

**Misc. Personnel:**

**Statement of Work:** Survey excavation extents, review grass cover

**Equipment Used:**

**Weather:** Sunny, stiff N breeze

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site |
| | Health & Safety Meeting |
| | - Meet Park Engineering crew at shoppette and move to neighborhoods |
| | - Perform walk of DU-2a with survey crew |
| | Park Eng. begins to create local reference points by shooting azimuth & distance from known survey locations |
| ~~1130~~ | ~~Break for lunch~~ |
| | - Perform grass inspections, identify two areas that don't need work - grass has grown over bare earth since previous inspection: |
| | DU-28b in Earhart 1-2 neighborhood |
| | DU-33d in Earhart 1-3 neighborhood |
| | All other areas still need work |
| 1130 | Break for lunch |
| 1200 | Return to site |
| 1230 | Park Eng completes shooting local reference points, begins shooting perimeter of DU-2a in Earhart 1-3 |
| 1410 | Park Eng. moves to Earhart 1-2 |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2
**Project #:**
**Date:** 2-14-2011 **Time:** 0730
**Location:** JBPHH, Earhart I-2
**Client:** HC/ACTUS
**Tt Personnel:** Aron Ungerleider

**Misc. Personnel:** Lovie (Jacobsen), Shane (Delta)

**Statement of Work:** PJ soil management oversight

**Equipment Used:** Camera

**Weather:** Hot, Sunny

| Time | Project Activity |
|---|---|
| 0730 | Tt arrived on site |
| 0735 | Health & Safety Meeting |
| 0740 | Tt AA drops off PTP from AT Actus office |
| 0750 | Tt AA arrives AT building 6363. NO workers are present. |
| 0800 | Tt AA marks boundary of area to be excavated between buildings 6363 and 6364. Other 3 corners are marked at the building corners. |
| 0805 | Delta's Shane shows up and Tt AA shows him boundary. Shane says fencing will go up today. Excavation will begin tomorrow. Shane says they will excavate the planters but not the gravel. |
| 0810 | Jacobsen's Lovie shows up and he speaks with Shane about the "clean" soil to be used for backfill. They will use the screened material from behind the Actus office. |
| 0830 | Lovie shows several Jacobsen workers what they will do in areas where planters are to be remediated. He says they will start at building 6336 and work their way towards building 6363. |
| 0845 | Workers leave to bring back equipment + gravel for backfill. |
| 0940 | Jacobsen workers arrive at building 6336 with gravel and geotextile. Workers begin removing plants from planters (option 1), placing them in bucket, and then laying geotextile down on top. This is occurring at unit 791. |
| 1000 | Gravel is laid down on top of geotextile. 2" worth of gravel spread across the geotextile in the remediation planter area. |
| 1011 | Unit 791 remediation is complete. |
| 1018 | Jacobsen guys begin removing invasive plant from planters at unit 797 at building 6336. One of the workers asks about the row of plants closest to |

the street. T+ A calls T+ YP to ask about the planters with plants put there by residents (and in this case with red wood chips and solar lights). T+ YP says not to disturb such areas at this point. T+ A relays this info to the JAcobsen workers. They proceed to remove immature plants in other planter areas.

1035 T+ A observes workers led by DAVID (Acting) put up orange construction fencing around Du 39A. T+ A checks boundaries between houses and deems it adequate.

1040 T+ A observes JAcobsen workers laying down geotextile over planter area at unit 797. Immature plants have been removed and mature plants (Ti) remain. geotextile is layed down with slits cut for remaining plants. Removed plants are placed in a large bucket.

1125 T+ A offsite. Lunch. Same as workers.

1130 On the way to lunch, T+ A notices the fence is complete at building 6363 at Du 39A.

1200 T+ A back onsite at building 6336. JAcobsen workers not present.

1205 JAcobsen workers arrive. Continue backfilling 2" of gravel at unit 797.

1255 JAcobsen workers finish backfilling gravel at unit 797 with the exception of the area in front that is being left untouched for now.

1300 JAcobsen begin remediation at building 6338 unit 811.

1320 After removing immature bands, JAcobsen lays down geotextile. part of this area has Mature Ti plants which will be left in place.

1340 T+ A observes fencing up at bldg 6363. Fence is adequate and even is extending boundary by 1.5 feet to the west.

1350 T+ A returns to bldg 6338 where JAcobsen are laying geotextile and gravel at unit 811.

1355 JAcobsen workers run out of geotextile. Have site to get more.

1425 JAcobsen workers return to unit 811. Continue to lay geotextile and gravel and cut slits into geotextile where mature plants are remaining.

1505 JAcobsen workers leave site. Planters at unit 811 are 90% complete. Some more gravel needs to remain. to be placed on the geotextile.

1515 T+ A offsite.

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2
**Project #:**
**Date:** 2-15-2011 **Time:** 0810
**Location:** Earhart I-2, JBPHH
**Client:** HC/Actus
**Tt Personnel:** Aaron Vangerleider, Jon Mollison
**Misc. Personnel:** Shane (Delta), Jeff edmonson (Actus)
**Statement of Work:** PI Soil Management oversight
**Equipment Used:** Camera
**Weather:** Hot, Sunny

| Time | Project Activity |
|---|---|
| 0810 | Tt arrived on site |
| 0815 | Health & Safety Meeting |
| 0820 | Tt AV arrives at building 6338, unit 811. JAcobsen workers are just finishing up remediating planters as they place gravel in the last area of the planters. |
| 0830 | JAcobsen workers finish remediating planters @ unit 811. Begin working at unit 817 at building 6338. |
| 0835 | Tt AV observes Delta workers operating excavator at DU 39A @ building 6363 removing 1 foot of PI soil within the fenced in area |
| 0837 | JAcobsen workers have removed all juvenile plants at planters at unit 817. Begin setting down geotextile and gravel. |
| 0845 | Tt AV observes tandem hauling truck enter DU 39A to haul out PI soil collected from the excavator. Orange geotextile has been laid out to prevent the truck from tracking PI soil on its tires. |
| 0905 | JAcobsen workers pour gravel over planters at unit 817. |
| 0910 | Tt Jon Mollison arrives onsite. Asks Me to go rent him two generators to run ambient air monitoring devices. |
| 0915 | Tt AV offsite. |
| 1015 | Tt AV onsite, helps Jon Mollison set up ambient air monitoring. Jeff edmonson (Actus) Arrives on site And Tt AV fills him in on status of Jacobsen worker's remediation of planters. |
| 1045 | Tt AV notices that Jacobsen workers have completed unit 817 planter remediation. |
| 1100 | Tt AV continues to help Tt JM set up Air monitoring And observes excavation of PI soil at DU 39A. |

TETRA TECH



1130 It Arr offsite Lunch And to load pictures onto photographic log.
1200 It Arr onsite, logs photos onto photo log.
1220 It Arr offsite to TETRA TECH office

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart RAP #2
**Project #:** ~~000~~ 100-SFO-T26535
**Date:** 2/15/2010 **Time:**
**Location:** Earhart 1-2, Hickam
**Client:** Hickam Communities
**Tt Personnel:** J Mollison, A. Ungerleider conducting oversight of plenum area remediation
**Misc. Personnel:**

**Statement of Work:** Oversight of Bldg 6363 excavation and air monitoring
**Equipment Used:**

**Weather:**

| Time | Project Activity |
|---|---|
| 845 | Tt arrived on site |
| | Health & Safety Meeting |
| | Calibrate & Install DustTrak air monitors, one in upgradient (east) corner, one downgradient of work area north of driveway for unit # |
| 930 | Calibrate and begin personal air monitoring program using SKC Personal air pumps and ORBO-1500 PUF Sandwich Samplewave - glass sleeves for TO-10A |

| Unit | $Q_{START}$* | $Q_{END}$* | Time (min) | Placement | Sample |
|---|---|---|---|---|---|
| 13496 | 1.008 | 1.032 | 323 | Operator | OP-02.15.2011 |
| 13775 | 1.029 | 0.9991 | 318 | Laborer | LAB-02.15.2011 |

*Average over 10 readings

1000 Install ambient air samplers
1015 Jeff Edmonson on-site for work update for ~20 minutes
1030 AN arrives with 2 generators

| Setup | Unit | $H_{START}$ | $H_{END}$ | $H_2O$ inches | Sample |
|---|---|---|---|---|---|
| Upgradient | | 993.18 | ~~990.79~~ 990.61 | 60 | AMBIENT-UP |
| Downgradient | | 4584.27 | 4590.63 | 76 | AMBIENT-DOWN |

1100 off-site for lunch
1130 Return to site to observe soil load out

1200 Follow up with planter work Building 6340, Unit 835 skipped due to containers in way

1230 Talk to landscapes - they are under instruction not to remove plants that owners installed. They will only work where they see Lawai as T: plants. Currently working on bldg 6353

1305 Fifth truck of soil loaded out

1330 Conduct quick survey of planter areas to determine where work won't be done until clients have been notified

1410 Jeff Edmonson on-site to discuss landscape issue - He has contacted Mel, who is discussing with Louis

Refuel generators for ambient air samplers

J.E. confirms that all plants & P.I. soil must be removed from planters regardless of who installed them

1430 Talk to Jacobsen crew about removing homeowner plants and what to do if the homeowner removes plants. Nothing you can do if they do it before you arrive. Otherwise, contact Actus

1500 Remove Dust Trak monitors

| | | | | |
|---|---|---|---|---|
| Upwind | Avg: 0.015 | Min: 0.0 | Max: 0.235 | Time: 5:41 |
| Downwind | Avg: 0.010 | Min: 0.00 | Max: 0.313 | Time: 5:46 |

1515 - Delta decons and removes excavator, breakdown & remove Ambient air samplers

- 11 Truckloads hauled out
- Approximately 200 ft$^2$ remains for removal along Okana Nui circle, Actus Delta has geotextile laid out on all excavated areas

1530 off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart Removal Action #2
**Project #:** 190-SFO-T26535-04
**Date:** 2/16/2011 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** S. Mollison

**Misc. Personnel:**

**Statement of Work:** Air Monitoring, Landscaping Removal, Excavation of 6363
**Equipment Used:** N

**Weather:**

| Time | Project Activity |
|---|---|
| 720 | Tt arrived on site |
| | Health & Safety Meeting |
| | Begin setting up air monitors |
| 730 | Delta drops off excavator |
| 820 | Delta on site, begin excavation @ 6363 |

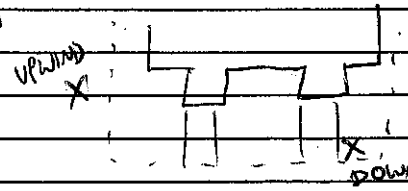
Ambient Monitors

| TSTART | TEND | PRESSURE: START | END | LOCATION |
|---|---|---|---|---|
| 999.61 | 1006.31 | 70 | 73 | UPWIND |
| 4590.63 | 4569.34 | 70 | 79 | DOWNWIND |

Personal Monitors

| Unit | QSTART | QEND | Time | Placement | Sample |
|---|---|---|---|---|---|
| 13496 | 0.9933 | 0.9779 | 372 | Operator | OP-2.16.2011 |
| 13775 | 1.009 | 1.007 | 369 | Laborer | LAB-2.16.2011 |

Set Up Dust Traks with Ambient Monitors




950 Downwind monitor falls over, unit busted, off-site for replacement

915 Return to site, repair downwind ambient sampler
930 Meet with Jacobsen crew to review all landscape areas

1630 Delta completes excavating unit 832 yard, lays out geotextile. laid out. Excavator moved over to unit 834

1130 3 Truckloads moved out so far, Delta break for lunch
1200 Refuel generators, return to work

Verify landscape work

Remove Dust Trak Monitors

| | | Average | Min | Max | Time |
|---|---|---|---|---|---|
| 1455 | Upwind: | 0.027 | 0.015 | 0.719 | 6:29 |
| | Downwind: | 0.030 | 0.010 | 0.813 | 6:32 |

1500 Remove Personal Air Monitor
1510 Delta excavator removed from site, crew lays out geotextile
- Front yard section fully excavated

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart Removal Action #2
**Project #:** 100-SFO-T26535-04
**Date:** 2/17/2011 **Time:**
**Location:** Hickam A FB
**Client:** Hickam Communities
**Tt Personnel:** J Mellisa

**Misc. Personnel:**

**Statement of Work:** Air monitoring, landscaping removal, excavation of 6363

**Equipment Used:**

**Weather:**

| Time | Project Activity |
|---|---|
| 745 | Tt arrived on site, drop off PtP from Health & Safety Meeting |

Set up Ambient air monitors

| T START | T END | P START | P END | LOCATION |
|---|---|---|---|---|
| 1006.31 | 1011.95 | 70 | 70 | UPWIND |
| ~~4569.34~~ 4596.34 | 4601.97 | 70 | 73 | DOWNWIND |

Set Up Personal Air Monitors

| UNIT | Q START | Q END | Time (min) | Placement | Sample |
|---|---|---|---|---|---|
| 13496 | 1.050 | 1.003 | 307 | Operator | OP-2.17.2011 |
| 13775 | 1.004 | 0.9932 | 309 | Laborer | LAB-2.17.2011 |
| | | | | | FB-2.17.2011 |

Also prep field blank
Set up Dust Trak air monitors

- Delta working on excavating front yard of unit 838, single truck hauling to ~~stor~~ soil storage area

- Check in with landscape work - guys working on Building 6380, Unit 548

1000 Fuel truck on site for excavator maintenance and fueling

TETRA TECH



1030 Jacobsen PM on-site to co-ordinate installation of water irrigation lines today and tomorrow
Call YKP to update her on schedule of excavation

1130-1200 Delta breaks for lunch

1200 Jacobsen crew stops work on landscape areas and begins installation of irrigation lines in 6363 DU-39a

1315 Excavation complete, Delta decons excavator treads and moves it off area, begins laying out geotextile fabric at unit 838

Irrigation lines complete at north and central portions of DU-39a

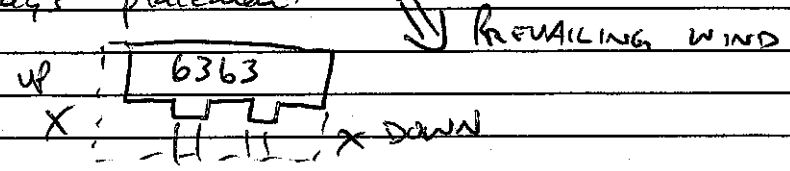
1345 Remove Dust Trak Monitors (mg/m³)

| Unit | Avg | Min | Max | Time |
|---|---|---|---|---|
| Upwind | 0.10 | 0.009 | 0.423 | ~~[illegible]~~ 5:46 |
| Downwind | 0.023 | 0.017 | 0.621 | 5:45 |

Break down personal air monitors

Break down ambient air monitors
Samples collected
~~ABB-A~~ ~~SMAR~~-AMB-AIR
EAR-AMBUP ~~2.17.2011~~
EAR-AMBDOWN ~~2.17.2011~~

Today's placement




1430 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart RA #2
**Project #:** 100-SFO-T26535-04
**Date:** 2/18/2011 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:** Landscape work oversight

**Equipment Used:**

**Weather:**

| Time | Project Activity |
|---|---|
| 800 | Tt arrived on site |
| | Health & Safety Meeting |
| | Check in on P.I. soil stockpile |
| | - Verify black plastic cover over additional material, including sand bags |
| | - Geotextile base intact |
| 815 | Follow dump truck from soil source behind Contractor's office to site and observe dumping |
| | Small front end loader spreading soil from dumpsite along road over rest of site |
| | Landscapers working on 562 Oham Ave St. |
| 1010 | Delta pauses dumping topsoil to allow time to grade out north area |
| | Verify landscape work at Building 6379 |
| 1130-1200 | Off-site for lunch |
| 1230 | Backfilling begins in center portion of DU-39a |
| | Delta is backfilling with a dark brown silty organic rich topsoil |
| 1300 | Landscapers continue work at Building 6380 |
| 1500 | Work complete for day - off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart RAP #2
**Project #:** 100-SFO-T26535-04
**Date:** 2/22/2011 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J. Mollison

**Misc. Personnel:**

**Statement of Work:** Backfill oversight, landscaping work oversight

**Equipment Used:**

**Weather:**

| Time | Project Activity |
|---|---|
| 815 | Tt arrived on site |
| | Health & Safety Meeting |
| | Delta has all soil present and in place - They are using a bobcat front end loader and hand tools to ~~re~~grade last section of front yard |
| 900 | Bobcat won't start, Delta has call into maintenance truck |
| | Call Mac - No sign of Jacobsen working in neighborhood |
| 945 | Mac calls - Jacobsen is waiting on load of gravel - won't start work until afternoon |
| 1000 | Delta brings small excavator to Bldg 6363 to load out Bobcat |
| ~~1000~~ JMM | ~~Off-site~~ and complete grading operations |
| 1030 | Call from J. Edmonson, Jacobsen crew did work on 568 Ohana Nui, |
| ~~1030~~ JM | ~~Off-site~~ through that isn't on the table or figure. Resident complained to H.C. - Verify that work was done, discuss status with Jacobsen crew |
| ~~1045~~ | |
| 1130 | Off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart RAP #2
**Project #:** 100-SFO-T26535-04
**Date:** 2/23/2011 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** Jon Mollison

**Misc. Personnel:**

**Statement of Work:** Contractor oversight - Landscape area

**Equipment Used:**

**Weather:**

| Time | Project Activity |
|---|---|
| 745 | Tt arrived on site |
| | Health & Safety Meeting |
| | Review work completed on 2/22: Earhart 1-2 Complete |
| | Building 6369, Unit 758 |
| | Building ~~6378, Unit 722~~ 6372, Unit 722 |
| | Building 6372, Unit 728 |
| | Plants left in place, gravel placed around them |
| | Landscaping crew working on building 6391 |
| 820 | Call received from Jeff Edmonson, update him on status of work done so far |
| 840 | Call Moe to discuss upcoming schedule for hydroseeding of 6363 area |
| 900 | off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart RAP #2
**Project #:** 100-SFO-26535-04
**Date:** 2/25/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** S. Mollison

**Misc. Personnel:**

**Statement of Work:** Oversight of planter boxes

**Equipment Used:** ~~6~~

**Weather:** Sunny mid-80s

| Time | Project Activity |
|---|---|
| 1015 | Tt arrived on site - Inspect Earhart 1-3 |
| | Health & Safety Meeting |
| | Building ~~927~~ 6391, Unit 922 Complete - side yard only |
| | Building 6391, Unit 928 Complete - side yard only |
| | Building 6397, Unit 948 Complete - entire yard |
| | Building 6401, Unit 402 complete - entire yard |
| | Building 6303, Unit 332 |
| 1100 | off-site |

TETRA TECH



1130 It Au offsite Lunch And to load pictures onto photographic log.
1200 It Au onsite. loads photos onto photo log.
1220 It Au offsite to Tetra Tech office

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2
**Project #:**
**Date:** 2-15-2011 **Time:** 0810
**Location:** Earhart I-2, JBPHH
**Client:** HC/Actus
**Tt Personnel:** Aaron Ungerleider, Jon Mollison

**Misc. Personnel:** Shane (Delta), Jeff edmonson (Actus)

**Statement of Work:** PI Soil Management oversight

**Equipment Used:** Camera

**Weather:** Hot, Sunny

| Time | Project Activity |
|---|---|
| 0810 | Tt arrived on site |
| 0815 | Health & Safety Meeting |
| 0820 | Tt Au arrives at building 6338, unit 811. Jacobsen workers are just finishing up remediating planters as they place gravel in the last area of the planters. |
| 0830 | Jacobsen workers finish remediating planters @ unit 811. Begin working at unit 817 at building 6338. |
| 0835 | Tt Au observes Delta workers operating excavator at DU 39A @ building 6363 removing 1 foot of PI soil within the fenced in area |
| 0837 | Jacobsen workers have removed all juvenile plants at planters at unit 817. Begin setting down geotextile and gravel. |
| 0845 | Tt Au observes tandem hauling truck enter DU 39A to haul out PI soil collected from the excavator. Orange geotextile has been laid out to prevent the truck from getting PI soil on its tires. |
| 0905 | Jacobsen workers pour gravel over planters at unit 817. |
| 0910 | Tt Jon Mollison arrives onsite. Asks me to go rent him two generators to run ambient air monitoring devices. |
| 0915 | Tt Au offsite. |
| 1015 | Tt Au onsite, helps Jon Mollison set up ambient air monitoring. Jeff edmonson (Actus) arrives on site and Tt Au fills him in on status of Jacobsen worker's remediation of planters. |
| 1045 | Tt Au notices that Jacobsen workers have completed unit 817 planter remediation. |
| 1100 | Tt Au continues to help Tt JM set up air monitoring and observes excavation of PI soil at DU 39A. |

| Decision Unit | Sub DU | VSI Date | Inspector | Contiguous Bare Spots <200 sq ft | Bare spots < 200 sq ft | Comments |
|---|---|---|---|---|---|---|
| 3 | c | 01/04/11 | JMM | | 25 x 6 | Bare earth due east of playground |
| 3 | c | 01/04/11 | JMM | 12 x 18 | | Areaa is about 30 northeast of playground |
| 14 | d | 01/04/11 | JMM | 6 x 20 and 15 x 7 | | Area north of and between buildings 6380 and 6381 |
| 29 | b | 01/04/11 | JMM | 20 x 30 | | Area consists of roughly 50% soil and 50% patchy grass |
| 28 | b | 01/04/11 | JMM | | 18 x 5 | Area consists of roughly 50% soil and 50% patchy grass |
| 13 | a | 01/05/11 | JMM | | 10 x 8 | Bare earth surrounds tree behind building 6355 |
| 13 | c | 01/05/11 | JMM | | 10 x 3 | Adjacent to back lanai of building 6353 |
| 15 | b | 01/05/11 | JMM | 15 x 6 and 25 x 2 | | Area contiguous and behind back lanai of building 6343 |
| 24 | b | 01/05/11 | JMM | 18 x 6 and 6 x 6 | | Soil beneath tree in tow large patches behind building 6373 |
| 24 | c | 01/05/11 | JMM | | 5 x 12 | Small patch behind building 6374 |
| 25 | d | 01/05/11 | JMM | | 6 x 10 | Adjacent to lanai inside “Yard of the Year” |
| 23 | b | 01/05/11 | JMM | | 3 x 5 | Soil exposed beneath swing set behind building 6368 |
| 56 | j | 01/05/11 | JMM | 16 x 12 | | Bare earth beneath basketball net behind building 6368 |
| 58 | b | 01/05/11 | JMM | 20 x 60 | | Large area with about 50% patchy grass cover in northeast corner of neighborhood. |
| | | | | | | |
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| Decision Unit | Sub DU | VSI Date | Inspector | Contiguous Bare Spots <200 sq ft | Bare spots < 200 sq ft | Comments |
|---|---|---|---|---|---|---|
| 14 | a | 01/04/11 | JMM | | 3 by 3 | 3 x 3 patch in swale behind building 6303 |
| 1 | c | 01/04/11 | JMM | 20 by 40 | 3 by 10 | Area surrounding tree trunks, 20' x 40' of pathcy grass |
| 2 | b | 01/04/11 | JMM | 20 by 30 | | Bare earth adjacent to trunk of papaya tree |
| 28 | a | 01/04/11 | JMM | 45 by 5 | | Patchy grass along west side of building 6426 |
| 19 | d | 01/04/11 | JMM | | 5 by 10 | 5' x 10' area beneath child's play table behind building 6406 |
| 19 | d | 01/04/11 | JMM | | 5 by 15 | 5' x 15' area along back patch of building 6406 |
| 35 | d | 01/04/11 | JMM | | 5 by 7 | Patchy grass adjacent to HiTel and TV boxes behind building 6407 |
| 20 | b | 01/04/11 | JMM | 18 by 5 and 5 by 5 | | Patchy grass adjacent to HiTel and TV boxes behind building 6407 |
| 33 | d | 01/04/11 | JMM | 14 by 7 | | Patchy grass in northeast corner of DU, northwest of building 6385 |
| 16 | d | 01/04/11 | JMM | | 4 by 5 | Bare earth beneath childrens swings behind building 6393 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

TETRA TECH



## FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-sto-26535 (04)
**Project Title:** Earhart 1-4 ~~(Earhart 1-2 & 1-3)~~
**Date:** April 11, 2011
**Time:** 908
**Location:** Joint Base Pearl Harbor- Hickam (JBPHH) / Earhart 1-4
**Client:** Hickam Communities (HC) / Actus
**Tt Personnel:** MO Scrivener (MOS) MS
**Misc. Personnel:** Stephen (Delta)
**Statement of Work:** Pesticide-Impacted (PI) Soil Management oversight
**Equipment Used:** camera
**Weather:** 80's, overcast

| Time | Project Activity |
|---|---|
| 908 | Tt arrived on site MOS on site |
| 908 | Health & Safety Meeting |
| | - Loading PI soil into trucks for hauling to Onizuka 11-3. Geotextile & plastic laid out for trucks. |
| | - MOS tells Stephen (Delta) to be sure trucks are not be overfilled |
| | - MOS observes concrete pieces loaded into truck. Need to ask Shane (Delta) why concrete in w/ soil. |
| 940 | - MOS offsite |
| 1305 | MOS onsite. |
| | - Trucks observed not covering loads. MOS tells Stephen (Delta). MO |
| | MOS calls Mei (Actus) and discusses trucks needing to cover loads & dust suppression b/c dust observed when loading soil into trucks. |
| | - MOS calls Yvonne Parry & discusses need for dust suppression. Yvonne Parry said she would call Grant w/ Actus to discuss dust control needed. |
| | - MOS talks to Howard (Delta) on site and |

Onizuka 11-3
Phillip (Delta) tells MOS (during a site visit) that small amt. of concrete from excavation was from area where storm drain lines replaced within Earhart 1-2

says dust suppression is needed when loading soil into trucks.

1416 - MW3 offsite.

TETRA TECH



## PHOTOGRAPHIC LOG

**Project Title:** Earhart I-4 (Earhart I-2 & I-3) Stockpile
**Date:** April 11, 2011

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| | 04112011_1 | loading soil into truck | | |
| | 04112011_2 | loading soil into truck | | |
| | 04112011_3 | truck backing onto plastic & geotextile | | |
| | 04112011_4 | loading soil into truck - dust | | |
| | 04112011_5 | loading soil into truck - dust | | |

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-sto-t26535-(04)
**Project Title:** Earhart 1-4 stockpile (Earhart 1-2 & 1-3)
**Date:** April 12, 2011
**Time:** 932
**Location:** Joint Base Pearl Harbor-Hickam (JBPHH) / Earhart 1-4
**Client:** Hickam Communities (HC) / Actus
**Tt Personnel:** MO scrivener (MOS) MOS
**Misc. Personnel:** Stephen (Delta)
**Statement of Work:** ~~Pesticide-Impacted~~ (PI) Soil management oversight
**Equipment Used:** camera
**Weather:** 80's sunny

| Time | Project Activity |
|---|---|
| 932 | Tt arrived on site MOS onsite |
| 932 | Health & Safety Meeting |
| | - loading PI soil from stockpile into tandem truck for hauling to Onizuka II-3 |
| | - Dust observed when ~~heavy~~ hauling picking soil up from stockpile & when dropping soil into truck. |
| | - MOS talks to Stephen (Delta) about dust control & Stephen says to contact Shane. |
| 932 | - MOS calls Shane & gets voicemail. |
| 933 | - MOS calls Mel (Actus) and tells him that dust observed at stockpile & dust suppression needed. Mel said he would call Shane. |
| 940 | - MOS calls Grant & gets voicemail |
| 941 | - MOS talks to Yvonne Parry (Tetra Tech) on the phone about dust at stockpile. Yvonne will continue to try to get Grant on phone to discuss |
| 1002 | - MOS talks to Grant and tells him dust at stockpile in Earhart 1-4 is unacceptable. |
| 1002 | - MOS offsite |
| 1023 | MOS talks to Grant on phone & Grant said he is on site & Delta has a water truck on site. MOS tells Grant dust control should not be an option it is critical when loading soil into loader bucket & loading into truck to be hauled to Onizuka II-3. |

1030 MOS on site.
- Water truck on site for dust suppression
- water used to wet stockpile before loading into truck.

1035 - MOS offsite

TETRA TECH



## PHOTOGRAPHIC LOG

**Project Title:** Earnart 1-4 (Earnart 1-2 & 1-3)

**Date:** April 12, 2011

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| | 04122011_1 | loading soil into truck | | |
| | 04122011_2 | water truck on site - spraying stockpile | | |
| | 04122011_3 | loading soil into truck | | |
| | 04122011_4 | loading soil into truck | | |

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-sfo-t26535
**Project Title:** Earhart 1-4 stockpile (Earhart 1-2/1-3)
**Date:** April 13, 2011
**Time:** 1137
**Location:** Joint Base Pearl Harbor-Hickam (JBPHH)/Earhart 1-4
**Client:** Hickam Communities (HC) | Actus
**Tt Personnel:** MD Scrivener (MOS)

**Misc. Personnel:**

**Statement of Work:** Pesticide-Impacted (PI) Soil Management Oversight
**Equipment Used:** camera

**Weather:** 80s sunny

| Time | Project Activity |
|---|---|
| 1137 | Tt arrived on site MOS onsite |
| 1137 | Health & Safety Meeting |
| | - Soil excavated and stockpiled for hauling to Onizuka 11-3. [Where stockpile from Earhart 1-2/1-3 was previously located has been scraped & this is the soil stockpiled for hauling.] |
| | - Need to verify w/ Actus that soil for berm was covered w/ geotextile & is not being managed as PI. |
| 1158 | - MOS offsite |

TETRA TECH



# PHOTOGRAPHIC LOG

**Project Title:** Earhart 1-4 (Earhart 1-2 / 1-3)

**Date:** April 13, 2011

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 1149 | 100-7893 | Soil & geotextile stockpile | | |
| 1150 | 100-7894 | Open area scraped (previously covered w/ geotextile) | | |
| 1150 | 100-7895 | Soil stockpile | | |
| 1150 | 100-7896 | Soil stockpile alongside berm | | |
| 1150 | 100-7897 | Soil stockpile - (from entrance) | | |

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-SF0-4
**Project Title:** Earhart 1-4 Stockpile Area (Earhart 1-2 & 1-3 PI Soil)
**Date:** April 14, 2011
**Time:** 855
**Location:** Joint Base Pearl Harbor-Hickam (JBPHH) / Earhart 1-4
**Client:** Hickam Communities (HC) / Actus
**Tt Personnel:** MD Scrivener (MDS)

**Misc. Personnel:**

**Statement of Work:** Pesticide-Impacted (PI) Soil Management oversight
**Equipment Used:** camera

**Weather:** 79, overcast

| Time | Project Activity |
|---|---|
| 855 | Tt arrived on site MDS on site. |
| 855 | Health & Safety Meeting |
| | - All PI soil stockpiled & geotextile has been removed from fenced area. |
| | - Earthern berms have been removed. |
| 909 | - MDS offsite |

TETRA TECH



## PHOTOGRAPHIC LOG

**Project Title:** Earhart 1-4 (Earhart 1-2 & 1-2 IP1 SOIL)
**Date:** April 14, 2011

| Time | Image ID | Description | Position | Direction |
|---|---|---|---|---|
| 908 | 107-7906 | Fenced area - SOIL stockpile | Completely removed | |
| 908 | 107-7907 | Fenced area - SOIL stockpile | completely removed | |

TETRA TECH



# FIELD NOTES

**Project Title:** Eachart I-2 Removal Action (RO#3)
**Project #:** 100-SFO-T26535
**Date:** 7-5-2011 **Time:** 0730
**Location:** JBPHH
**Client:** HC/Lend lease
**Tt Personnel:** Jon Mollison, Aaron Ungerleider

**Misc. Personnel:**

**Statement of Work:** PI Soil Management oversight

**Equipment Used:** CAMERA

**Weather:** HOT, Sunny

| Time | Project Activity |
|---|---|
| 0730 | Tt arrived on site (JMM) |
| 0735 | Health & Safety Meeting<br>-Mark out first 4 DUs: 27d, 38d, 15b, 11b<br>-Meet with Shane to discuss markout and excavation strategy.<br>-All ti plants to be removed |
| 820 | Verify fencing in place at Soil Management Area |
| 840 | Delta walking out decision units - discuss need to remove fencing in back yards |
| 0920 | Tt AU arrives onsite. Meets with Tt JM to discuss removal action. Tt AU + JM walk around decision units where removal action will occur At bldg 6335. |
| 0945 | Tt JM offsite. Tt AU reads removal Action workplan. |
| 1100 | Tt AU offsite lunch. Tt AU continues to read workplan. At this point, no work has begun on fencing at II-2. |
| 1130 | Tt AU back onsite. Tt AU drives to building 6346 to see if Anti Delta guys have been seen there. Tt AU observes Delta personnel walking around. They say they will begin putting up fencing At bldg 6335 in an hour or so. |
| 1230 | Delta begins putting up fencing (green construction fence) At bldg 6335. Delta operator Matthew to Tt AU that the Tenant At this house may want to keep two plants And that she will remove them by tomorrow morning And replant them elsewhere. |

TETRA TECH



EARHART RO#3 7/5/11

1400 Tt Av offsite. Goes to Mee Tt JAM to switch out rental cars between National and United truck rental.

1500 Tt Av onsite at 6335.

1525 Delta workers complete putting up fencing at bldg 6335. Fence is on or beyond boundaries.

1530 Tt Av offsite.

# FIELD NOTES

**Project Title:** Earhart I-2 Removal Action (RO# 3)
**Project #:** 100-SFO-T26535
**Date:** 7-6-2011 **Time:** 0730
**Location:** JBPHH
**Client:** HC/Lendlease
**Tt Personnel:** Aron Ungerleider, John Mollison

**Misc. Personnel:**

**Statement of Work:** PI Soil Management oversight + Air monitoring

**Equipment Used:** Camera

**Weather:** Cool, Cool.

| Time | Project Activity |
|---|---|
| 0730 | Tt arrived on site |
| 0735 | Health & Safety Meeting |
| 0740 | Tt AM drives to all four decision units/buildings meant to be fenced + excavated this week to see if Delta personnel are working. |
| 0750 | Tt AM doesn't see any workers in the area. Tt AM waits at bldg 6342 which is the next building meant to be fenced. |
| 800 | JM & Delta arrive on-site<br>set up Air Monitoring equipment<br>Dust Trak monitors set up and started |
| 830 | Set up Personal Air monitors one on operator, one on laborer |
| ~~900~~ | ~~Set up Ambient Air monitors~~ (JM)<br>DAR2-27d-LAB-~~27d~~ 7.6.11<br>DAR2-27d-OP-7.6.11 |
| 900 | Set up Ambient Air monitors<br>DAR2-27d-UP<br>DAR2-27d-DOWN |
| 0915 | Tt AM observes excavation of PI soil at DU 27D @ bldg 6335. Excavator scrapes soil from yard (fenced off) and places soil in tandem hauling truck. laborer sweeps any soil that spills out of fenced area (e.g. sidewalks) back into fenced area. |
| 1000 | Tt AM Mobilizes to stock pile area at I-4. This Area is fenced off, has geotextile covering the entire Area and has its gate closed. Orange "Amazon" hauling truck arrives, open the gate, and travels into the Stockpile Area and drops off his load to the east corner of the lot. The driver then drives out the lot and |

EARHART RO#3 7/6/11

then shuts the gate again. Berm is present in stockpile area around edges.

1015 T+A arrive back @ bldg 6375. Spot checks excavated area at several locations with a tape measure. 6 spot checks are all at depths between 7"-9" from grade.

1040 T+JM offsite to handle rental car issues.

1105 T+A mobilizes to bldg 6342 to check on fencing. Fencing is up on 2/3rd's of the DU (38D). T+A notices a discrepancy between the boundary on the map of the DU and where the fencing was placed on the NE side of the DU. T+A will bring this issue up with T+JM.

1130 T+A returns to 6375 (DU27D) to see that DRMO crew is still excavating PI Soil.

1130 Delta off for lunch

1230 Delta & TE return to site

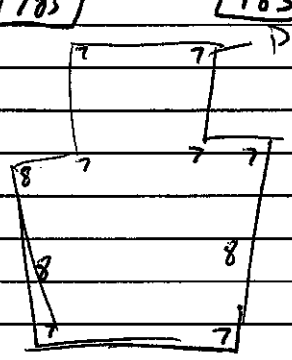
1250 Delta completes front yard of 783 & 785, moves excavator to front of 787 O.N. Circle

A&I identifies misplaced boundary at DU-38d. JM calls Shane to discuss

Laborers air pump has low battery - switch pump to preserve sampling

1320 Fuel truck on-site for mini-excavator

Verify excavation depth at 27d




SAMPLES COLLECTED

EAR2 - 38d - QE -

EAR2 - 38d - SAS

EAR2 - 15b - QP -

EAR2 - 15b - LAB -

1400 YKP & Jeff Edmonson on-site for brief review of progress

Swap out Dust Trak monitors

1420 YKP & JE off-site

1430 Inspect fence installation, inspect small planters at DU-15d

**Project Title:** Earhart RO#3
**Date:** 7/6/11

1445 - Large portable storage shed in back yard DU-116, HC & Delta are aware and looking into removing it prior to excavation

- Shane intends to have 2 excavators & 2 crews working in DUs-38d & 156 in tandem tomorrow

- Excavation at DU-27d may be complete by days end, may need to relabel Ambient Air samples

1530 Delta begins to break down equipment, Te begins air monitor breakdown

| Samples collected: | TIME [MIN] |
|---|---|
| EAR2-27d-LAB-7.6.11 | 269 |
| EAR2-27d-OP-7.6.11 | 353 |

Also: Run times:
Ambient Up = 6.49 hours
Ambient Down = 6.53 hours

1600 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Eashart RO #3
**Project #:** 100-SFO-T26535-04
**Date:** 7/7/11 **Time:** 0730
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison, Aaron Ungerleider

**Misc. Personnel:** Shane (Delta)

**Statement of Work:** PI Soil Management Oversight + Air Monitoring

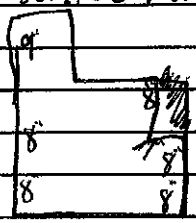
**Equipment Used:** Camera, Air Monitors

**Weather:** Sunny, windy

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, JM+AU |
| | Health & Safety Meeting |
| | Delta prepping for final loadout at DU-27d |
| | - Set up Dust Trak and Ambient air monitors at DU-27d |
| 745 | Begin running downwind monitors |
| 755 | Begin running |
| | Set up 4 personal air monitors |
| 800 | Give 2 personal air monitors to crew working at DU-27d |
| | Move to DU-38d |
| | Excavator and trucks loading out at building 6342 |
| | Hand out air monitors at DU-38d |
| 845 | Digging complete at DU-27d, move Dust Trak and Ambient Air Monitors to DU-38d-15b |
| 900 | Second excavator moved from DU-27d to -38d |
| 915 | Tt AU + JM Set up upwind + Downwind Ambient Air monitors for DU's 38d + 15b. |
| 915 | Tt JM offsite, Tt AU oversees excavation at DU 38d. Two excavators are working simultaneously on this DU. |
| 1000 | Tt AU spot checks western most portion of DU 27d. All spot checks indicate depth at below 6". See map. |

EARHART RO #3 7/7/11

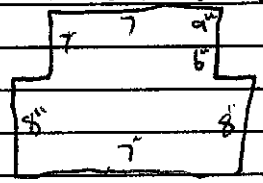
Western-most portion of DU 27d+ depths found at spot checks




1020 T+A returns to DU 38d. WO excavators continue work here. Excavation has not yet begun at DU 15b.

1036 T+A checks dust tracks + Ambient Air Monitors to ensure they are running. They are all running well.

1115 T+A spot checks central portion of DU 38d. All spot check locations are at or below 6". See below. DU 38d central portion.




1130 Operator working at DU 38d complains that his Air Monitor had a malfunction, he gives it to T+A and the tube connection piece to the pump has torn and come off right where it connects to the pump. It has been running for 185 minutes. It is serial # 12829.

1145 T+A offsite, lunch and getting gasoline for generators.

1230 T+A onsite, refills generators. T+A ~~Engineer~~ observes excavation continuing at DU 38d on the east + west portions of the DU. The central portion already has orange geotextile layed down.

1245 T+A notices a Delta laborer without his personal Air monitor on on the eastern portion of the DU. T+A inquires, laborer says he forgot to ~~put~~ it back on after lunch. He grabs it and turns it on.

1330 - 1345 T+A JM onsite. Personal Air monitor for laborer (12829) has been fixed and given back to him.

1400 Both excavators are working still at DU 38d. Orange geotextile is being layed out on central portion of this DU.

1440 Western portion of DU 38d looks fully excavated and orange geotextile is layed down.

1450 1/2 of DU 15B has been excavated behind bldg 6343.

1520 T+A collects Personal Air Monitors from operators + laborers and records results. Dust Trak is also collected.

1540 (1540) T+A collects Ambient Air monitors both upwind + downwind of the two

**Project Title:** EARHART RO#3
**Date:** 7/7/11

[CONTINUED]

DU's (15b & 38d). Times are recorded

1550 Pack up sample equipment and pack samples

| / | SAMPLES COLLECTED | TIME [MIN] |
|---|---|---|
| | EAR2-27d-LAB-7.7.11 | 366 |
| | EAR2-27d-OP-7.7.11 | 431 |
| | EAR2-38d-LAB-7.7.11 | 280 |
| | EAR2-38d-OP-7.7.11 | 414 |

| AMBIENT SAMPLES | TODAY | TOTAL |
|---|---|---|
| UPWIND | 7.42 | 13.91 |
| DOWNWIND | 7.08 | 12.61 |

1600 off-site

TETRA TECH



# FIELD NOTES

**Project Title:** EARHART I-2
**Project #:** 100-SFO-T26535
**Date:** 7/8/11 **Time:**
**Location:** Earhart I-2, Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

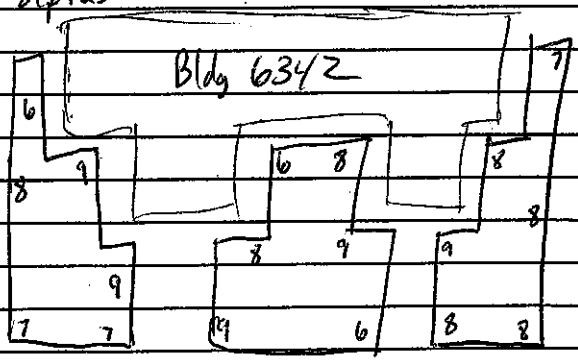
**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny, stiff breeze

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, Deliver PTP Form |
| | Health & Safety Meeting |
| 745 | Set up downwind monitor for ambient & dust |
| 800 | Calibrate and hand out personal air monitors |
| 845 | Set up upwind ambient & dust air monitors |
| | Delta excavating DU-38d & DU-15b |
| | Irrigation lines being installed at ~~DU-15b~~ DU-27d |
| 930 | First load of clean backfill arrives at DU-27d |
| | Excavation at DU-38d complete |
| | Verify depths: |




OHANA NUI CIRCLE

7/8/11 Earhart RO#3

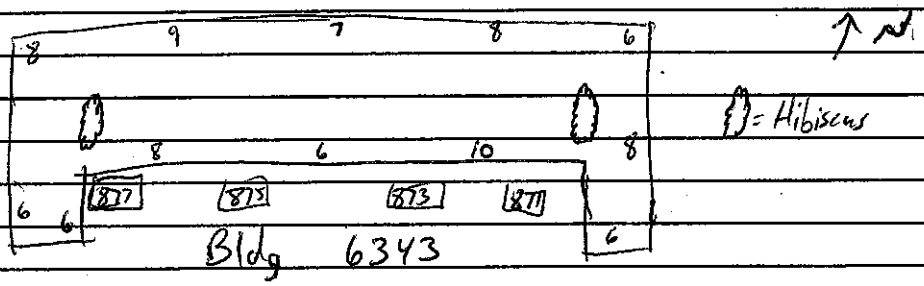
1000 Irrigation lines going into DU-27d
Geotextile laid out at DU-15b as they excavate

1115 Complete excavation at DU-15b, move excavators & trucks to DU-11b

1130 - Break down Dust Trak & Ambient air monitors and move them over to DU-11b
- Delta stops work for lunch

1200 Delta resumes excavation at DU-11b, start monitoring

1245 Verify excavation depths at DU-15b




1300 Refuel generators for ambient air

Delta running two trucks for soil excavations & 1 truck for importing clean material

1400 Backfilling at DU-27d complete
Delta moves to DU-15b and begins backfilling

1450 Begin to break down air monitors

1500 Jeff Edmonson on-site for progress review

1530 Complete breakdown of air sampling/monitoring equipment
- Personal air monitor for DU-27b operator not returned before Delta left site, call Shane to track it down

Ambient Monitors
UP - Ran for 2.49 hrs, total sample time of 19.20 hr
DOWN - Ran for 3.06 hrs, total sample time of 19.33 hr

**Project Title:** Earhart RO #3
**Date:** 7/8/11

For Monday Upwind sample requires 4.8 hrs to hit 24 hr run time
Downwind sample requires 4.66 hrs to hit 24 hr run time

| Samples collected Today | Run Time |
|---|---|
| EAR2-156-OP-7.8.11 | ~~423~~ 409 |
| EAR2-156-LAB-7.8.11 | ~~409~~ 404 |
| EAR2-38d-LAB-7.8.11 | 423 |
| EAR2-38d-OP-7.8.11 | 489 |

1630 Finally track down personal air monitor

Break down equipment, pack up samples

1645 off-site

TETRA TECH



# FIELD NOTES

**Project Title:** 100-SFO-T26535-04
**Project #:** EARHART I-2 RO #3
**Date:** 7/11/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** JON MOLLISON

**Misc. Personnel:**

**Statement of Work:** PI Remediation Oversight

**Equipment Used:**

**Weather:** Sunny

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site |
| | Health & Safety Meeting |
| | - Delta prepping work at DU-11b, moving gazebo but waiting for HC Maitenance to remove shed |
| | - Backfilling ongoing at DU-~~15b~~ 38d |
| | - Prep air monitors - ambient monitors in place at DU-11b & DustTrak as well |
| | - Set up personal air monitors at DU-11b |
| 800 | Jeff Edmonson on-site - he is working with HC on getting shed moved |
| 820 | Set up personal air monitors at DU-38b crew ~~Hickam~~ |
| | Delta has two-man crew installing fencing around next round of DUs |
| 930 | HC Maintenance on site to move shed & planter box at DU-11b, Delta on standby for 1/2-hour while waiting |
| | PI Soil removal resumes |
| 1030 | Front yard of bldg 6342 - DU-38d has all soil, Delta grading those areas |

7/11/11 Earhart RO #3

1100 Excavation at DU-116 complete, geotextile being laid out

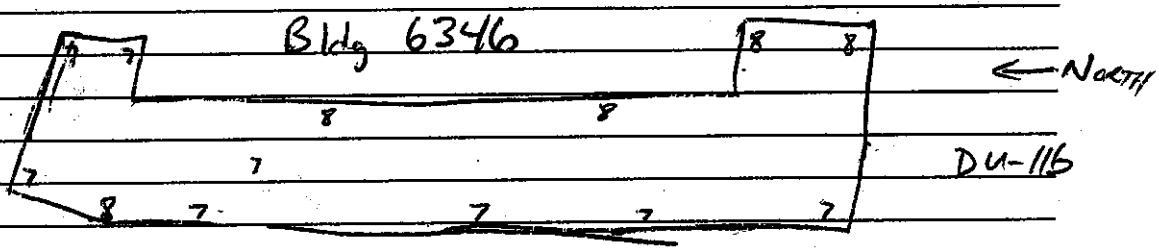
1130 Delta breaks for lunch

1200 Return from lunch, break down Dust Tak and Ambient Air monitors at DU-116

Talk to Weyman Kam - he recommends returning extra Ambient Air monitors

Delta moved over to DU-29a

1230 Verify excavation depths at DU-116




1300 Pack up samples from ambient air samplers
Set up Dust Taks at DU-29a

| Total Ambient Sample Time | Hours |
|---|---|
| EAR2-AMB-UP | 23.40 |
| EAR2-AMB-DOWN | 23.46 |

1430 Break down personal air monitors
EAR2-116-OP-7.12.11
EAR2-116-LAB-7.12.11
EAR2-15b-OP-7.12.11
EAR2-15b-LAB-7.12.11

1500 Discuss possibility of returning extra set up ambient air monitors
Yvonne recommends setting up for one sample at TSA

Delta leaves clean soil stockpile at 116 - rented them to level it out

1530 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** EARHART RO #3
**Project #:** 100-SFO-T26535-04
**Date:** 7/12/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:**

**Misc. Personnel:**

**Statement of Work:** PI Removal Oversight

**Equipment Used:**

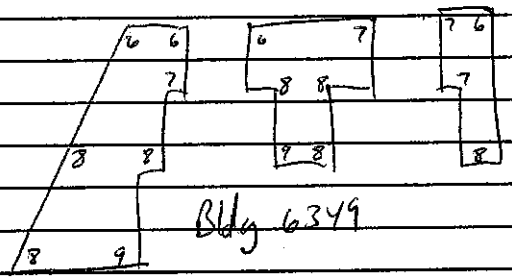
**Weather:** Partly sunny

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, deliver P+P to DB office |
| | Health & Safety Meeting |
| 800 | Set up ambient monitors at DU-29a |
| | Set up DustTrak monitors at DU-29a |
| 820 | Calibrate and pass out personal air monitors at DU-29a, no backfilling occurring this morning at other DUs |
| 900 | Calibrate second set of ambient air monitors (U2 & D2) and set them up at Temporary Stockpile Area (TSA) |
| | Delta excavating eastern portion of DU-29a |
| 1000 | Observe PI excavation at 29a |
| | - Geotextile placed between excavation area and dump truck |
| | - One excavator operator & one laborer |
| 1100 | off-site for lunch and fuel for generators |
| 1145 | Return to site, refuel generators |
| | Observe soil dumping at TS Area |

TETRA TECH

Earhart RO #3 7/12/11

1400 Delta completes excavation at DU-29a
Confirm depths




1500 Begin breaking down and collecting air monitoring samples

| Personal air monitors | Run Time (min) |
|---|---|
| EAR2-~~OP~~ 29a - OP - 7.12.11 | 397 |
| EAR2-~~LAB~~ 29a - LAB - 7.12.11 | 392 |

| Ambient Samples | Run Time (hours) |
|---|---|
| EAR2 - AMB - UP2 | 6.57 |
| EAR2 - AMB - DOWN2 | 6.82 |
| EAR2 - AMB - UP - TSA | 5.9 |
| EAR2 - AMB - DOWN - TSA | |

1600 off-site

TETRA TECH



# FIELD NOTES

**Project Title:** EARHART RO #3
**Project #:** 100-SFO-T26535-04
**Date:** 7/13/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Partly cloudy, light NE breeze

| Time | Project Activity |
|---|---|
| 700 | Tt arrived on site, deliver PtP form |
| | Health & Safety Meeting |
| | - Set up ambient monitors at Temp. Stockpile Area |
| | - Downwind monitor has electric problems, takes 30 minutes to troubleshoot |
| 800 | Set up ambient monitors at DU-426 where work continues excavating PI soil |
| | Set up 2 personal air monitors - 1 crew working today |
| 900 | Review TSA coverage, observe excavation |
| 1030 | off-site for lunch |
| 1130 | Return to site, |
| | Refuel air monitors |
| 1200 | Delta running two dump trucks between DUs and TSA |
| 1230 | Refueling truck on-site for excavator |
| | Delta has fencing installed around DU-23 & 6 |
| 1355 | Light rain starts - Dust Trak monitors brought in from rain at both DU-426 & TSA |
| 1415 | Rain ends |
| | Final load of PI soil removed from DU-426 |

Earhart RO #3 7/13/11

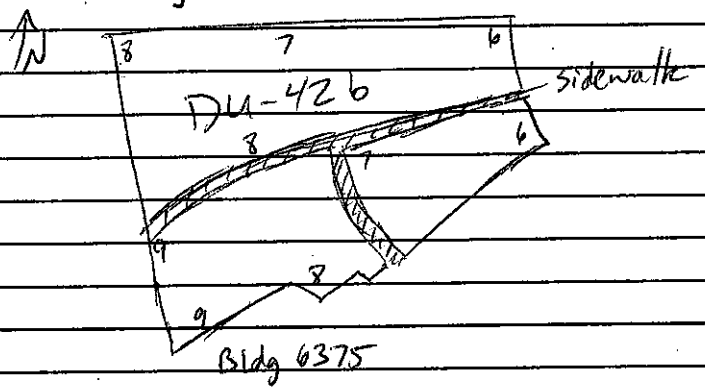
1420 Break down the ambient air monitors @ DU-426

1440 Break down ambient air monitors ~~@ DU-4~~ @ 75A
Break down personal air monitors

Samples
EAR2-426-01-7.13.11
EAR2-426-LAB-7.13.11

Total of 11 truck loads of PI soil removed today

1500 Confirm excavation extent of DU-426




1530 off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart RO #3
**Project #:** 100-SFO-T26535-04
**Date:** 7/14/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** S Mallison

**Misc. Personnel:**

**Statement of Work:** P.I. soil excavation oversight

**Equipment Used:**

**Weather:** Sunny

| Time | Project Activity |
|---|---|
| 630 | Tt arrived on site, set up ambient sampler at TSA |
| | Health & Safety Meeting |
| 700 | Set up ambient monitors at DU-23, too early to turn on - wait for work to begin |
| | Prep personal air monitors |
| 730 | Delta hauls excavator from previous DU using a trailer |
| | Call Tarrent Lab to order additional PUF samplers |
| 780 | Delta begins excavating P.I. soil |
| | Start ambient air monitors and DustTraks at DU-23 |
| 830 | Deliver PUF forms to DB office |
| | Mark out decision units in Earhart I-3 |
| 1000 | Delta laying out geotextile as the excavate northwards |

- Soil storage area has been graded flat - PI soil covers 80% of the enclosure to a depth of 2-3'
- Trucks driving over P.I. soil to dump in back part of enclosure
- Drivers brush soil and dust off of truck tires before leaving the TSA enclosure

1130 Delta breaks for lunch

EARHART ROTH3 7/14/11

1200 Delta returns to work
1230 Delta completes excavation of DU-23b, moves immediately into DU-23a

YKP onsite for brief review of process and work status.

1500 Delta completes excavating at DU-23a #6, begin breakdown of air monitors

| Personal air samples | Run Time |
|---|---|
| EAR2-23-OP-7.14.11 | 452 |
| EAR2-23-LAB-7.14.11 | 451 |

| Completed Ambient Samples | | Hours |
|---|---|---|
| EAR2-AMB-UP-7.14.11 | | 20.24 |
| EAR2-AMB-DOWN-7.14.11 | | 19.96 |
| EAR2- } TSA - Not enough time yet will run tomorrow | UP | 19.85 = 4.85 Needed |
| EAR2- } | DOWN | 19.24 = 4.76 Needed |

1600 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** EARHART RO#3
**Project #:** 100-5FO-T26535-04
**Date:** 7/15/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:**

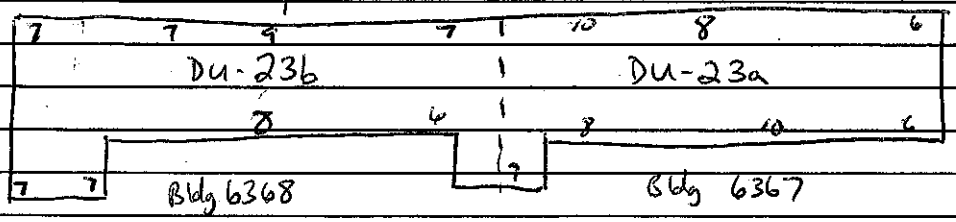
**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny, light breeze

| Time | Project Activity |
|---|---|
| 830 | Tt arrived on site |
| | Health & Safety Meeting |
| | - Set up Dust Traks and Ambient Air Monitors at Temporary Stockpile Area |
| | - Delta grading clean soil at DU-15b |
| | - Pack up 2 Dust Traks for shipment |
| | - Verify soil covers at TSA - black plastic covering entire stockpile |
| 915 | Confirm depths at DU-23a&b |




930 Delta completes grading at DU-15b, moves to complete fill and grade at DU-11b

1130 Delta completes grading at DU-11b, breaks for lunch

1200 Delta resumes work, drops one load of clean soil at DU-29a, but moves operations over to DU-42b

TETRA TECH



EARHART RO#3 7/15/11

1300 Begin breaking down ambient air monitors

Final ambient samples: Total Run Time
TSA-AMB-UP 23.50 hours
TSA-AMB-DOWN 23.68 hours

Pack up 2 ambient air monitors and prep for shipment

1345 Return to DU-42b and document fill status
1410 Tt Au arrives onsite.
1415 Tt SM offsite.
1430 Grant from land lease arrives to ask of status of RO3. Tt Au tells him what he thinks but says he will call at end of the day once he checks everything.
1440 Tt Au observes backfilling of clean soil at 42B (6375)
1530 Workers stop backfilling soil at 42B. Put fence back up.
Tt Au calls Shane (Delta) to find out if they are excavating PI soils on monday but he doesn't answer. Tt Au leaves him a message.
1545 Tt Au drives around I-2 to check on progress of RO3 DU's.
Tt Au notices weist high stockpiles at DU 29A on geotextile.
1600 Tt Au notices that the fence at the I-4 laydown/stockpile area is wide open!!
1605 Tt Au calls Grant to give him the RO3 update and to tell him about the fence. He says he will call the DB contractor.
1610 Tt Au offsite.

TETRA TECH

7/18/2011



# FIELD NOTES

**Project Title:** EARHART Rd#3
**Project #:** 100-SFO-T26535-04
**Date:** 07/18/11 **Time:** 0730
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** S Mollison, A Ungerleider

**Misc. Personnel:** Shane (DeltA)

**Statement of Work:** PI soil MAnagement oversight

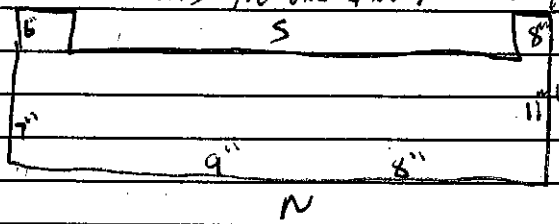
**Equipment Used:** CAMERA

**Weather:** Partly sunny

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, deliver P+P form |
| | Health & Safety Meeting |
| 800 | - DeltA setting up at DU-14c, grader not working at DU-23a & -236 so DeltA is installing fence and starting PI soil removal at DU-14c |
| | - No PUF-2500 samplers on-site. Shipment arrives today, will resume monitoring tomorrow |
| | - Set up personal air monitors |

| | Serial | Sample | Start Rate | End Rate | RunTime |
|---|---|---|---|---|---|
| 0076 | 12829 | EAR2-14c-OP-7.18.11 | 1.003 | | |
| 0607 | 02718 | EAR2-14c-LAB-7.18.11 | 1.005 | | |

0950 Tt AA Arrives onsite. Meets with Tt JM
1010 Tt JM offsite to historics.
1015 Tt AA observes PI soil excavation at DU14C.
1005 Tt AA + JM go to DU 37A to tell fencing guy to just fence the central and eastern portions of the DU.
1040 Tt AA JM checks the excavated portion of the DU (Eastern Half)




1111 Tt AA observes DeltA operator using hose to wet soil for dust suppression @ DU14C.

TETRATECH

Earthwt RO #3 7/18/11

1195 T+A offsite. Lunch

1215 T+A onsite. Delta continues to excavate DU 14C. worker is using hose for dust suppression.

1250 T+A checks the fence at DU 37A. It is in the right place

1255 T+A observes Jacobsen personnel arrive at DU 29A to begin irrigation work.

1430 Delta workers complete excavation at DU 14C. T+A spot checks for depths. Also perimeter of excavations. Depths are good.

1445 Delta workers completely cover excavated area with geotextile. Operations says they will not begin another one today and that they probably won't excavate PI soils tomorrow.

1450 T+A collects personal air monitors from the operator + laborer.
Operator's air monitor said "Batt flow fault" and had only 76 mins on it.
Laborer's air monitor said "lo batt" flashing, and only had 107 mins. The pump on both air monitor's were not calibrated.

1505 T+A offsite. Mobilize to SNCO3 to meet with T+JM.

1540 T+A offsite.

AN

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart Rd #3
**Project #:** T26535
**Date:** 7-19-2011 **Time:** 0700
**Location:** JBPHH
**Client:** HC/Lend Lease
**Tt Personnel:** Aron Ungerleider, Jay Morrison

**Misc. Personnel:** Shane (Delta)

**Statement of Work:** PI Soil Management Oversight

**Equipment Used:** Camera, Tape Measure

**Weather:** Hot, Sunny

| Time | Project Activity |
|---|---|
| 0700 | Tt arrived on site |
| 0705 | Health & Safety Meeting |
| 0710 | Tt Ar + Tt JM Meet at DU 37A. Tt Ar calls Shane (Delta) to see if they will be excavating PI soil today. He says most likely not unless they finish backfilling from earlier at the end of the day. |
| 0730 | Tt JM offsite to SWDS. Tt Ar drives around I-2 + I-3 to see if any other work has occured. Tt Ar notices that fencing is up at DU 33C. Tt Ar believes this was done yesterday. |
| 0745 | Tt Ar Arrives At DU 23 A+B and observes two tandem hauling trucks bringing in "clean" material and bobcat spreading it around. |
| 0815 | Lend Lease - Jeff Edmonson arrives and asks for update on the days' activities and inquires when irrigation work being conducted at 23 A+B |
| 0900 | Jacobsen workers arrive onsite. |
| 0930 | Tt Ar asks Delta laborer if Jacobsen will be doing irrigation work at these DU's. he says Yes. |
| 1030 | Tt Ar drives around I-2 + I-3 to see if any other work is being done. Tt Ar checks fencing at I-3 DU 33C. Tt Ar observes personnel putting up fencing at DU 34C. Also observes that DU 11B is backfilled. |
| 1050 | Backfilling is complete at DU 23 A+B. |
| 1115 | Backfilling begins at DU 14C. |
| 1135 | Tt Ar offsite lunch. |
| 1215 | Tt Ar onsite at 14C. Backfilling continues. |
| 1400 | Backfilling complete at 14C. Clean begins backfilling 29A. |
| 1500 | No more trucks hauling in "clean soil" at 29A. DU is 3/4 backfilled. |

Earhart RO #3 7/19/11

T+A meets with Shane (Delta) who says tomorrow he plans to excavate PT soil 1st AM DU 37A then AM 33C.

1510 T+A offsite, T+A drives to SMO3 to meet with T+JM.

1535 T+A offsite.

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart RO#3
**Project #:** 26535
**Date:** 7-20-2011 **Time:** 0700
**Location:** JBPHH
**Client:** HC/ land lease
**Tt Personnel:** Aron Ungerleider / Jon Mollison

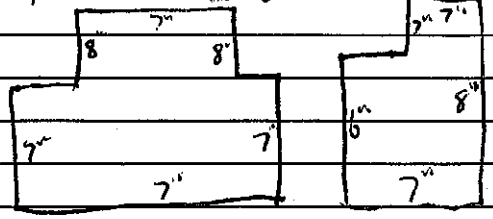
**Misc. Personnel:**

**Statement of Work:** PI Soil management oversight

**Equipment Used:** Camera, Air monitoring equipment.

**Weather:** rainy, cool.

| Time | Project Activity |
|---|---|
| 0700 | Tt arrived on site |
| 0705 | Health & Safety Meeting |
| 0710 | Tt AU + JM Set up air monitoring equipment At DU 37A |
| 0735 | Tt JM offsite, mobilizes to SWDS. |
| 0755 | Delta crew shows up At Du 37A. |
| 0815 | Tt AU sets up dust trak + personal Air monitors. |
| 0835 | Delta begins excavating of PI Soil At Stg 0379 (Du 37A) |
| 0838 | Tt AU begins Upwind Ambient Air monitor + Dust trak. |
| 0840 | Tt AU begins downwind Ambient Air monitor + dust trak. |
| 0830 | Tt AU begins personal Air monitor EAR2-37A-LAB-7.20.11 |
| | Tt AU begins Personal Air monitor EAR2-37A-OP-7.20.11 |
| 0900 | Tt AU checks on Ambient Air Sampling equipment And notices the battery is dead on the Upwind dust Trak 06237. Tt AU plugs it in At 901 And it begins Sampling Again. |
| 1009 | Delta finishes excavating center portion of the Du. |
| 1015 | Tt AU spot checks central portion. Depths are good. See drawing below |




| | |
|---|---|
| 1020 | Delta laborer places orange geotextile On the excavated area, north eastern portion of DU |
| 1115 | Delta laborers finish backfilling + laying orange geotextile At Du 37A |
| 1118 | Tt AU + JM breakdown Air monitoring (Ambient) equipment. Tt AU spot checks |

TETRA TECH



Earhart RO #3 7/20/11

depth on eastern portion of DU. Depths are adequate.

1130 Tt mobilizes to I-3 DU 33C bldg (6391) to set up ambient air sampling equipment + dust trak.

1140 Tt offsite. lunch.

1220 Tt onsite with Tt Scott Duran at DU 33C. Tt Au notices that down wind dust trak is off. It is having battery/charge/power issues. Tt Au checks other air monitors and they are all working fine. Tt Au instructs Tt Scott Duran on air monitoring.

1308 Tt Au checks Dust trak (down wind) and notices it is off again. Tt Au attempts to restart it.

1312 Tt Au is asked by Delta labore if they are getting rid of planters that don't have gravel + weed barrier. (immature plants). Tt Au says yes. Tt Au calls Gail Eaton to double check. left message.

1343 Tt Au checks down wind dust trak again. It is off. There is obviously something wrong with it.

1420 Delta continues to excavate eastern most portion of DU 33C.

1445 Tt Au checks on fencing of other DU's in I-3. Tt Au notices that DU 12B is yet to be fenced while DU 20A has been partially fenced due to fence belonging to tenant in the DU.

1450 Tt Au returns to DU 33C. Delta still excavating.

1510 Tt JM arrives to help break down air monitoring equipment

1515 Delta stops excavating PI soil at DU 33C.

1520 Tt Au records air monitoring data.

1535 Tt Au offsite.

TETRA TECH

GAI. - 415-260-8403 Page 1 of 2

# FIELD NOTES

**Project Title:** Earhart RO#3
**Project #:** 26535
**Date:** 7-21-2011 **Time:** 0700
**Location:** JBPHH
**Client:** NC / Lend Lease
**Tt Personnel:** Aron Ungerleider, Jon Mollison

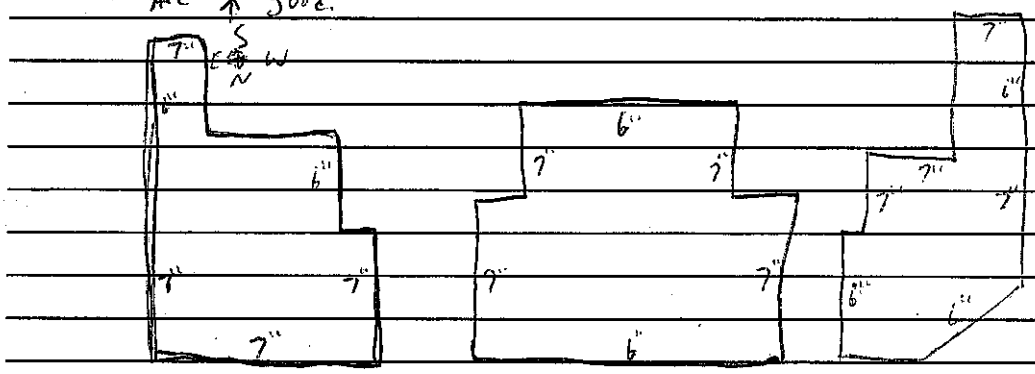
**Misc. Personnel:** Shane (Delta)

**Statement of Work:** PI Soil management oversight, Air monitoring

**Equipment Used:** Camera, Air monitoring equipment

**Weather:** hot, sunny

| Time | Project Activity |
|---|---|
| 0700 | Tt arrived on site |
| 0705 | Health & Safety Meeting |
| 0710 | Tt Av & JM set up Air monitoring equipment. Tt JM offsite to SWCO3 At 0730 |
| 0750 | Delta begins excavating central portion of DU. Tt Av spot checks Eastern portion of DU. Depths (33c) are good. |




| | |
|---|---|
| 0808 | Tt Av begins personal Air monitoring of Delta operator + laborers |
| 0818 | Tt Av begins dust trak Air monitoring upwind + down wind. |
| 0816 | Tt Av begins Ambient Air monitor. |
| 0835 | Tt Av has to restart upwind ~~Air Monitor~~ Dust Trak due to battery charge issues. |
| 0902 | Tt Av has to restart down wind dust trak due to battery charge issues. Tt Av notices that down wind ambient Air monitor is having issues with the clock. Tt Av reprograms power cords and gets it running. |
| 0950 | Delta finishes excavating central portion of DU 33C. Tt Av spot checks. Depth is good. |
| 1015 | Delta covers central portion of DU with orange geotextile. |
| 1035 | Tt Av is informed by Delta worker that Ambient Air monitoring tower (Down wind) |

TETRA TECH



Earhart RO #3 7/21/11

has tipped over and is laying on its side. Tt Au goes to investigate. Dust Trak is off, tower is still running, still plugged in pump still working at about 49

1042 Tt Au restarts downwind dust trak and repositions downwind ambient air monitor

1055 Tt Au calls Gail Eaton to discuss the map discrepancy issue brought up by Shane AX 0930 about Du 29A. Gail confirms the RO3 map I have is correct and that to her knowledge Shane's is incorrect however it is really up to Jeff Edmonson.

1129 Tt Au checks dust trak's + personal air monitor on laborer to make sure they are working. They are all working.

1130 Tt Au offsite. lunch

1200 Tt Au onsite. 33C. Workers not yet working here

1222 Delta continues excavating Du 33C.

1300 Tt Au checks dust traks. They are working. Tt Au refills generators with gasoline

1330 Delta finishes excavating Du 33C. Orange geotextile is laged down. Tt Au spot checks western portion. Depths are adequate. Excavator moves to 34C bldg (6401)

1340 Tt Au shuts off ambient air monitors + dust trak + records data. Mobilizes to Du 34C.

1400 Tt Au sets up upwind ambient air monitors + dust traks but does not start them because work has been paused at this Du. Several scoops have been excavated though.

1418 Delta is still not working due to technical/mechanical problem with the excavator. Laborer leaves the site. Tt Au collects his air monitor and records data.

1450 Tt Au collects operator's personal air monitor and records data. No work is being done at Du 34C.

1515 Tt JM arrives to pick up generators + ambient air monitors.

1520 Tt Au offsite.

TETRA TECH



# FIELD NOTES

**Project Title:** Eachart RO #3
**Project #:** 26535
**Date:** 7-22-2011 **Time:** 0700
**Location:** JBPHH
**Client:** Hc/ Land lease
**Tt Personnel:** Aron Ungerleider, Jon Mollison

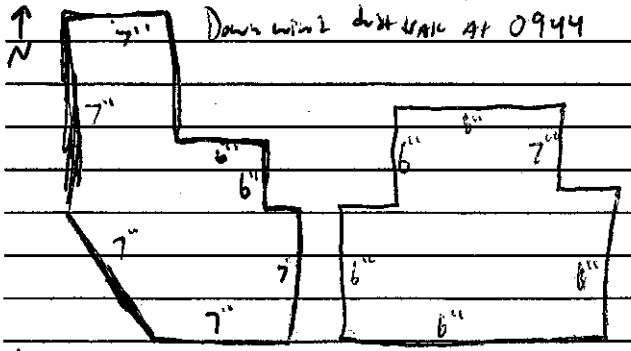
**Misc. Personnel:**

**Statement of Work:** PJ soil management oversight, Air monitoring

**Equipment Used:** Camera, Air Monitoring equipment

**Weather:** Hot, sunny, rainy

| Time | Project Activity |
|---|---|
| 0700 | Tt arrived on site |
| 0705 | Health & Safety Meeting |
| 0710 | Tt meets At Du 34C. Set up Ambient Air Monitoring equipment. Discuss boundary issue At Du 29A. Turns out Delta might have to excavate more on the east side of the building. |
| 0750 | Tt A sets up Andstads personal Air monitoring, Ambient air monitoring, And dust trak. Work (PJ soil excavation) commences at Du 34C. |
| 0830 | Delta workers continue to excavate western portion of Du 34C. |
| 0940 | Tt A checks on Ambient Air monitors + dust traks. Down wind dust trak has detatched from its power chord. This is a reoccurring problem. Tt A resets the Down wind dust trak At 0944 |




| | |
|---|---|
| 1100 | Tt A spot checks western portion of Du After excavation is completed. Depths are Adequate. Delta begins excavating central portion of Du. |
| 1104 | Tt A checks dust traks. Down wind dust trak is off but still plugged in. Tt A turns it back on at 1105. |
| 1130 | Tt A offsite, Lunch. |
| 1200 | Tt A returns to Du 34C. |

TETRA TECH



Earhart RO #3 7/22/2011

1220 Tt Au checks dust traks, notices the downwind dust trak is off again. Tt Au changes the batteries in this dust trak and moves it to the upwind station. Tt Au reads data from the upwind dust trak and moves it to the downwind station

1240 Tt Au starts dust traks. Delta still excavating central portion of Du 34C.

1330 Delta finishes excavating central portion, moves to Easter portion of the Du. Labore lays geotextile down on central portion

1343 Tt Au checks on downwind dust trak. It is on.

1347 Tt Au spot checks Du 34C central portion. Depths are adequate.

1430 Tt Au has encounter with Grant Rosin Actus. He mentions map issue about boundary at 29 A (6340). Grant says he will call to get RO3 status update.

1455 Lend lease Grant calls Tt Au and Tt Au gives him RO3 status update.

1515 Tt Au breaks down Air monitoring stations. Tt Au notices that the downwind generator is off as well as the ambient air monitor and the dust trak as well. JM assists in breakdown + collection of equipment.

1530 Tt Au offsite.

PHOTOGRAPHIC LOG

7-22-11 / 0828 / 100-2622 / excavating Du 34C.

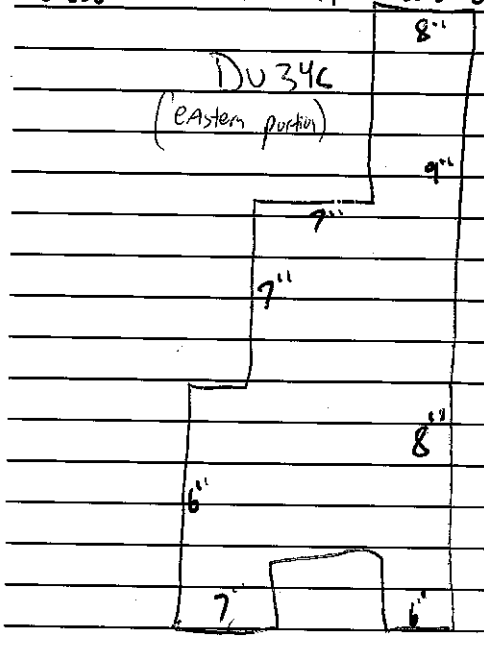
TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 26535
**Project Title:** Earhart RO#3
**Date:** 7-25-2011
**Time:** 0700
**Location:** JBPHH
**Client:** Hc / lend lease
**Tt Personnel:** Aron Ungerleider, Jon Mollison, Landin Johnson
**Misc. Personnel:**
**Statement of Work:** PI soil management oversight / Air monitoring.
**Equipment Used:** Camera
**Weather:** Hot, Sunny

| Time | Project Activity |
|---|---|
| 0700 | Tt arrived on site |
| 0705 | Health & Safety Meeting |
| 0710 | Tt A + JM meet At DU 34C. Begin to set up field equipment At DU 20A. |
| 0730 | DelTA begins work At DU 34C. They excavate A small amount of soil from DU 34C And then move equipment to DU 20A. |
| 0800 | Tt A spot checks eAstern portion of DU 34C. Depths Are Adequate. |



Earhart RO#3 7/25/11

0805 T+ LJ arrives from Health and Safety meeting And gets oriented in RO#3 oversight.

0830 T+ begins Air monitoring At Du 20A. Excavation of PI soil is underway.

0915 T+ An checks upwind + downwind dust trak and Ambient Air monitors. All is working correctly.

1005 T+ An checks upwind + downwind dust trak and Ambient Air monitors All are working correctly.

1100 T+ An checks upwind + downwind dust trak and Ambient Air monitors. All are working right.

1114 upwind Air monitoring generator dies. T+ An takes upwind + downwind dust trak readings And resets time on upwind and Ambient Air monitor.

1120 Delta about 75% complete with Du 20A.

1145 T+ An offsite. Take T+ MOS to Airport.

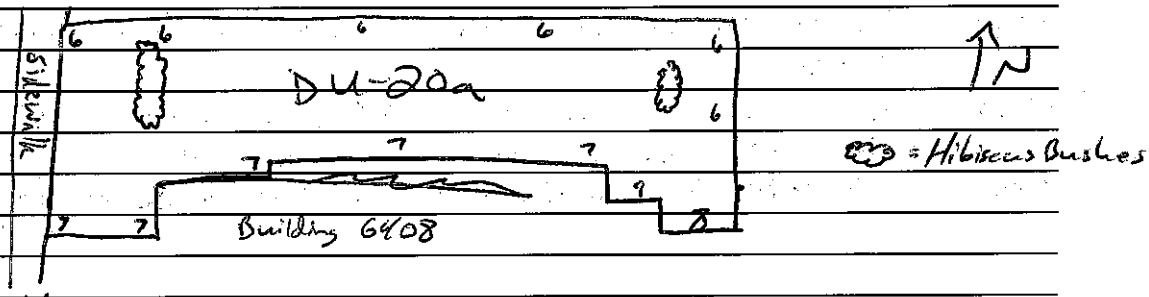
1245 T+ An onsite At Du 20A. Meets with T+ JM to get sampling equipment.

1300 Jacobsen workers Are doing irrigation At Du 34C.

All off-site, JM on-site, drop off P+P form @ D/B office

1345 Delta completes excavation at DU-20a, lays out final piece of geotextile

1400 Confirm excavation depths




Move DustTrak & Ambient monitors to DU-126

1430 Delta setting up fencing and excavators at DU-626

1515 Collect personal air monitors

EAR3-20a-LAB-7.25.11

EAR3-20a-OP-7.25.11

1570 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart RO #3
**Project #:** 26535
**Date:** 7-26-2011 **Time:** 0726-1532
**Location:** JBPHH
**Client:** HC / Lend Lease
**Tt Personnel:** L. Johnson, J. Mollison

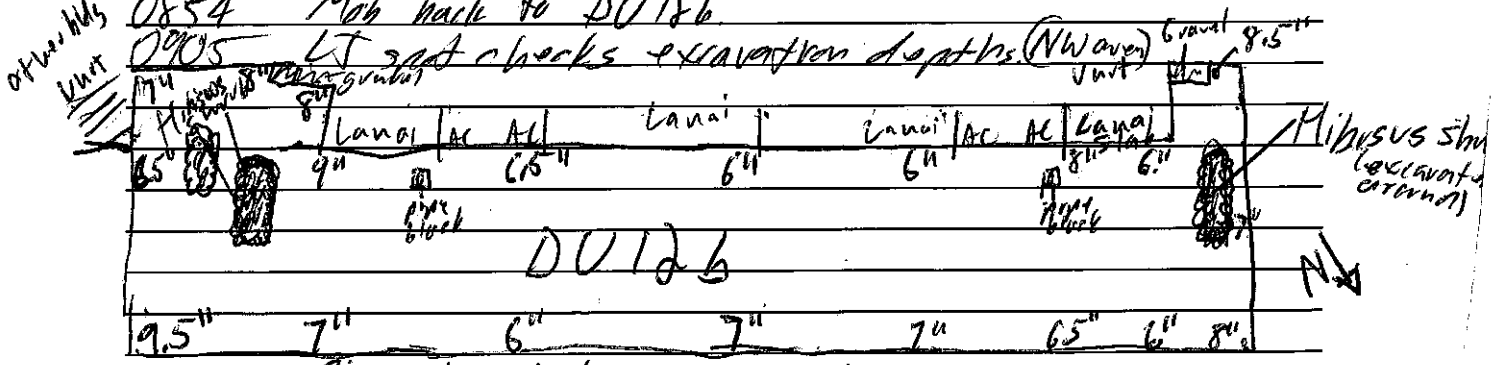
**Misc. Personnel:**

**Statement of Work:** PI Soil Management Oversight

**Equipment Used:** Camera, tape measure, air monitoring equip.

**Weather:** Sunny, warm

| Time | Project Activity |
|---|---|
| 0726 (LJ) | Tt arrived on site (JM already onsite - at stockpile) Health & Safety Meeting |
| 0730 | LJ meets JM at stockpile. JM briefs LJ on PI soil mgmt oversight for stockpile. |
| 0736 | Mob. to DU12b. Set up air monitoring equipment + give personal air monitors to operator and laborer. PI soil excavation is underway. |
| 0810 | Start air monitoring |
| 0843 | Truck full with PI soil load. LJ mob to stockpile site to observe unloading of PI soil onto stockpile. |
| 0854 | Mob back to DU12b. |
| 0905 | LJ spot checks excavation depths (NW area) |




Excavation depths are adequate.

0946 Noticed UI 6195 generator stopped. Restarted.
Meter reading: 5765.78
DT 9387 meter reading: 3712.4

TETRA TECH



1035 LJ spot checks remaining area. Depths are adequate.
1039 PI soil excavation completed.
1039 Collect personal air monitors from operator and laborer. Shut down RVF + DU35 TRAK air monitoring equipment. Complete logs.
1120-1139 Lunch break.
1152 Delta workers back onsite → appear to still be on lunch break.
1225 Delta workers start work again (load tracked mini-loader). Delta finishing placing geotextile over DU 26.
1250 Per Delta, backfill ("clean" soil) to start at Ohana Nui Circle (DU33c). Mob to that location.
1310 Still no Delta. Drive around sites where they might be backfilling → cannot find Delta trucks/staff
1320 Tel A. Ungelider re: POC for Delta to find out where they will be working (if working on this site today. POC: Shane 330-8972. Per Aron, clean fill from behind DB of Aku → mob.
1322 Observed Delta laborer covering stockpile. No Delta dump trucks at clean fill stockpile. Mob back to DU33c.
1340 Tel Shane re: where is Delta crew? → Left voicemail.
1350 Shane called back → Delta is at unit #6349. LJ mob to there (figure out where it is first).
1355 Arrived at #6349. Delta has been backfilling at 921, 923, 925, 927 Nanu St. (aka #6349 on map).
1515 Jon Mollison onsite. LJ brief JM on Delta progress/QC. Pack up ambient samples.
EAR3-AMB-UP-7.26.11
EAR3-AMB-DOWN-7.26.11
1527 Delta finished moving soil with tracked skid steer. Delta sweeps sidewalks and road.
1528 TT pack up personal air monitoring samples.
EAR3-126-LAB-7.26.11
EAR3-126-~~LAB~~ 7.26.11-OP-7.26.11
1533 TT offsite.

TETRA TECH



# FIELD NOTES

**Project Title:** RO#3 Earhart
**Project #:** 100-5F0-T26535-04
**Date:** 7/27/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Overcast, scattered light rain

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site |
| | Health & Safety Meeting |
| | Delta crew at DU29a, grading out soil in front yard |
| 830 | Delta moves over to DU-37a, first load of soil dumped on east side of DU |
| | - DU-29a grading is not complete, western portion of DU has enough soil, but it needs final grading. Soil is a little too muddy, so Delta plans to let it dry before grading |
| ~~900~~ | |
| 945 | Light drizzle turns to moderate rain, soil too muddy to work, Delta calls off work for crew to avoid tracking mud into drives & roads |
| 955 | Off-site |

TETRA TECH



# FIELD NOTES

**Project Title:** ROI #3 Earhart 1-2
**Project #:** 100-SFO-T26535-04
**Date:** 8/1/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Overcast

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site, call Shane (Delta), they are working Health & Safety Meeting |
| | Backfilling to occur at DU-37a, Delta setting up for days work |
| | Delta grades existing soil inplace, then waits for soil truck to bring additional soil from behind D/B office |
| 900 | Two truck loads waiting while grading at DU-37a is completed |
| ~~930~~ 37 | Followed truck to DB office stockpile and confirmed that backfill material is coming from clean stockpile area |
| 930 | Noted hydroseed at DU-42b, confirm all DUs with hydroseed: 15b, 38d, 23a & b, 14c, 27d, and |
| | Hydroseed needed at 29a & 37a |
| 1010 | Backfilling complete at DU-37a, Delta moves to DU-29a and finalizes backfilling. Soil was in place, but too wet to work until today |
| 1130 | Complete grading operations at DU-37a, move to Earhart I-3 |
| | Break for lunch |

Earhart RO #3 8/1/11

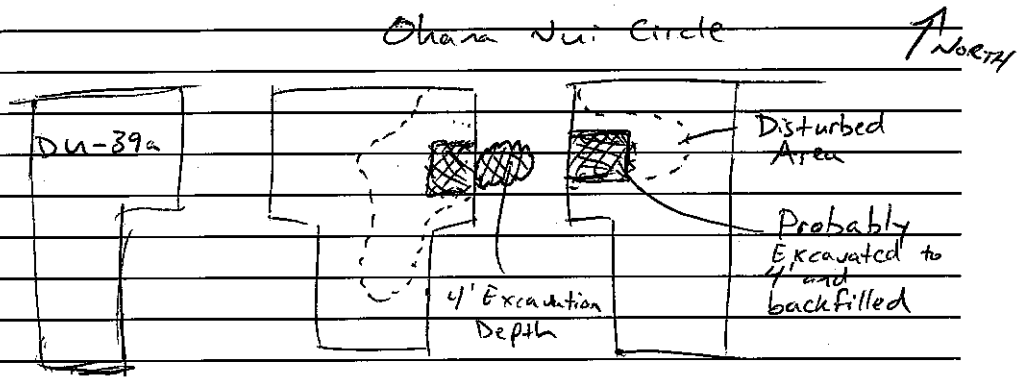
1200 Delta returns from lunch and places first backfill load at DU-33c

Photo document fill soil placement at Earhart I-2

1300 Observe disturbed area at DU-39a in Earhart I-2 (Building 6363). Appears as though somebody has excavated the driveway and portions to either side of it. Geotextile exposed to surface. Call Gail to notify.

1400 Meet with Marlena & Grant (Actus) at 6363 to discuss

1420 Marlena, Grant off-site




Building 6363

1520 Delta finishes days work. Backfill at DU-33a is ~80% complete

1530 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart RO#3
**Project #:** 100-SFO-T26535-04
**Date:** 8/2/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** Jon Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny, stiff NE breeze

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site |
| | Health & Safety Meeting |
| | Check in with Delta, final detail work at DU-33c in place, soil loading at |
| | Photodocument DU-33c completion |
| 930a | Meet Grant at Building 6363 |
| | - HC work crew has covered disturbed soil areas with blue plastic sheeting |
| | - They are installing orange construction fencing around the area |
| | - Breaking up concrete slabs for removal |
| | - Sweeping soil and shoveling soil off of roadways, sidewalks and driveways |
| | - Water inside excavation being pumped onto disturbed area for infiltration and settlement |
| 1100 | Follow dump trucks over to DB office to verify material comes from proper soil stockpile. Meet Martelna who expresses concern over use of dump trucks for both clean soil hauling and hauling potential P.I. soil from Onizuka II-2 |
| 1130 | Delta breaks for lunch |

Earhart RO #3 8/2/11

1200 Return to site. Delta continues backfilling DU-34c

1230 Move to DR Contractors office to observe soil loading

1300 Soil trucks leave stockpile area without dust cover in place - remind drivers that dust & stones are a concern even for clean soil

1330 - Maintenance truck on-site to refuel bobcat grading DU-34c

- Last load of clean soil into DU-34c, bobcat and laborer continue to grade and do detail work in the area

- Dump trucks load soil into DU-20a, 6 soil piles total

- Remind Delta to spread stockpiles in DU-20a before end of day

1500 - Swing by Building 6363 to check on progress - driveway excavation filled, Kong construction has cleared most soil off roadway and are continuing cleanup work.

1520 Ft Delta completes detail work at DU-34c, Photo document completed work

1530 Off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Eahart RD #3
**Project #:** 100-SFO-T26535-04
**Date:** 8/3/11 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** Jon Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Partly sunny

| Time | Project Activity |
|---|---|
| 730 | Tt arrived on site |
| | Health & Safety Meeting |
| | Delta setting up for day's work |
| | Delta spreading soil at DU-20a, grader levelling out stockpiles left overnight |
| 830 | Jacobsen installing sprinkler heads and adjusting flow and aim at DU-33a |
| 900 | Call from Grant re: Building 6363, meeting to occur at 930 |
| | - Also, soil excavated from Building 6363 was moved to JNC07 stockpile area today |
| 930 | Meeting: Confirm excavation to 12" where trenching was below geotextile, 3:6" digging outside trenched area where soil covers grass area |
| | - Delta questions: Clean soil source? |
| | Excavated material to Temporary Stockpile Area? |
| | ↳ No - Goes to JNC07 pile |
| | Representatives |
| | Mac - Actus |
| | Shane - Delta |
| | Jason - HC of Hickam Communities Maintenance |
| | Mark - Delta |
| | Grant - HC/Actus |
| | Tereas Brown - HC, concerned about timing of work |
| 1030 | Meeting End |

8/3/11 Earhart RO #3

1030 Delta completed all backfill and detail work at DU-20a
Jacobsen installing sprinkler heads and aiming them properly at DU-34c
Some soil remains at DU-20a, Delta using bobcat to move left over clean soil over to DU-12b

1100 Photodocument completed DU-20a

1130 - 1200 Lunch break for Delta

1200 Delta resumes backfilling
Photodocument ongoing work

1300 Final soil load placed at DU-12b

1320 Take photo of clean soil stockpile remaining at DB contractor office

1430 Last piece of soil grading complete, photograph final layout and grade

- Review status of Building 6363, concrete poured at driveway
- Check in on sprinkler installation at DU-34c, crew is repairing lines located above geotextile that were cracked during backfilling. No PI exposure

1500 Delta and Tt off-site

# APPENDIX F

## Summary of Findings Reports

***F1- Temporary Stockpile Confirmation Sampling***

***F2- Backfill Soil Sources***

# APPENDIX F1

## Temporary Stockpile Confirmation Sampling

TETRA TECH

March 20, 2012

Mr. Jeffrey Seibert
Development Manager
Hickam Communities LLC
211 Mercury Street
Honolulu, HI 96818

Jeffrey.Seibert@lendlease.com

**Subject:** **TO107– Summary of Findings Report for Confirmation Soil Sampling at the Former Stockpile Staging Yard, Earhart I-4 Neighborhood, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi**

Dear Mr. Seibert:

This letter report presents the results of confirmation soil sampling and chemical analysis Tetra Tech performed on behalf of Hickam Communities LLC (HC) under Task Order (TO) 107. The work was conducted at the temporary soil stockpiling area located south of Ohana Nui Circle in the Earhart I-4 Neighborhood located on Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi (hereinafter the "Site"). The purpose of the confirmation soil sampling was to verify that surface soil within the footprint of the former stockpile located at the Site does not contain pesticide-impacted (PI) soil, and does not present a risk of exposure to future HC residents, workers and guests.

## BACKGROUND

Based on previous soil sampling results from similar investigations conducted at other HC properties, the primary chemicals of concern expected to be present at the Site are the organochlorine pesticides aldrin, technical chlordane, and dieldrin. A general description of the chemical properties, toxicity, methods of application, and environmental behavior of these chemicals is presented in the *Pesticide-Impacted Soil Investigation and Management Program Manual, Hickam Air Force Base, Oʻahu, Hawaiʻi* (Program Manual; Tetra Tech 2011a).

In May 2011, adjusted site-specific Environmental Action Levels (EALs) developed for HC Project sites were presented in the revised *Preliminary Human Health Risk Evaluation Work Plan for Hickam Communities, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi* (HHRE Work Plan) (Tetra Tech 2011a), and accepted by the Hawaiʻi Department of Health (HDOH) in its letter dated October 31, 2011 (HDOH 2011b). This SoFR has been prepared using the adjusted site-specific EALs for aldrin and dieldrin presented in the HHRE Work Plan.

The Site consists of undeveloped land on HC property that was used as a temporary stockpiling area for PI soil generated during removal actions at the Earhart I-2 and I-3 Neighborhoods. Prior to its use as a temporary stockpiling area, the existing ground surface at the Site was graded and covered by geotextile fabric. Soil from the removal action was then transported and stockpiled on the geotextile at the Site from July 6, 2011 to February 14, 2012. The confirmation soil sampling was conducted after removal of the PI soil stockpile and geotextile fabric, and the surface of the Site scraped and removed soil managed in accordance with the *Program Manual* (Tetra Tech 2011b). The Site is shown in Figure 1.

## FIELD METHODS

On February 15, 2012, Tetra Tech mobilized to the Site to collect multi-incremental (MI) surface soil samples. The decision unit (DU) consisted of the generally level ground inside the soil berms surrounding the footprint area for stormwater runoff prevention. A drawing showing the layout and location of the DU is provided in the field notes in Appendix A.

One MI sample was collected from the upper 6-inches of soil within the DU (STP-FP-06). For quality assurance/quality control purposes the sample was collected in triplicate (one MI sample and two replicates). All sampling activities were conducted in accordance with the Sampling Analysis Plan (SAP) prepared for this sampling event (Tetra Tech 2012). Unless noted otherwise, Tetra Tech followed the MI soil sampling protocols recommended in the HDOH *Interim Final Technical Guidance Manual for Implementation of the Hawaii State Contingency Plan* (TGM) (HDOH 2009).

For each MI soil sample, Tetra Tech collected a total of fifty (50) increments (soil subsamples) using a 7/8-inch soil probe sampler. The sample probes were cleaned before each use using a laboratory grade detergent mixed with water, followed by a tap water rinse, and a final rinse with de-ionized water. The sampler was driven to a depth of 6-inches below grade, recovered, and the material brought to the surface composited in the field by placing the subsamples into sealable 1-gallon plastic bags. In order to preserve sample integrity during sample collection and transport, each of the MI sample bags was sealed, labeled, and placed into an ice-cooled insulated chest for transport under a chain-of-custody to the analytical laboratory.

## ANALYTICAL METHODS AND RESULTS

A total of three MI soil samples were submitted to Torrent Laboratory, Milpitas, California for analysis on a standard (5-day) turn-around-time (TAT) basis. Each MI soil sample was composited by the laboratory according to the HDOH MI subsampling protocol (HDOH 2009). Material from the 1-gallon bag was air dried at room temperature, sieved through a 2 millimeter (mm) sieve, and then spread out to collect thirty (30) subsamples.

The MI soil samples were then analyzed for Organochlorine Pesticides by US Environmental Protection Agency (EPA) Method 8081.

The laboratory analytical results were compared to the following screening levels:

- The HDOH Tier 1 EALs are for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is a non drinking water resource (Table B-1; HDOH 2011a);
- Site-specific EALs for technical chlordane established for HC property (Tetra Tech 2011a);
- Adjusted site-specific EALs for aldrin and dieldrin (Tetra Tech 2011b); and
- The site-specific EAL-based cumulative risk was calculated and compared to the carcinogenic risk threshold of $1 \times 10^{-4}$, or the Hazard Index (HI) of 1.0 established for HC property (Tetra Tech 2011b).

The laboratory analytical results are summarized in Tables 1 and 2, and a copy of the analytical report is provided as Appendix B. Only the analytes detected at or above the respective laboratory reporting limits are shown in Tables 1 and 2.

## QUALITY ASSURANCE / QUALITY CONTROL

### Laboratory Data Quality

The three MI soil samples collected February 15, 2012 were air-dried and shipped on February 16, 2012, by overnight express and received by Torrent Laboratory on February 17, 2012 in good condition. The samples were logged as Work Order (WO) 1202101. A standard five-business day turnaround time (TAT) was requested for all three samples (excluding MI sample preparation time).

All coolers were received within the required temperature limit of 4°C, ±2°C. All samples were extracted/digested and analyzed within the method holding times, and project-specific turnaround times. All LCS and LCSD spike and surrogate recoveries were within acceptance limits. The results for WO 1202101were reported on February 28, 2012.

### Field Data Quality

In accordance with the HC Program Manual (Tetra Tech 2011b), which calls for collection of field triplicate samples at a rate of one triplicate per 20 samples (five percent), one set of triplicate samples was collected for this verification sampling event. The triplicate sample was collected from the single DU (STP-FP-06). The replicate samples are identified by the suffix -1, -2, and -3.

The relative standard deviations (RSDs) for the triplicate sample were calculated using the RSD calculation provided in the Quality Assurance Program Plan (QAPP) (Tetra Tech 2011a). The RSD goal for field triplicates for the program is 35 percent. The RSD goal was met for all detected compounds in the triplicate; the RSDs for the detected analytes ranged from 7 to 15 percent.

The RSDs in the replicate samples are an indicator of how closely the concentrations in the MI soil samples represent the actual average concentration in soil from the DUs. However, at concentrations near the limit of detection, variability naturally tends to be higher, and this may be a source of some of the variability observed in the triplicate for this sampling event.

## ANALYTICAL RESULTS

Organochlorine pesticides were detected at concentrations above the laboratory reporting limit in the MI soil samples collected on February 15, 2012. These analytical results are summarized below and presented in Table 1.

- Aldrin was detected in all three MI soil samples at concentrations ranging from 0.32 milligrams per kilogram (mg/kg) to 0.37 mg/kg, which are below the Tier 1 EAL for aldrin (0.92 mg/kg).
- Chlordane was detected in all three MI soil samples at concentrations ranging from 1.5 mg/kg to 1.8 mg/kg, which are below the Tier 1 EAL for chlordane (16 mg/kg).
- Dieldrin was detected in all three MI soil samples at concentrations ranging from 0.77 mg/kg to 0.94 mg/kg, which are below the Tier 1 EAL for dieldrin (1.5 mg/kg).
- One or more of 4,4'-dichlorhodiphenyldichloroethane (DDD), 4,4'-dichloro-diphenyldichloroethylene (DDE), and 4,4'-dichlorhodiphenyltrichloroethane (DDT) were detected in the three MI soil samples collected from the Site; all of these detections are below the respective Tier 1 EALs.
- Endrin was detected in one of three MI soil samples at a concentration of 0.22 mg/kg, which is below the Tier 1 EAL for endrin (3.7 mg/kg).

## CUMULATIVE RISK AND HAZARD THRESHOLD

The cumulative risk is the sum of the carcinogenic risks posed by the detected concentrations of all organochlorine pesticides in the soil. Similarly, the cumulative noncancer hazard (hazard index) is the sum of the noncancer hazards posed by detected concentrations of all organochlorine pesticides in soil. The HHRE Work Plan presented four criteria to evaluate whether soil at an HC project site is considered to be

PI soil. These four criteria are referred to as the "2011 HHRE Standard", and are presented below

1. The cumulative excess cancer risk for aldrin plus dieldrin must not exceed $1 \times 10^{-4}$;
2. The cumulative excess cancer risk for all other organochlorine pesticides must not exceed $1 \times 10^{-5}$;
3. The cumulative excess cancer risk for all chemicals of potential concern (COPCs) must not exceed $1 \times 10^{-4}$; and
4. The hazard index for all COPCs must not exceed 1.

Thus, for risk management purposes, areas with organochlorine pesticide concentrations meeting all four criteria of the 2011 HHRE Standard, would support the conclusion that potential human health risks are within acceptable risk and hazard levels, and the soil in not PI soil. If any of the four criteria of the 2011 HHRE Standard are not met, the soil must be managed as PI soil. The results of the application of the 2011 HHRE Standard to the analytical results is presented in Table 2.

- The site-specific EAL-based calculated cumulative risks meet the four criteria of the 2011 Standard (Tetra Tech 2011b), indicating that the soil in the stockpile footprint DU at the Site is not PI soil.

## CONCLUSIONS AND RECOMMENDATIONS

The results of the MI soil sampling indicate that organochlorine pesticides were detected in soil at the Site.

- The RSDs for all of the analytes were below the 35 percent goal except DDT. Although the RSD goal of 35 percent was exceeded for DDT in the triplicate, this exceedence is likely due to the concentrations detected in the triplicate being close to the laboratory detection limit.
- There are no organochlorine pesticide detections that exceed the respective Tier 1 EALs (HDOH 2011a).
- The cumulative risks calculated for the detected organochlorine pesticides are below the 2011 Standard (Tetra Tech 2011b), and ***do not meet the criteria for PI soil.***

## REFERENCES

HDOH (Hawai‘i Department of Health). 2009. *Interim Final Technical Guidance Manual for Implementation of the Hawaii State Contingency Plan.* Prepared by: Hawai‘i Department of Health Environmental Management Division. June 21, 2009.

----------. 2011a. *HDOH Environmental Action Levels, Supplemental Models in Excel Format, EAL Surfer*. 2005 EALs updated in Fall 2011. Accessed at internet website URL: http://hawaii.gov/health/environmental/hazard/eal2005.html

_____. 2011b. *Subject: Review of Revised Draft Preliminary Human Health Risk Evaluation Work Plan (October 7, 2011), Facility/Sites: Hickam Communities sites, 2011-627-ES.* Letter from Eric Sadoyama HDOH to Roger Franklin, Lend Lease LLC - Public Partnerships. October 31, 2011.

Tetra Tech. 2011a. *TO#56, Preliminary Human Health Risk Evaluation Work Plan for Hickam Communities, Joint Base Pearl Harbor-Hickam, Hawai‘i*. Prepared for Hickam Communities LLC. DCN: 2653504.021.F01. October 7, 2011.

----------*. 2011b. Pesticide-Impacted Soil Investigation and Management Program Manual, Hickam Air Force Base, O ʻahu, Hawai ʻi, DCN: 2770101.001.F01.* Prepared for Hickam Communities LLC. July 27, 2011.

----------. 2012. *Sampling Analysis Plan, Verification Sampling, Temporary Stockpile Footprint, Earhart I-4, Joint Base Pearl Harbor-Hickam, O ʻahu, Hawai ʻi.* Prepared for Hickam Communities LLC. February 15, 2012.

If you have any questions or comments about this report, please contact me at (415) 490-2975 or Yvonne Parry (808) 533-3366. Tetra Tech appreciates the opportunity to provide continued environmental support to HC.

Sincerely,
**TETRA TECH**

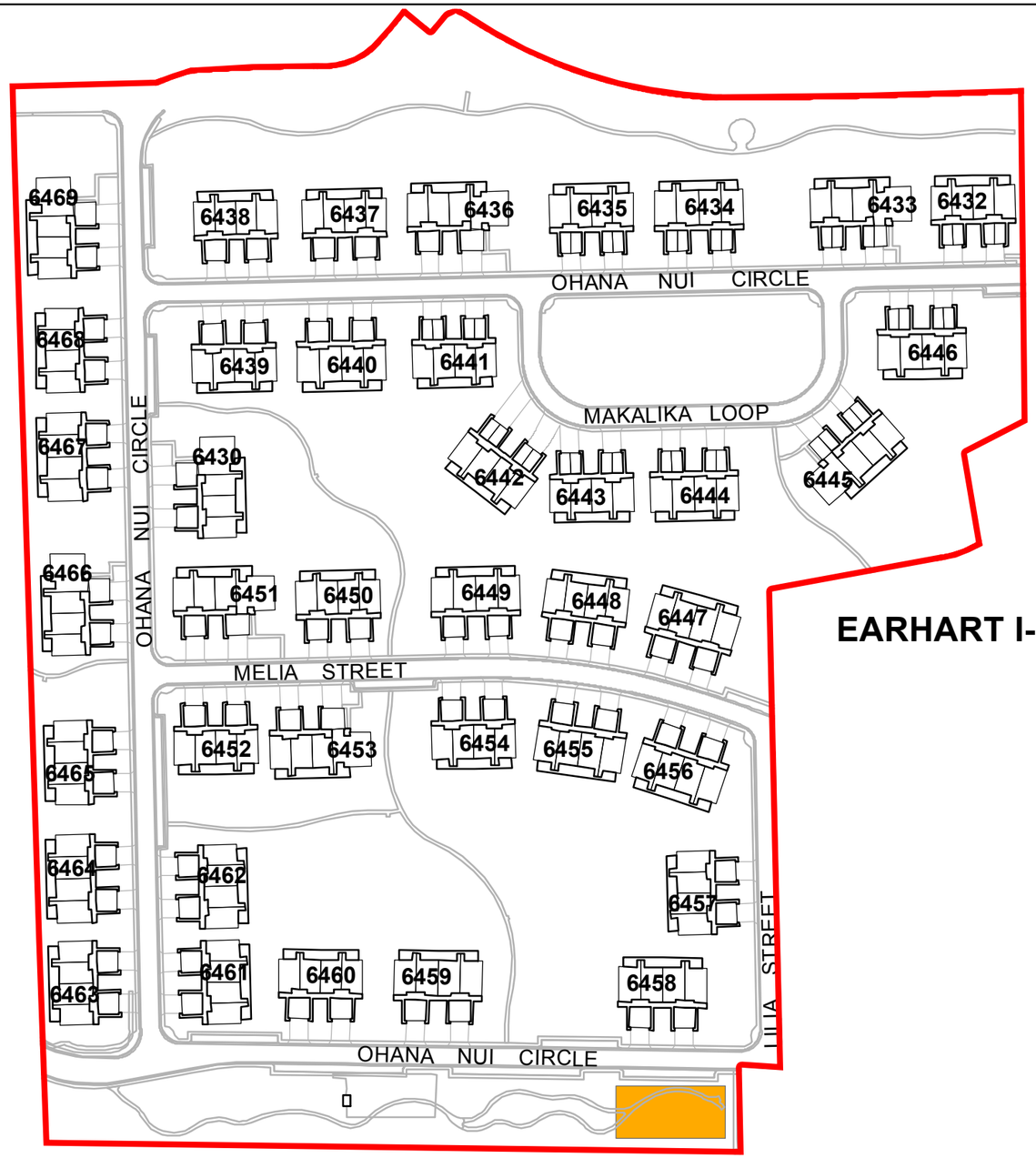
Gail Eaton, PG
Senior Geologist

Attachments:

| | |
|---|---|
| Figure 1. | Stockpile Footprint Decision Unit |
| Table 1. | Analytical Results for Pesticides in Soils, Stockpile Footprint Sampling, Earhart I-4 Neighborhood |
| Table 2. | Risk and Hazard Calculations for Pesticides in Soils, Stockpile Footprint Sampling, Earhart I-4 Neighborhood |
| Appendix A. | Tetra Tech Field Records |
| Appendix B. | Laboratory Analytical Report |

cc: Yvonne Parry, Senior Project Manager, Tetra Tech
Tom Whitehead, CHG, Technical Lead, Tetra Tech
Gary Floyd, Program Manager, Tetra Tech

**FIGURE**




**EARHART I-4**

0 75 150
Feet

R:\NEW\29025\Layouts\Stockpile Decision Unit.mxd 3/15/12 - YE

Earhart I-4 Boundary
Buildings
Roads
Stockpile Fooprint Decision Unit

TETRA TECH

***Stockpile Footprint Decision Unit***
***Earhart I-4 Earhart Neighborhood***
***Hickam Communities, March 2012***

Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i

**Figure 1**

# TABLES

**Table 1**
**Analytical Results for Pesticides In Soil**
**Temporary Stockpile Footprint, Earhart I-4 Neighborhood**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Decision Unit | Sample ID | Sample Date | Depth Interval (inches) | Aldrin (mg/kg) | Chlordane [3] (mg/kg) | Dieldrin (mg/kg) | 4,4-DDD (mg/kg) | 4,4-DDE (mg/kg) | 4,4-DDT (mg/kg) | Endrin (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **STP-FP** | **STP-FP-06-1** | **2/15/2012** | **0 to 6** | 0.34 | 1.8 | 0.77 | <0.012 | 0.031 | 0.021 | <0.014 |
| **STP-FP** | **STP-FP-06-2** | **2/15/2012** | **0 to 6** | 0.37 | 1.5 | 0.90 | <0.012 | 0.039 | 0.026 | 0.022 |
| **STP-FP** | **STP-FP-06-3** | **2/15/2012** | **0 to 6** | 0.32 | 1.8 | 0.94 | <0.012 | 0.042 | 0.024 | <0.014 |
| ***HDOH Tier 1 EAL [1]*** | | | | ***0.92*** | ***16*** | ***1.5*** | ***2.0*** | ***1.4*** | ***1.7*** | ***3.7*** |
| ***Site-Specific EAL [2]*** | | | | ***12*** | ***23.4*** | ***9.8*** | ***NE*** | ***NE*** | ***NE*** | ***NE*** |

***NOTES***

Only detected analytes are shown in this table.
Sample STP-FP-06 is a triplicate.

Exceeds HDOH Tier 1 EAL
Exceeds Site-Specific EAL

DDD dichlorodiphenyldichloroethane
DDE dichlorodiphenyldichloroethylene
DDT dichlorodiphenyltrichloroethane
EAL Environmental Action Level
HDOH Hawai'i Department of Health
mg/kg milligram per kilogram
NE Not established
STP Soil stockpile
FP Footprint
< less than the laboratory reporting limit

(1) HDOH Tier 1 EALs are for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is a non drinking water resource (Table B-1) (HDOH 2011a).
(2) Site-specific EALs calculated for Hickam Communities property (Tetra Tech 2011a and 2011b).
(3) Technical chlordane. The technical chlordane constituents alpha-chlordane, gamma-chlordane, heptachlor, and heptachlor epoxide not reported in this table. Any detections of these chemicals are provided in the laboratory analytical report.

**TABLE 2**
**Results for Pesticides in Soil / Risk and Hazard Calculations - Child Resident**
**Temporary Stockpile Footprint, Earhart I-4 Neighborhood**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Decision Unit | Sample ID | Date Sampled | Depth Interval (inches) | Analytical Results (mg/kg) | | | | | | | Child Resident | | | | | | | | | | | | | | | | | PI Soil [2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Cancer Risk | | | | | | | | | | Noncancer Hazard | | | | | | | | |
| | | | | Aldrin | Chlordane [3] | Dieldrin | 4,4-DDD | 4,4-DDE | 4,4-DDT | Endrin | Aldrin | Chlordane | Dieldrin | 4,4-DDD | 4,4-DDE | 4,4-DDT | Endrin | Cumulative Risk | | | Aldrin | Chlordane | Dieldrin | 4,4-DDD | 4,4-DDE | 4,4-DDT | Endrin | Endrin Ketone | Hazard Index | |
| *Resident Child - Cancer EALs (mg/kg)* [1] | | | | 42 | 23.4 | 20 | 2 | 1.4 | 1.7 | ---- | | | | | | | | All COPCs | Aldrin and Dieldrin | No Aldrin or Dieldrin | | | | | | | | | | Yes / No |
| *Resident Child - Noncancer EALs (mg/kg)* [1] | | | | 12 | 35 | 9.8 | ---- | ---- | 7.2 | 3.7 | | | | | | | | | | | | | | | | | | | | |
| STP | STP-FP-06-1 | 2/15/2012 | 0 to 6 | 0.34 | 1.8 | 0.77 | <0.012 | 0.031 | 0.021 | <0.014 | 8.1E-07 | 7.7E-07 | 3.8E-06 | ND | 2.2E-08 | 1.2E-08 | ND | 5.4E-06 | 4.6E-06 | 8.0E-07 | 0.03 | 0.05 | 0.08 | ND | ---- | 0.00 | ND | ND | 0.2 | No |
| STP | STP-FP-06-2 | 2/15/2012 | 0 to 6 | 0.37 | 1.5 | 0.90 | <0.012 | 0.039 | 0.026 | 0.022 | 8.8E-07 | 6.4E-07 | 4.4E-06 | ND | 2.8E-08 | 1.5E-08 | ---- | 6.0E-06 | 5.3E-06 | 6.8E-07 | 0.03 | 0.04 | 0.09 | ND | ---- | 0.00 | 0.00 | ND | 0.2 | No |
| STP | STP-FP-06-3 | 2/15/2012 | 0 to 6 | 0.32 | 1.8 | 0.94 | <0.012 | 0.042 | 0.024 | <0.014 | 7.6E-07 | 7.7E-07 | 4.6E-06 | ND | 3.0E-08 | 1.4E-08 | ND | 6.2E-06 | 5.4E-06 | 8.1E-07 | 0.03 | 0.05 | 0.10 | ND | ---- | 0.00 | ND | ND | 0.17 | No |

***NOTES***

**Non PI soil**
**PI Soil**

Sample STP-FP-06 is a triplicate.

PI Soil Pesticide impacted soil
HDOH Hawai'i Department of Health
HC Hickam Communities LLC
EAL Environmental Action Level
mg/kg milligram per kilogram
< less than the laboratory reporting limit
DDD dichlorodiphenyldichloroethane
DDE dichlorodiphenyldichloroethylene
DDT dichlorodiphenyltrichloroethane
COPC chemicals of potential concern
---- not established

(1) HDOH. 2011. Review of revised Preliminary Human Health Risk Evaluation Work Plan for Hickam Communities, Joint Base Pearl Harbor-Hickam. 2011-627-ES. Letter from Eric Sadoyama HDOH to Roger Franklin, Lend Lease Americas LLC. October 31, 2011.

(2) If any of the four criteria associated with the HC 2011 HHRE standard (HDOH 2011) are not met, soil must be managed as PI soil in accordance with the site-specific soil management plan. The four criteria associated with the 2011 HHRE standard are as follows:
Criteria #1 - the cumulative excess cancer risk (ECR) for aldrin plus dieldrin must not exceed $1 \times 10^{-4}$
Criteria #2 - the cumulative ECR for all other organochlorine pesticides must not exceed $1 \times 10^{-5}$
Criteria #3 - the cumulative ECR for all COPCs must not exceed $1 \times 10^{-4}$
Criteria #4 - the hazard index for all COPCs must not exceed 1.0.

(3) Technical chlordane. The technical chlordane constituents alpha- and gamma-chlordane not reported in this table. Any detections of alpha- and gamma-chlordane are provided in the laboratory analytical report.

# APPENDIX A
# FIELD RECORDS

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart I-2 Soil Berm Construction
**Project #:** T29030
**Date:** 2/15/12 **Time:**
**Location:** Hickam AFB
**Client:** HC/Aztec
**Tt Personnel:** J Mollison

**Misc. Personnel:**

**Statement of Work:**

**Equipment Used:**

**Weather:** Sunny

| Time | Project Activity |
|---|---|
| 745 | Tt arrived on site at Soil berm gate |
| | Health & Safety Meeting |
| 800 | NSC & DPS arrive on site, open gate to soil berm |
| | Discuss ~~daily~~ days plan with NSC. They are running 8 trucks. Both excavators are loading soil at JNC07. Two loading zones. One from road side and one from parking lot side. |
| | Observe dust control at JNC07 - laborer using a hose to wet stockpile. |
| 930 | Call from TKP - Sampling @ RO3 Stockpile area is go for today |
| 1000 | Off-site for SAP & Sample gear |
| 1115 | Return to site, RO3 Stockpile area |
| 1140 | Collect STP-FP-06-1 } 30 increments from 0"-6" depth |
| 1145 | Collect STP-FP-06-2 } |
| 1150 | Collect STP-FP-06-3 } |
| 1200 | Off-site for lunch |
| 1220 | Move to JNC07 to observe soil loadout |
| | Delta truck drops small load of P.I. soil from Historics district, about 5 cubic-yards |
| | Discuss project status with NSC. So far 35 truckloads of soil have been pulled from JNC07 stockpile |

(CONT)

2/15/12 PI Soil Berm Earhart 1-2

1330 Observe personal and ambient air monitors in place
Trucks using main street gate for haul route

1400 Light sprinkle (rain) passes through

1410 Return to loading area at JNC07, call from YKP re: soil load issue in parking lot
Meet with Grant (Actus) & Brian Jeremiah & Aaron Ungerleider

- Observe waters ponding inside stockpile area - no water outside fence or evidence of water flow outside fence. Socks in place around fence are dry
- Excavator struck spigot that was buried by PI soil and sticking up & active

- Verify Delta trucks are dedicated to transport of clean soil from Ewa Lot 6 or PI soil from Historics districts

- Front end loader was loading soil inside fence, then hauling it ~30 yds through lot outside fence to trucks. No large quantities of PI soil on asphalt but significant amount of dust from PI pile

- NSC will leave trucks outside fence tomorrow & only drive front end loader inside fence. The loading area will be lined with geotextile.

1515 Gate at berm locked, unable to do final daily inspection
1520 Off-site

# APPENDIX B
# LABORATORY ANALYTICAL REPORT

Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306
Email: Yvonne.parry@Tetratech.com

RE: RO3 Stockpile Footprint Sampling

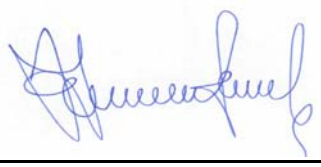
Work Order No.: 1202101

Dear Yvonne Parry:

Torrent Laboratory, Inc. received 3 sample(s) on February 17, 2012 for the analyses presented in the following Report.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.



G.Gueorguieva
Sr. Project Manager

February 28, 2012
Date

**Date:** 2/28/2012

**Client:** Tetra Tech Inc (HI)

**Project:** RO3 Stockpile Footprint Sampling

**Work Order:** 1202101

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Unless otherwise indicated in the following narrative, no results have been method and/or field blank corrected.

Reported results relate only to the items/samples tested by the laboratory.

Analytical Comments, General, For all samples, Note:Samples processed under Incremental Sampling Procedure SOP TCI0109.

Sample collection date and time is reflective of Hawaiian Standard Time (HST) while all anlaytical dates and times are reflective of Pacific Standard Time (PST).

Analytical Comments for METHOD 8081S_Tetra Tech, ALL SAMPLE, Note: Per client request, whenever possible (where matrix interference does not preclude it),sample data is reported to the MDL. Results reported between the MDL and PQL are qualified with the appropriate "J" flag and should be considered as estimated values

Analytical Comments for method S_8081MITetra, 1202101-001A MS/MSD, QC Analytical Batch ID 408591, Note:The % recoveries for Endrin and 4,4-DDT are outside of laboratory control limits but are within % RPD limits. The associated LCS/LCSD % recoveries and % RPD are within limits. No corrective action required.

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 02/17/12
**Date Reported:** 02/28/12

**STP-FP-06-1** 1202101-001

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 25 | 0.011 | 0.050 | 0.34 | mg/Kg |
| gamma-Chlordane | SW8081A | 25 | 0.011 | 0.050 | 0.27 | mg/Kg |
| alpha-Chlordane | SW8081A | 25 | 0.0090 | 0.050 | 0.24 | mg/Kg |
| 4,4-DDE | SW8081A | 25 | 0.012 | 0.050 | 0.031 | mg/Kg |
| Dieldrin | SW8081A | 25 | 0.011 | 0.050 | 0.77 | mg/Kg |
| 4,4-DDT | SW8081A | 25 | 0.020 | 0.050 | 0.021 | mg/Kg |
| Chlordane | SW8081A | 25 | 0.25 | 0.50 | 1.8 | mg/Kg |

**STP-FP-06-2** 1202101-002

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 25 | 0.011 | 0.050 | 0.37 | mg/Kg |
| gamma-Chlordane | SW8081A | 25 | 0.011 | 0.050 | 0.30 | mg/Kg |
| alpha-Chlordane | SW8081A | 25 | 0.0090 | 0.050 | 0.25 | mg/Kg |
| 4,4-DDE | SW8081A | 25 | 0.012 | 0.050 | 0.039 | mg/Kg |
| Dieldrin | SW8081A | 25 | 0.011 | 0.050 | 0.90 | mg/Kg |
| Endrin | SW8081A | 25 | 0.014 | 0.050 | 0.022 | mg/Kg |
| 4,4-DDT | SW8081A | 25 | 0.020 | 0.050 | 0.026 | mg/Kg |
| Chlordane | SW8081A | 25 | 0.25 | 0.50 | 1.5 | mg/Kg |

**STP-FP-06-3** 1202101-003

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 25 | 0.011 | 0.050 | 0.32 | mg/Kg |
| gamma-Chlordane | SW8081A | 25 | 0.011 | 0.050 | 0.38 | mg/Kg |
| alpha-Chlordane | SW8081A | 25 | 0.0090 | 0.050 | 0.31 | mg/Kg |
| 4,4-DDE | SW8081A | 25 | 0.012 | 0.050 | 0.042 | mg/Kg |
| Dieldrin | SW8081A | 25 | 0.011 | 0.050 | 0.94 | mg/Kg |
| 4,4-DDT | SW8081A | 25 | 0.020 | 0.050 | 0.024 | mg/Kg |
| Chlordane | SW8081A | 25 | 0.25 | 0.50 | 1.8 | mg/Kg |

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 02/17/12
**Date Reported:** 02/28/12

| | | | |
|---|---|---|---|
| **Client Sample ID:** | STP-FP-06-1 | **Lab Sample ID:** | 1202101-001A |
| **Project Name/Location:** | RO3 Stockpile Footprint Sampling | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 02/15/12 / 11:40 | | |
| **Tag Number:** | RO3 Stockpile Footprint Sampling | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| gamma-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0099 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| beta-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0091 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| delta-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Heptachlor | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.028 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Aldrin | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | 0.34 | | mg/Kg | 408591 | 4803 |
| Heptachlor epoxide | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0079 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| gamma-Chlordane | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | 0.27 | | mg/Kg | 408591 | 4803 |
| alpha-Chlordane | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0090 | 0.050 | 0.24 | | mg/Kg | 408591 | 4803 |
| Endosulfan I | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.015 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| 4,4-DDE | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | 0.031 | J | mg/Kg | 408591 | 4803 |
| Dieldrin | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | 0.77 | | mg/Kg | 408591 | 4803 |
| Endrin | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.014 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| 4,4-DDD | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Endosulfan II | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.038 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| 4,4-DDT | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.020 | 0.050 | 0.021 | J | mg/Kg | 408591 | 4803 |
| Endrin aldehyde | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.026 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Endosulfan sulfate | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Methoxychlor | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.015 | 0.13 | ND | | mg/Kg | 408591 | 4803 |
| Endrin Ketone | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.010 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Chlordane | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.25 | 0.50 | 1.8 | | mg/Kg | 408591 | 4803 |
| Toxaphene | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.25 | 2.5 | ND | | mg/Kg | 408591 | 4803 |
| TCMX (S) | SW8081A | 2/24/12 | 02/26/12 | 25 | 52.5 | 139 | 105 | | % | 408591 | 4803 |
| DCBP (S) | SW8081A | 2/24/12 | 02/26/12 | 25 | 50.2 | 139 | 131 | | % | 408591 | 4803 |

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 02/17/12
**Date Reported:** 02/28/12

| | | | |
|---|---|---|---|
| **Client Sample ID:** | STP-FP-06-2 | **Lab Sample ID:** | 1202101-002A |
| **Project Name/Location:** | RO3 Stockpile Footprint Sampling | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 02/15/12 / 11:45 | | |
| **Tag Number:** | RO3 Stockpile Footprint Sampling | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| gamma-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0099 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| beta-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0091 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| delta-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Heptachlor | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.028 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Aldrin | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | 0.37 | | mg/Kg | 408591 | 4803 |
| Heptachlor epoxide | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0079 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| gamma-Chlordane | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | 0.30 | | mg/Kg | 408591 | 4803 |
| alpha-Chlordane | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0090 | 0.050 | 0.25 | | mg/Kg | 408591 | 4803 |
| Endosulfan I | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.015 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| 4,4-DDE | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | 0.039 | J | mg/Kg | 408591 | 4803 |
| Dieldrin | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | 0.90 | | mg/Kg | 408591 | 4803 |
| Endrin | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.014 | 0.050 | 0.022 | J | mg/Kg | 408591 | 4803 |
| 4,4-DDD | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Endosulfan II | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.038 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| 4,4-DDT | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.020 | 0.050 | 0.026 | J | mg/Kg | 408591 | 4803 |
| Endrin aldehyde | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.026 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Endosulfan sulfate | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Methoxychlor | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.015 | 0.13 | ND | | mg/Kg | 408591 | 4803 |
| Endrin Ketone | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.010 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Chlordane | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.25 | 0.50 | 1.5 | | mg/Kg | 408591 | 4803 |
| Toxaphene | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.25 | 2.5 | ND | | mg/Kg | 408591 | 4803 |
| TCMX (S) | SW8081A | 2/24/12 | 02/26/12 | 25 | 52.5 | 139 | 105 | | % | 408591 | 4803 |
| DCBP (S) | SW8081A | 2/24/12 | 02/26/12 | 25 | 50.2 | 139 | 130 | | % | 408591 | 4803 |

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 02/17/12
**Date Reported:** 02/28/12

| | | | |
|---|---|---|---|
| **Client Sample ID:** | STP-FP-06-3 | **Lab Sample ID:** | 1202101-003A |
| **Project Name/Location:** | RO3 Stockpile Footprint Sampling | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 02/15/12 / 11:50 | | |
| **Tag Number:** | RO3 Stockpile Footprint Sampling | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| gamma-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0099 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| beta-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0091 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| delta-BHC | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Heptachlor | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.028 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Aldrin | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | 0.32 | | mg/Kg | 408591 | 4803 |
| Heptachlor epoxide | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0079 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| gamma-Chlordane | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | 0.38 | | mg/Kg | 408591 | 4803 |
| alpha-Chlordane | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.0090 | 0.050 | 0.31 | | mg/Kg | 408591 | 4803 |
| Endosulfan I | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.015 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| 4,4-DDE | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | 0.042 | J | mg/Kg | 408591 | 4803 |
| Dieldrin | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.011 | 0.050 | 0.94 | | mg/Kg | 408591 | 4803 |
| Endrin | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.014 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| 4,4-DDD | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Endosulfan II | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.038 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| 4,4-DDT | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.020 | 0.050 | 0.024 | J | mg/Kg | 408591 | 4803 |
| Endrin aldehyde | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.026 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Endosulfan sulfate | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.012 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Methoxychlor | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.015 | 0.13 | ND | | mg/Kg | 408591 | 4803 |
| Endrin Ketone | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.010 | 0.050 | ND | | mg/Kg | 408591 | 4803 |
| Chlordane | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.25 | 0.50 | 1.8 | | mg/Kg | 408591 | 4803 |
| Toxaphene | SW8081A | 2/24/12 | 02/26/12 | 25 | 0.25 | 2.5 | ND | | mg/Kg | 408591 | 4803 |
| TCMX (S) | SW8081A | 2/24/12 | 02/26/12 | 25 | 52.5 | 139 | 102 | | % | 408591 | 4803 |
| DCBP (S) | SW8081A | 2/24/12 | 02/26/12 | 25 | 50.2 | 139 | 125 | | % | 408591 | 4803 |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1202101 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 02/24/12 | **Prep Batch:** | 4803 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 02/26/12 | **Analytical Batch:** | 408591 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.00044 | 0.0020 | ND | |
| gamma-BHC | 0.00040 | 0.0020 | ND | |
| beta-BHC | 0.00036 | 0.0020 | ND | |
| delta-BHC | 0.00049 | 0.0020 | ND | |
| Heptachlor | 0.0011 | 0.0020 | ND | |
| Aldrin | 0.00044 | 0.0020 | ND | |
| Heptachlor epoxide | 0.00032 | 0.0020 | ND | |
| gamma-Chlordane | 0.00042 | 0.0020 | ND | |
| alpha-Chlordane | 0.00036 | 0.0020 | ND | |
| Endosulfan I | 0.00059 | 0.0020 | ND | |
| 4,4-DDE | 0.00048 | 0.0020 | ND | |
| Dieldrin | 0.00043 | 0.0020 | ND | |
| Endrin | 0.00057 | 0.0020 | ND | |
| 4,4-DDD | 0.00047 | 0.0020 | ND | |
| Endosulfan II | 0.0015 | 0.0020 | ND | |
| 4,4-DDT | 0.00081 | 0.0020 | ND | |
| Endrin aldehyde | 0.0010 | 0.0020 | ND | |
| Endosulfan sulfate | 0.00049 | 0.0020 | ND | |
| Methoxychlor | 0.00062 | 0.0050 | ND | |
| Endrin Ketone | 0.00040 | 0.0020 | ND | |
| Chlordane | 0.010 | 0.020 | ND | |
| Toxaphene | 0.010 | 0.10 | ND | |
| TCMX (S) | | | 99.5 | |
| DCBP (S) | | | 91.6 | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1202101 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 02/24/12 | **Prep Batch:** | 4803 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 02/26/12 | **Analytical Batch:** | 408591 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | ND | 20 | 106 | | | 44.2 - 125 | | |
| gamma-BHC | 0.40 | 2.0 | ND | 20 | 104 | | | 56.9 - 124 | | |
| beta-BHC | 0.36 | 2.0 | ND | 20 | 106 | | | 44.2 - 125 | | |
| delta-BHC | 0.49 | 2.0 | ND | 20 | 85.5 | | | 61.5 - 116 | | |
| Heptachlor | 1.1 | 2.0 | ND | 20 | 104 | | | 63.6 - 125 | | |
| Aldrin | 0.44 | 2.0 | ND | 20 | 102 | | | 53 - 126 | | |
| Heptachlor epoxide | 0.32 | 2.0 | ND | 20 | 103 | | | 54.6 - 130 | | |
| gamma-Chlordane | 0.42 | 2.0 | ND | 20 | 101 | | | 68.7 - 123 | | |
| alpha-Chlordane | 0.36 | 2.0 | ND | 20 | 102 | | | 42.4 - 128 | | |
| Endosulfan I | 0.59 | 2.0 | ND | 20 | 97.3 | | | 61.2 - 119 | | |
| 4,4-DDE | 0.48 | 2.0 | ND | 20 | 99.1 | | | 45.3 - 123 | | |
| Dieldrin | 0.43 | 2.0 | ND | 20 | 101 | | | 44 - 128 | | |
| Endrin | 0.57 | 2.0 | ND | 20 | 104 | | | 44.1 - 126 | | |
| 4,4-DDD | 0.47 | 2.0 | ND | 20 | 93.6 | | | 39.6 - 123 | | |
| Endosulfan II | 1.5 | 2.0 | ND | 20 | 87.9 | | | 46.7 - 112 | | |
| 4,4-DDT | 0.81 | 2.0 | ND | 20 | 110 | | | 52.8 - 134 | | |
| Endrin aldehyde | 1.0 | 2.0 | ND | 20 | 72.1 | | | 40.2 - 113 | | |
| Endosulfan sulfate | 0.49 | 2.0 | ND | 20 | 86.4 | | | 62.1 - 116 | | |
| Methoxychlor | 0.62 | 5.0 | ND | 20 | 97.9 | | | 55.2 - 126 | | |
| Endrin Ketone | 0.40 | 2.0 | ND | 20 | 84.6 | | | 53.9 - 120 | | |
| TCMX (S) | | | ND | 2100 | 95.9 | | | 52.5 - 121 | | |
| DCBP (S) | | | ND | 2100 | 86.6 | | | 50.2 - 121 | | |

Torrent LABORATORY, INC.

# MS/MSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1202101 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 02/24/12 | **Prep Batch:** | 4803 |
| **Matrix:** | **Soil** | **Analytical Method:** | SW8081A | **Analyzed Date:** | 02/26/12 | **Analytical Batch:** | 408591 |
| **Spiked Sample:** | 1202101-001A | | | | | | |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Sample Conc. | Spike Conc. | MS % Recovery | MSD % Recovery | MS/MSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Aldrin | 11 | 50 | 13.54 | 20 | 0.000 | 0.000 | 8.17 | 53.9 - 142 | 30 | NR |
| gamma-BHC | 9.9 | 50 | 0.13 | 20 | 84.6 | 85.7 | 1.02 | 56.9 - 120 | 30 | |
| Heptachlor | 28 | 50 | 0.63 | 20 | 105 | 104 | 1.38 | 52.2 - 117 | 30 | |
| Dieldrin | 11 | 50 | 30.92 | 20 | 0.000 | 0.000 | 7.82 | 29.2 - 130 | 30 | NR |
| Endrin | 14 | 50 | 0.00 | 20 | 236 | 241 | 2.07 | 44.1 - 121 | 30 | S |
| 4,4-DDT | 20 | 50 | 0.82 | 20 | 162 | 97.5 | 27.9 | 24.6 - 134 | 30 | S |
| TCMX (S) | | | | 2100 | 93.1 | 94.9 | | 52.5 - 139 | | |
| DCBP (S) | | | | 2100 | 111 | 111 | | 50.2 - 139 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: RO3 Stockpile Footprint Sampling

Work Order No.: 1202101

Date and Time Received: 2/17/2012 12:00

Received By: NG

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 4 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | N/A | | | |

pH Checked by: pH Adjusted by:

All samples present and correct.

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)

**Project Name:** RO3 Stockpile Footprint Sampling

**Project # :**

**Report Due Date:** 2/28/2012

**QC Level:**

**TAT Requested:** 5+ day:0

**Date Received:** 2/17/2012

**Time Received:** 12:00

**Comments:**

**Work Order # :** ***1202101***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1202101-001A | STP-FP-06-1 | 02/15/12 11:40 | Soil | 08/15/12 | | | S_8081MITetra | |
| **Sample Note:** | Samples need to be air dried, then proceed with sieving and subsampling per HDOH guidance. Multi-Incremental preparation. | | | | | | | |
| 1202101-002A | STP-FP-06-2 | 02/15/12 11:45 | Soil | 08/15/12 | | | S_8081MITetra | |
| 1202101-003A | STP-FP-06-3 | 02/15/12 11:50 | Soil | 08/15/12 | | | S_8081MITetra | |

Torrent LABORATORY, INC.

1202101

# CHAIN-OF-CUSTODY RECORD

TETRA TE

Client Name/Account #: TetraTech, Inc.
Address: 737 Bishop St., Suite 3020
City/State/Zip: Honolulu, HI 96813
Project Manager: Yvonne Parry
Telephone Number: (808)533-3366 Fax No.: (808)533-3306
Sampler Name: (Print) Jon Mollison
Sampler Signature: J. Mollison

Report To: Y. Parry, G. Eaton, J. Mollison
Invoice To: Y. Parry
Project ID: RO3 Stockpile Footprint Sampling
Project #: 100-SFO-T29025

| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Preservative: Ice | Preservative: $HNO_3$ (Red Label) | Preservative: HCl (Blue Label) | Preservative: NaOH (Orange Label) | Preservative: $H_2SO_4$ Plastic (Yellow Label) | Preservative: $H_2SO_4$ Glass(Yellow Label) | Preservative: None (Black Label) | Preservative: Other (one MeOH VOA) | Matrix: Groundwater | Matrix: Wastewater | Matrix: Drinking Water | Matrix: Sludge | Matrix: Soil | Matrix: Other (specify): | Analyze For: Multi-Incremental Preparation | Analyze For: 8081 | RUSH TAT (Pre-Schedule) | Standard TAT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001A | STP-FP-06-1 | 2.15.2012 | 1140 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | | X |
| 002A | STP-FP-06-2 | 2.15.2012 | 1145 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | | X |
| 003A | STP-FP-06-3 | 2.15.2012 | 1150 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | | X |

**Special Instructions:** Samples have not been air dried - please dry, then proceed with sieving and subsampling as per HDOH guidance

**Method of Shipment:** FEDEX

**Laboratory Comments:**
Temperature Upon Receipt: 4 °C
VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| Jon Mollison J. Mollison | 2/15/12 | 900AM | FED EX | 2/15/12 | 900AM |
| Relinquished by: | Date | Time | Received by Laboratory: | Date | Time |
| FedEx | 2/17/12 | 12:00 p.m. | NAVIN K. | 2-17-12 | 12:00 P.M |

Page 1 of 1

# APPENDIX F2

## Backfill Soil Sources

December 1, 2010

Mladena Yankova Kukin mladena.yankovakukin@actuslendlease.com
Development Manager
Hickam Communities LLC
211 Mercury Street
Honolulu, HI 96818

**Subject: TO#56 (Mod 4): Final Summary of Findings Report on Sampling and Chemical Analysis of Import Soil Stockpile Located at the RHS Lee Baseyard, Pearl City, Hawai`i**

Dear Ms. Yankova:

This final summary of findings report (SoFR) presents the results of import stockpile soil sampling and chemical analysis Tetra Tech performed on behalf of Hickam Communities LLC (HC) under Task Order #56 Modification 4. This report documents the sampling and analysis of one approximately 800-cubic yard (CY) soil stockpile generated from a mass excavation conducted at Windward Community College (WCC) (Greco 2010), Tax Map Key (TMK) 1-4-5-023:014. The stockpile is currently located at the RHS Lee construction yard, Pearl City, O`ahu, Hawai`i (hereinafter the "Site").

The purpose of this investigation was to evaluate the stockpiled soil for the presence (if any) of organochlorine pesticides, metals, and total petroleum hydrocarbons (TPH) as diesel and motor oil, and to determine the suitability of the soil for import as clean backfill for the HC including the neighborhoods Earhart I-2 and Earhart I-3. The soil sampling and evaluation of the analytical results was done in accordance with the *Pesticide Impacted Soils Investigation and Management Program Manual* (Program Manual) (Tetra Tech 2009), and the *Removal Action Work Plan No. 1* (RO# 1) (Tetra Tech 2010b).

## FIELD METHODS

Tetra Tech mobilized to WCC for stockpile sampling on November 2, 2010. All sampling activities were conducted in accordance to the Sampling Analysis Plan (SAP) prepared for this sampling event (Tetra Tech 2010a). A copy of the field records is provided in Appendix A.

Before sampling, the stockpile was separated into two decision units (DU) (WCC-STP-1 and WCC-STP-2) as shown in Figure 1. Tetra Tech followed the multi-incremental (MI) soil sampling protocols recommended by Hawai`i Department of Health (HDOH) for this event (HDOH 2009). For the stockpile MI soil samples, Tetra Tech collected seventy-five (75) soil increments (subsamples) using dedicated stainless steel spoons. Samples were collected from each DU at depths ranging from the surface down to the original grade. Soil at depths greater than 6-inches was collected from the bucket of an excavator, which safely accessed and collected material from various locations from the interiors of the individual stockpile decision units (DU). For quality assurance/quality control purposes, Tetra Tech collected one MI soil sample in triplicate (one MI sample and two replicates).

The collected soil was composited in the field by placing the sample into a 1-gallon sealable plastic bag. To preserve sample integrity during sample collection and transport, the MI soil sample bag was sealed, labeled, and placed into an ice-cooled insulated chest for transport under a chain-of-custody to the analytical laboratory.

## ANALYTICAL METHODS

A total of four MI soil samples were submitted to Torrent Laboratory, Milpitas, California for analysis. The MI soil samples were prepared according to the HDOH MI sub-sampling protocol (HDOH 2009). Material from each 1-gallon bag was air dried at room temperature, sieved through a 2 millimeter (mm) sieve. The sieved material was then spread out and thirty sub-samples collected by the laboratory were combined into one MI sample and prepared for analysis. Each MI soil sample was analyzed for:

- Organochlorine Pesticides by US Environmental Protection Agency (EPA) Method 8081A;
- Resource Conservation and Recovery Act (RCRA) 8 Metals by EPA Method 6010; and
- Total Petroleum Hydrocarbons (TPH) as diesel and motor oil by EPA Method 8015B, with silica gel cleanup.

## ANALYTICAL RESULTS

The analytical results were compared to the following screening levels:

- The HDOH Tier 1 Environmental Action Levels (EALs) for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is not a drinking water resource (Table B-1) (HDOH 2009b);
- The Site-specific Tier 2 EALs for aldrin, dieldrin, and technical chlordane established for HC property (Tetra Tech 2009);
- The Tier 2-based cumulative risk was calculated for organochlorine pesticides and compared to the 1 x $10^{-5}$ cumulative risk threshold established for HC property (Tetra Tech 2009).

The laboratory analytical results are summarized below, and presented in Table 1. A copy of the analytical report is provided Appendix B. Only analytes detected at or above the laboratory reporting limit are shown in Table 1.

### Pesticides

- Organochlorine compounds were detected at concentrations at above the laboratory reporting limits in all of the MI soil samples collected from the stockpile.

Dieldrin was detected in all four MI soil samples at concentrations ranging from 0.0065 milligrams per kilogram (mg/kg) to 0.038 mg/kg. The detection for dieldrin in WCC-STP-1 is below the HDOH Tier 1 EAL for dieldrin (0.03 mg/kg), but exceeds the Tier 1 EAL for the triplicate sample collected for WCC-STP-2. All of the detections are below the Tier 2 EAL.

- Aldrin was detected in the triplicate sample collected from WCC-STP-2 at concentrations ranging from 0.099 mg/kg to 0.021 mg/kg which are below the Tier 1 EAL for aldrin (0.029 mg/kg). Aldrin was not detected in the sample collected for WCC-STP-1
- Minor concentrations of 4,4 –dichlorodiphenyldichloroethane (DDD) were detected in two of the three MI soil samples collected from STP-WCC-2. These detections are below the Tier 1 EAL for DDD (2.0 mg/kg). There is no Tier 2 EAL established for HC property.

### Metals

- The RCRA-8 metals lead and arsenic were detected at concentrations at or above the laboratory reporting limits in all of the MI soil samples collected from the stockpile.

- Arsenic was detected in all four MI soil samples at concentrations ranging from 2.2 mg/kg to 4.7 mg/kg; however these detections are below the Tier 1 EAL for arsenic (20 mg/kg).
- Lead was detected in all four MI soil samples at concentrations ranging from 6.9 mg/kg to 7.7 mg/kg; however these detections are below the Tier 1 EAL for lead (200 mg/kg).

### Petroleum Hydrocarbons

- TPH as diesel and motor oil were detected at concentrations above the laboratory reporting limits in the MI soil samples collected from the stockpile.
- TPH as diesel was detected in MI soil sample WCC-STP-1 at a concentration of 6.8 mg/kg, which is below the respective Tier 1 EAL (500 mg/kg). TPH as diesel was not detected in the triplicate sample WCC-STP-2.
- TPH as motor oil was detected in all four MI soil samples at concentrations ranging from 44 mg/kg to 66 mg/kg; however these detections are below the respective Tier 1 EAL (200 mg/kg).

## CUMULATIVE RISK

Cumulative risk is the sum of the carcinogenic risks of the individual compounds. For HC sites, the calculated Tier 2-based cumulative risk posed by aldrin, chlordane, and dieldrin is compared to the $1 \times 10^{-5}$ risk threshold established for HC (Tetra Tech 2009). The cumulative risk can be exceeded even if there are no detections above the HC Tier 2 EALs. If the calculated cumulative risk exceeds the risk threshold, the soil is designated as pesticide-impacted (PI) soil.

- The calculated Tier 2-based cumulative risk does not exceed the $1 \times 10^{-5}$ risk threshold any of the MI soil samples collected from the WCC stockpile.

## CONCLUSIONS

Based on Tetra Tech's evaluation of the analytical results, and the project plans (Tetra Tech 2009 and 2010b), Tetra Tech concludes that the soil in the WCC stockpile located at the Site **is not PI soil** and is therefore suitable for unrestricted use on HC property.

- Organochlorine pesticides were detected at concentrations at or above laboratory reporting limits in all of the MI soil samples collected from the WCC Stockpile. There are no detections exceeding the respective Tier 2 EALs established for HC

property, and the Tier 2-based calculated risk is below the 1 x $10^{-5}$ risk threshold established for HC property (Tetra Tech 2009). Detections for dieldrin were at concentrations exceeding the Tier 1 EAL for dieldrin.

- There were no detections of RCRA-8 metals or petroleum hydrocarbon compounds at concentrations exceeding the respective Tier 1 EALs.

## REFERENCES

CFR (Code of Federal Regulations). 2010. CFR Title 40: 261.24 Table 1—Maximum Concentration of Contaminants for the Toxicity Characteristic. Accessed at internet website URL: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9b8d30a98d2bd8ffe90e6b8042d2ffc6&rgn=div8&view=text&node=40:25.0.1.1.2.3.1.5&idno=40

Greco, Arthur. 2010. Actus Superintendent. Email to Yvonne Parry (Tetra Tech) on November 16

HDOH (Hawai`i Department of Health). 2009a. *Interim Final Technical Guidance Manual for Implementation of the Hawaii State Contingency Plan.* Prepared by: Hawai`i Department of Health Environmental Management Division. June 21.

HDOH (Hawai`i Department of Health). 2009b. HDOH Environmental Action Levels, Supplemental Models in Excel Format, EAL Surfer. March 2009. Accessed at internet website URL: http://hawaii.gov/health/environmental/hazard/eal2005.html

Tetra Tech. 2009. *Pesticide-Impacted Soils Investigation and Management Program Manual, Hickam Air Force Base,* O`ahu, Hawai`i. Prepared for Hickam Community Housing LLC. May 2009.

Tetra Tech. 2010a. *Sampling and Analysis Plan, Stockpile Sampling, RHS Lee Construction Yard, Pearl City, Hawai`i.* Prepared for Prepared for Hickam Communities LLC. November 2, 2010.

Tetra Tech. 2010b. *Removal Action Work Plan No. 1, Immediate Actions for Pesticide-Impacted Soil, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, O`ahu Hawai`i.* Prepared for Hickam Communities, LLC. DCN 2653504.001.F05. October 11, 2010.

If you have any questions or comments about this report, please do not hesitate to contact me at (415) 490-2975 or Yvonne Parry in our Honolulu office, at (808) 533-3366. Tetra Tech appreciates the opportunity to provide continued environmental support to HC.

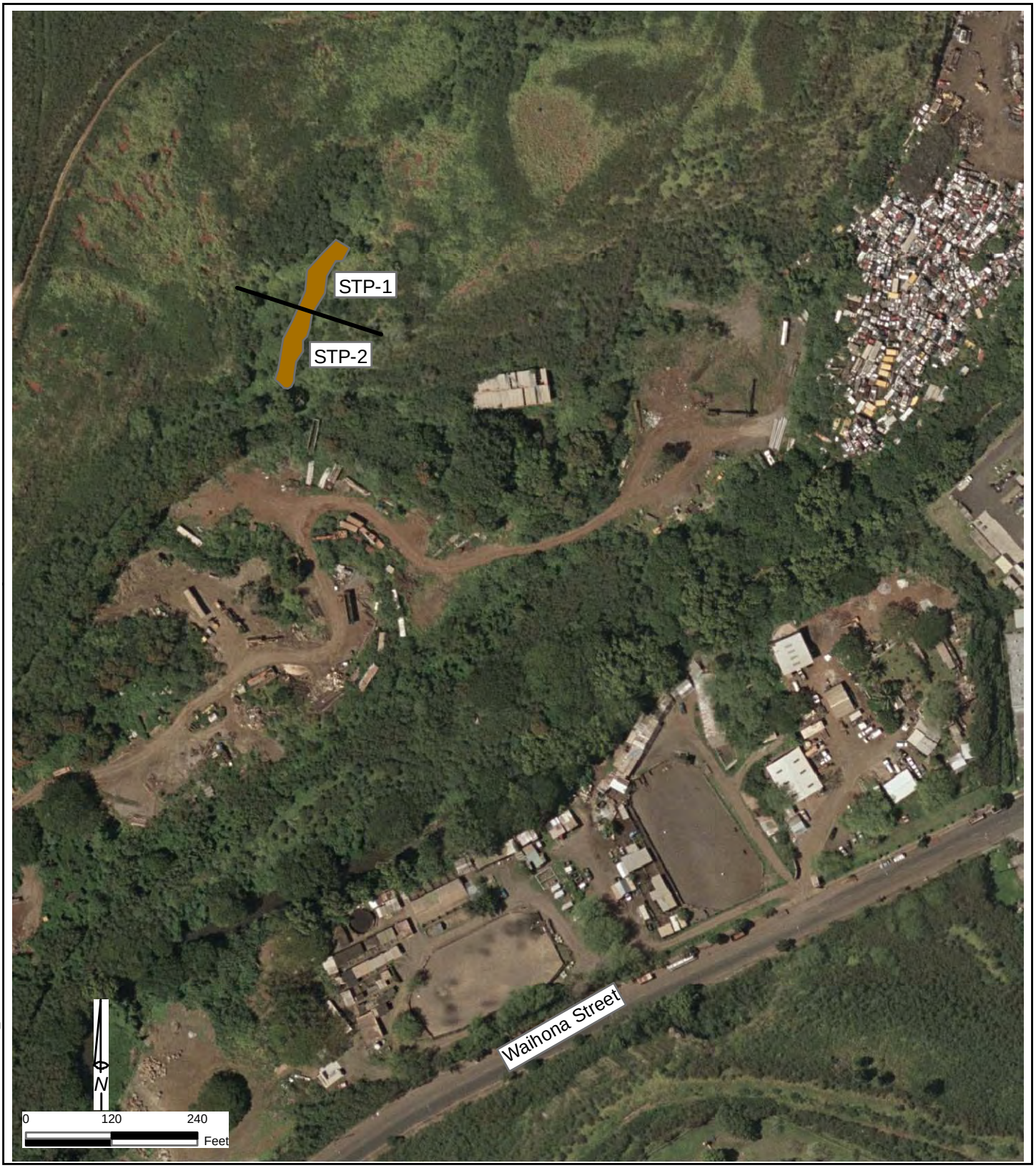
Sincerely,
**TETRA TECH**

Gail Eaton, P.G.
Senior Geologist
Tetra Tech

Attachments:
Figure 1 – WCC Stockpile Location
Table 1 – Summary of WCC Stockpile Analytical Results
Appendix A – Field Records
Appendix B – Laboratory Analytical Reports

cc: Gary Floyd, Program Manager, Tetra Tech
Tom Whitehead C.HG., Technical Lead, Tetra Tech
Yvonne Parry, Project Manager, Tetra Tech

# FIGURE




F:/GIS/Hickam1/RHSLee_STP.mxd - 11/15/10 - JB

**Legend:**

Stockpile Area

# *RHS Lee Stockpile Location Map*

Pearl City, O'ahu, Hawai'i

Tetra Tech, Inc

**Figure 1**

# TABLE

**Table 1**
**Hickam Communities**
**Analytical Results for Soil**
**RHS Lee Stockpile**
**Hickam Air Force Base, O'ahu, Hawai'i**

| Sample ID → | HDOH Tier 1 EAL[1] (mg/kg) | HC Tier 2 EAL[2] (mg/kg) | WCC-STP-1 (mg/kg) | WCC-STP-2A (mg/kg) | WCC-STP-2B (mg/kg) | WCC-STP-2C (mg/kg) |
|---|---|---|---|---|---|---|
| ***Sample Date →*** | | | ***11/2/2010*** | ***11/2/2010*** | ***11/2/2010*** | ***11/2/2010*** |
| *Pesticides* | | | | | | |
| 4,4´-DDD | 2.0 | NE | < 0.0047 | 0.005 | < 0.0047 | 0.0048 |
| Aldrin | 0.029 | 0.42 | < 0.0044 | 0.0099 | 0.021 | 0.013 |
| Dieldrin | 0.03 | 0.45 | 0.0065 | 0.037 | 0.038 | 0.034 |
| ***Cumulative Risk*** | | | 1 E-07 | 1 E-06 | 1 E-06 | 1 E-06 |
| *RCRA 8 Metals* | | | | | | |
| Arsenic | 20 | NE | 2.4 | 2.2 | 4.7 | 4.1 |
| Lead | 200 | NE | 6.9 | 7.7 | 7.1 | 7.7 |
| *Petroleum Hydrocarbons and Constituents* | | | | | | |
| TPH as Diesel | 500 | NE | 6.8 | < 2.0 | < 2.0 | < 2.0 |
| TPH as Motor Oil | 500 | NE | 44 | 56 | 60 | 66 |

***Notes:***

Only detected analytes are shown in this table.

Exceeds HDOH Tier 1 EAL

Exceeds HC Tier 2 EAL

Below 1 x $10^{-5}$ risk threshold

Above 1 x $10^{-5}$ risk threshold

| | |
|---|---|
| HDOH | Hawai`i Department of Health |
| HC | Hickam Communities LLC (formerly Hickam Community Housing LLC) |
| EAL | Environmental Action Level |
| mg/kg | milligram per kilogram |
| < | less than the laboratory reporting limit |
| DDD | dichlorodiphenyldichloroethane |
| NE | not established |
| 1 | HDOH Tier 1 EALs for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is a non drinking water resource (Table B-1) (HDOH 2009). |
| 2 | Site-specific Tier 2 EALs calculated for Hickam Communities property (Tetra Tech 2009). |

# APPENDIX A

## FIELD RECORDS

TETRA TECH



# FIELD NOTES

**Project Title:** RHS LEE STOCKPILE SAMPLING
**Project #:**
**Date:** 11-2-2010 **Time:** 1145
**Location:**
**Client:**
**Tt Personnel:** J. BARLOS

**Misc. Personnel:**

**Statement of Work:** STOCKPILE SAMPLING

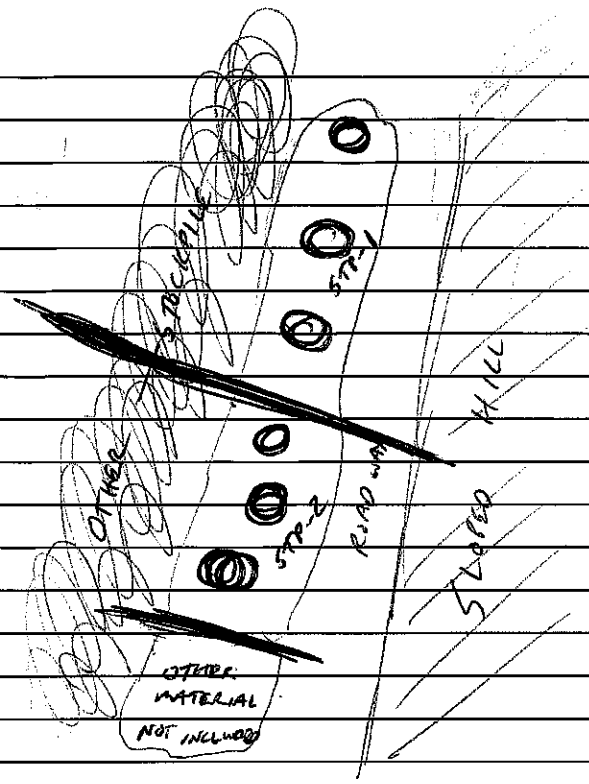
**Equipment Used:** EXCAVATOR & SPOONS TO SAMPLE

**Weather:** ≈80° CLOUDY

| Time | Project Activity |
|---|---|
| 1145 | Tt arrived on site |
| 1146 | Health & Safety Meeting |
| 1149 | MEET WITH RHS LEE TO DISCUSS LOCATION OF STOCKPILE STOCKPILE IS LOCATED ON SEPARATE LOT AND IS SITTING ALONG SIDE OTHER STOCK PILES. RHS LEE CONFIRMS THAT STOCKPILE ALONG EAST SIDE IS WHAT IS TO BE SAMPLED. |
| 1158 | TT JB MOBS TO STOCKPILE AND SORTS AND DIVIDES IT INTO TWO (2) SEPARATE DECISION UNITS. OPERATOR OF EXCAVATOR PREPARES FOR EXCAVATION. SEE SKETCH |
| 1209 | BEGIN SAMPLING WCC-STP-1 |
| 1310 | WCC-STP-1 SAMPLE COLLECTED |
| 1316 | BEGIN SAMPLING WCC-STP-2 |
| 1410 | WCC-STP-2A SAMPLE COLLECTED |
| 1415 | WCC-STP-2B SAMPLE COLLECTED |
| 1420 | WCC-STP-2C SAMPLE COLLECTED |
| | ALL SAMPLES CONSISTED OF 75 INCREMENTS COMING FROM 3 HOLES AND OUTER SHELL INCREMENTS. 60 INCREMENTS WERE TAKEN FROM THE 3 HOLES (20 EACH HOLE) AND 15 WERE TAKEN FROM OUTER SHELL OF STOCKPILE. |
| 1428 | TT PACKS UP SAMPLE AND LEAVES SITE. |

TETRA TECH




STOCKPILE
STP-1
OTHER
STP-2
ROAD WAY
SLOPED HILL
OTHER MATERIAL NOT INCLUDED

# APPENDIX B

## LABORATORY ANALYTICAL REPORTS

Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306

RE: RHS Lee Stockpile

Work Order No.: 1011030

Dear Yvonne Parry:

Torrent Laboratory, Inc. received 4 sample(s) on November 04, 2010 for the analyses presented in the following Report.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.

Patti Sandrock

November 11, 2010
Date

**Date:** 11/11/2010

**Client:** Tetra Tech Inc (HI)

**Project:** RHS Lee Stockpile

**Work Order:** 1011030

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Analytical Comments for method SW8081A, For MS, QC Analytical Batch ID 402935, Note:The % recoveries for Dieldrin is outside of laboratory control limits. The associated LCS/LCSD % recoveries and % RPD are within limits. No corrective action required.

Note: Although an MSD was prepared, it was not analyzed or reported due to a laboratory extraction error (no surrogates or spike added to the sample). % RPD of LCS/LCSD is reported in lieu of MS/MSD % RPD.

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

**WCC-STP-1** 1011030-001

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.0051 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.0041 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.0065 | mg/Kg |
| TPH as Diesel (SG) | SW8015B(M) | 1 | 0.76 | 2.0 | 6.8 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 1 | 1.8 | 4.0 | 44 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 2.4 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 6.9 | mg/Kg |

**WCC-STP-2A** 1011030-002

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.0099 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.010 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.010 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.037 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0050 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 1 | 1.8 | 4.0 | 56 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 2.2 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 7.7 | mg/Kg |

**WCC-STP-2B** 1011030-003

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.021 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.0097 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.0089 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.038 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 1 | 1.8 | 4.0 | 60 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 4.7 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 7.1 | mg/Kg |

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

**WCC-STP-2C** 1011030-004

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.013 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.012 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.012 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.034 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0048 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 1 | 1.8 | 4.0 | 66 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 4.1 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 7.7 | mg/Kg |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-1 | **Lab Sample ID:** | 1011030-001A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 13:10 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0560 | 0.34 | 2.4 | | mg/Kg | 402947 | 1512 |
| Lead | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0740 | 0.260 | 6.9 | | mg/Kg | 402947 | 1512 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| beta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| delta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Aldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor epoxide | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0042 | 0.020 | 0.0051 | J | mg/Kg | 402935 | 1503 |
| alpha-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | 0.0041 | J | mg/Kg | 402935 | 1503 |
| Endosulfan I | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDE | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Dieldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0043 | 0.020 | 0.0065 | J | mg/Kg | 402935 | 1503 |
| Endrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDD | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan II | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDT | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endrin aldehyde | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan sulfate | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Methoxychlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402935 | 1503 |
| Endrin Ketone | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402935 | 1503 |
| Toxaphene | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402935 | 1503 |
| TCMX (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 52.5 | 139 | 109 | | % | 402935 | 1503 |
| DCBP (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 50.2 | 139 | 102 | | % | 402935 | 1503 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-1 | **Lab Sample ID:** | 1011030-001A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 13:10 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 0.76 | 2.0 | 6.8 | x | mg/Kg | 402938 | 1502 |
| TPH as Motor Oil (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 1.8 | 4.0 | 44 | | mg/Kg | 402938 | 1502 |
| Pentacosane (S) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 61.5 | 133 | 98.2 | | % | 402938 | 1502 |

**NOTE:** x- Not typical of Diesel standard pattern (possibly fuel lighter than diesel)

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2A | **Lab Sample ID:** | 1011030-002A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:10 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0560 | 0.34 | 2.2 | | mg/Kg | 402947 | 1512 |
| Lead | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0740 | 0.260 | 7.7 | | mg/Kg | 402947 | 1512 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| beta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| delta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Aldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | 0.0099 | J | mg/Kg | 402935 | 1503 |
| Heptachlor epoxide | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0042 | 0.020 | 0.010 | J | mg/Kg | 402935 | 1503 |
| alpha-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | 0.010 | J | mg/Kg | 402935 | 1503 |
| Endosulfan I | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDE | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Dieldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0043 | 0.020 | 0.037 | | mg/Kg | 402935 | 1503 |
| Endrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDD | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0047 | 0.020 | 0.0050 | J | mg/Kg | 402935 | 1503 |
| Endosulfan II | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDT | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endrin aldehyde | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan sulfate | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Methoxychlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402935 | 1503 |
| Endrin Ketone | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402935 | 1503 |
| Toxaphene | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402935 | 1503 |
| TCMX (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 52.5 | 139 | 124 | | % | 402935 | 1503 |
| DCBP (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 50.2 | 139 | 120 | | % | 402935 | 1503 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2A | **Lab Sample ID:** | 1011030-002A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:10 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 0.76 | 2.0 | ND | | mg/Kg | 402938 | 1502 |
| TPH as Motor Oil (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 1.8 | 4.0 | 56 | | mg/Kg | 402938 | 1502 |
| Pentacosane (S) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 61.5 | 133 | 90.3 | | % | 402938 | 1502 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2B | **Lab Sample ID:** | 1011030-003A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:15 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0560 | 0.34 | 4.7 | | mg/Kg | 402947 | 1512 |
| Lead | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0740 | 0.260 | 7.1 | | mg/Kg | 402947 | 1512 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| beta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| delta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Aldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | 0.021 | | mg/Kg | 402935 | 1503 |
| Heptachlor epoxide | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0042 | 0.020 | 0.0097 | J | mg/Kg | 402935 | 1503 |
| alpha-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | 0.0089 | J | mg/Kg | 402935 | 1503 |
| Endosulfan I | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDE | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Dieldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0043 | 0.020 | 0.038 | | mg/Kg | 402935 | 1503 |
| Endrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDD | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan II | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDT | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endrin aldehyde | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan sulfate | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Methoxychlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402935 | 1503 |
| Endrin Ketone | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402935 | 1503 |
| Toxaphene | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402935 | 1503 |
| TCMX (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 52.5 | 139 | 116 | | % | 402935 | 1503 |
| DCBP (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 50.2 | 139 | 109 | | % | 402935 | 1503 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2B | **Lab Sample ID:** | 1011030-003A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:15 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 0.76 | 2.0 | ND | | mg/Kg | 402938 | 1502 |
| TPH as Motor Oil (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 1.8 | 4.0 | 60 | | mg/Kg | 402938 | 1502 |
| Pentacosane (S) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 61.5 | 133 | 98.1 | | % | 402938 | 1502 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2C | **Lab Sample ID:** | 1011030-004A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:20 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0560 | 0.34 | 4.1 | | mg/Kg | 402947 | 1512 |
| Lead | SW6010B | 11/9/10 | 11/11/10 | 1 | 0.0740 | 0.260 | 7.7 | | mg/Kg | 402947 | 1512 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| beta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| delta-BHC | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Heptachlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Aldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0044 | 0.020 | 0.013 | J | mg/Kg | 402935 | 1503 |
| Heptachlor epoxide | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| gamma-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0042 | 0.020 | 0.012 | J | mg/Kg | 402935 | 1503 |
| alpha-Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0036 | 0.020 | 0.012 | J | mg/Kg | 402935 | 1503 |
| Endosulfan I | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDE | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Dieldrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0043 | 0.020 | 0.034 | | mg/Kg | 402935 | 1503 |
| Endrin | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDD | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0047 | 0.020 | 0.0048 | J | mg/Kg | 402935 | 1503 |
| Endosulfan II | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| 4,4'-DDT | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endrin aldehyde | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Endosulfan sulfate | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Methoxychlor | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402935 | 1503 |
| Endrin Ketone | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402935 | 1503 |
| Chlordane | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402935 | 1503 |
| Toxaphene | SW8081A | 11/9/10 | 11/09/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402935 | 1503 |
| TCMX (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 52.5 | 139 | 121 | | % | 402935 | 1503 |
| DCBP (S) | SW8081A | 11/9/10 | 11/09/10 | 10 | 50.2 | 139 | 113 | | % | 402935 | 1503 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/04/10
**Date Reported:** 11/11/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | WCC-STP-2C | **Lab Sample ID:** | 1011030-004A |
| **Project Name/Location:** | RHS Lee Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/02/10 / 14:20 | | |
| **Tag Number:** | RHS Lee Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 0.76 | 2.0 | ND | | mg/Kg | 402938 | 1502 |
| TPH as Motor Oil (SG) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 1.8 | 4.0 | 66 | | mg/Kg | 402938 | 1502 |
| Pentacosane (S) | SW8015B(M) | 11/8/10 | 11/09/10 | 1 | 61.5 | 133 | 97.6 | | % | 402938 | 1502 |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545_TPHSG | **Prep Date:** | 11/08/10 | **Prep Batch:** | 1502 |
| **Matrix:** | Soil | **Analytical Method:** | SW8015B(M) | **Analyzed Date:** | 11/08/10 | **Analytical Batch:** | 402927 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| TPH as Diesel (SG) | 0.76 | 2.0 | ND | |
| TPH as Motor Oil (SG) | 1.8 | 4.0 | ND | |
| Pentacosane (S) | | | 108 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1503 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 11/09/10 | **Analytical Batch:** | 402935 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.00044 | 0.0020 | ND | |
| gamma-BHC | 0.00040 | 0.0020 | ND | |
| beta-BHC | 0.00036 | 0.0020 | ND | |
| delta-BHC | 0.00049 | 0.0020 | ND | |
| Heptachlor | 0.0011 | 0.0020 | ND | |
| Aldrin | 0.00044 | 0.0020 | ND | |
| Heptachlor epoxide | 0.00032 | 0.0020 | ND | |
| gamma-Chlordane | 0.00042 | 0.0020 | ND | |
| alpha-Chlordane | 0.00036 | 0.0020 | ND | |
| Endosulfan I | 0.00059 | 0.0020 | ND | |
| 4,4'-DDE | 0.00048 | 0.0020 | ND | |
| Dieldrin | 0.00043 | 0.0020 | ND | |
| Endrin | 0.00057 | 0.0020 | ND | |
| 4,4'-DDD | 0.00047 | 0.0020 | ND | |
| Endosulfan II | 0.0015 | 0.0020 | ND | |
| 4,4'-DDT | 0.00081 | 0.0020 | ND | |
| Endrin aldehyde | 0.0010 | 0.0020 | ND | |
| Endosulfan sulfate | 0.00049 | 0.0020 | ND | |
| Methoxychlor | 0.00062 | 0.0050 | ND | |
| Endrin Ketone | 0.00040 | 0.0020 | ND | |
| Chlordane | 0.010 | 0.020 | ND | |
| Toxaphene | 0.010 | 0.10 | ND | |
| TCMX (S) | | | 82.6 | |
| DCBP (S) | | | 69.1 | |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3050B_MI | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1512 |
| **Matrix:** | Soil | **Analytical Method:** | SW6010B | **Analyzed Date:** | 11/11/10 | **Analytical Batch:** | 402947 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier | |
|---|---|---|---|---|---|
| Arsenic | 0.0560 | 0.34 | 0.13 | | |
| Lead | 0.0740 | 0.260 | 0.24 | | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545_TPHSG | **Prep Date:** | 11/08/10 | **Prep Batch:** | 1502 |
| **Matrix:** | Soil | **Analytical Method:** | SW8015B(M) | **Analyzed Date:** | 11/08/10 | **Analytical Batch:** | 402927 |
| **Units:** | mg/Kg | | Blank | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | 0.76 | 2.0 | ND | 33.33 | 72.2 | 84.7 | 15.9 | 50.8 - 111 | 30 | |
| TPH as Motor Oil (SG) | | | ND | 100 | | | | 61.5 - 133 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1503 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 11/09/10 | **Analytical Batch:** | 402935 |
| **Units:** | ug/Kg | | LCSD | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | ND | 20 | 95.1 | 106 | 10.8 | 44.2 - 125 | 30 | |
| gamma-BHC | 0.40 | 2.0 | ND | 20 | 91.1 | 102 | 10.9 | 56.9 - 124 | 30 | |
| beta-BHC | 0.36 | 2.0 | ND | 20 | 96.3 | 108 | 11.7 | 44.2 - 125 | 30 | |
| delta-BHC | 0.49 | 2.0 | ND | 20 | 82.2 | 94.2 | 13.9 | 61.5 - 116 | 30 | |
| Heptachlor | 1.1 | 2.0 | ND | 20 | 95.4 | 108 | 12.0 | 63.6 - 125 | 30 | |
| Aldrin | 0.44 | 2.0 | ND | 20 | 99.0 | 111 | 11.5 | 53 - 126 | 30 | |
| Heptachlor epoxide | 0.32 | 2.0 | ND | 20 | 95.3 | 107 | 11.5 | 54.6 - 130 | 30 | |
| gamma-Chlordane | 0.42 | 2.0 | ND | 20 | 97.1 | 109 | 11.7 | 68.7 - 123 | 30 | |
| alpha-Chlordane | 0.36 | 2.0 | ND | 20 | 97.4 | 108 | 10.6 | 42.4 - 128 | 30 | |
| Endosulfan I | 0.59 | 2.0 | ND | 20 | 90.0 | 105 | 15.4 | 61.2 - 119 | 30 | |
| 4,4'-DDE | 0.48 | 2.0 | ND | 20 | 95.9 | 107 | 10.8 | 45.3 - 123 | 30 | |
| Dieldrin | 0.43 | 2.0 | ND | 20 | 92.7 | 104 | 12.0 | 44 - 128 | 30 | |
| Endrin | 0.57 | 2.0 | ND | 20 | 89.2 | 102 | 13.3 | 44.1 - 126 | 30 | |
| 4,4'-DDD | 0.47 | 2.0 | ND | 20 | 90.3 | 102 | 12.0 | 39.6 - 123 | 30 | |
| Endosulfan II | 1.5 | 2.0 | ND | 20 | 80.5 | 96.1 | 17.7 | 56.7 - 112 | 30 | |
| 4,4'-DDT | 0.81 | 2.0 | ND | 20 | 89.9 | 101 | 11.4 | 52.8 - 134 | 30 | |
| Endrin aldehyde | 1.0 | 2.0 | ND | 20 | 74.6 | 89.4 | 18.2 | 50.2 - 113 | 30 | |
| Endosulfan sulfate | 0.49 | 2.0 | ND | 20 | 82.4 | 97.5 | 16.7 | 62.1 - 116 | 30 | |
| Methoxychlor | 0.62 | 5.0 | ND | 20 | 77.1 | 88.7 | 14.1 | 55.2 - 126 | 30 | |
| Endrin Ketone | 0.40 | 2.0 | ND | 20 | 79.9 | 92.9 | 14.9 | 53.9 - 120 | 30 | |
| TCMX (S) | | | ND | 2100 | 96.4 | 105 | | 52.5 - 121 | | |
| DCBP (S) | | | ND | 2100 | 84.2 | 95.8 | | 50.2 - 121 | | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3050B_MI | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1512 |
| **Matrix:** | Soil | **Analytical Method:** | SW6010B | **Analyzed Date:** | 11/11/10 | **Analytical Batch:** | 402947 |
| **Units:** | mg/Kg | | Blank | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.056 | 0.34 | 0.13 | 10 | 98.9 | 97.3 | 1.6 | 75 - 125 | 30 | , |
| Lead | 0.074 | 0.26 | 0.24 | 10 | 105.6 | 104 | 2.1 | 75 - 125 | 30 | , |

Torrent LABORATORY, INC.

# MS/MSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011030 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 11/09/10 | **Prep Batch:** | 1503 |
| **Matrix:** | **Soil** | **Analytical Method:** | SW8081A | **Analyzed Date:** | 11/09/10 | **Analytical Batch:** | 402935 |
| **Spiked Sample:** | 1011030-004A | | | | | | |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Sample Conc. | Spike Conc. | MS % Recovery | MSD % Recovery | MS/MSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Aldrin | 4.4 | 20 | 1.29 | 20 | 116 | | | 53.9 - 142 | | |
| gamma-BHC | 4.0 | 20 | 0.10 | 20 | 94.1 | | | 56.9 - 120 | | |
| Heptachlor | 11 | 20 | 0.15 | 20 | 106 | | | 52.2 - 117 | | |
| Dieldrin | 4.3 | 20 | 3.45 | 20 | 169 | | | 29.2 - 130 | | S |
| Endrin | 5.7 | 20 | 0.00 | 20 | 104 | | | 44.1 - 121 | | |
| 4,4'-DDT | 8.1 | 20 | 0.22 | 20 | 99.3 | | | 24.6 - 134 | | |
| TCMX (S) | | | | 2100 | 118 | | | 52.5 - 139 | | |
| DCBP (S) | | | | 2100 | 123 | | | 50.2 - 139 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: RHS Lee Stockpile

Work Order No.: 1011030

Date and Time Received: 11/4/2010 14:07

Received By: NG

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 4 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | | | | |
| pH Checked by: | pH Adjusted by: | | | |

Torrent LABORATORY, INC.

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)
**QC Level:**
**Project Name:** RHS Lee Stockpile
**TAT Requested:** 3 day:25
**Project # :** 100-SFO-T26535-04
**Date Received:** 11/4/2010
**Report Due Date:** 11/11/2010
**Time Received:** 14:07

**Comments:** 3 day TAT!!!(+2 days drying) Recv'd 4 soils for 8081 ; TPHDOSG ; Lead and Arsenic @4'C.Pls. email an EDD result to Y.Parry ; G.Eaton and T.Whitehead.Incremental sampling required.

**Work Order # :** ***1011030***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1011030-001A | WCC-STP-1 | 11/02/10 13:10 | Soil | 05/03/11 | | | EDD<br>S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |
| **Sample Note:** | 3 day Rush! Multi incremental sampling, soils need to be air dried and subsampled. 8081,Pb,As, TPHD/MoSG. | | | | | | | |
| 1011030-002A | WCC-STP-2A | 11/02/10 14:10 | Soil | 05/03/11 | | | S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |
| 1011030-003A | WCC-STP-2B | 11/02/10 14:15 | Soil | 05/03/11 | | | S_6010BMI<br>S_TPHDOSG<br>S_8081MITetra | |
| 1011030-004A | WCC-STP-2C | 11/02/10 14:20 | Soil | 05/03/11 | | | S_6010BMI<br>S_TPHDOSG<br>S_8081MITetra | |

Torrent LABORATORY, INC.

# RUSH 3-DAY TAT

# CHAIN-OF-CUSTODY RECORD

TETRA TECH

1011030

Client Name/Account #: TetraTech, Inc.
Address: 737 Bishop St., Suite 3020
City/State/Zip: Honolulu, HI 96813
Project Manager: Y. Parry
Telephone Number: (808)533-3366 Fax No.: (808)533-3306
Sampler Name: (Print) J. Barlos
Sampler Signature:

Report To: Y. Parry, G. Eaton, T. Whitehead
Invoice To: Y. Parry
Project ID: RHS Lee Stockpile
Project #: 100-SFO-T26535-04

| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Preservative: Ice | $HNO_3$ (Red Label) | HCl (Blue Label) | NaOH (Orange Label) | $H_2SO_4$ Plastic (Yellow Label) | $H_2SO_4$ Glass(Yellow Label) | None (Black Label) | Other (one MeOH VOA) | Matrix: Groundwater | Wastewater | Drinking Water | Sludge | Soil | Other (specify): | Analyze For: Multi-Incremental Preparatic | 8081 | 8015B TPH Diesel and Motor Oil (4 silica gel cleanup) | Lead & Arsenic (6010) | | | | | | | RUSH TAT (Pre-Schedule | Standard TAT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001A | WCC-STP-1 | 11/2/10 | 1310 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | |
| 002A | WCC-STP-2A | 11/2/10 | 1410 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | |
| 003A | WCC-STP-2B | 11/2/10 | 1415 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | |
| 004A | WCC-STP-2C | 11/2/10 | 1420 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | |

RUSH
3 DAYS

**Special Instructions:**
Please proceed with air-drying, sieving and subsampling as per HDOH guidance

Method of Shipment: FEDEX

**Laboratory Comments:**
Temperature Upon Receipt: 4 °C
VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| Jaymes Barlos | 11-3-2010 | 1200 | FedEx | 11-3-2010 | 1200 |
| Relinquished by: | Date | Time | Received by Laboratory: NAVIN G | Date | Time |
| FedEx | 11-4-10 | 14:07 | R. G. Ghodasara | 11-4-10 | 14:07 |

Page 1 of 1

TETRA TECH

November 17, 2010

Mladena Yankova Kukin mladena.yankovakukin@actuslendlease.com
Development Manager
Hickam Communities LLC
211 Mercury Street
Honolulu, HI 96818

**Subject: TO#56: Summary of Findings Report on Sampling and Chemical Analysis of the Soil Stockpiles for Import to Earhart I-2 and Earhart I-3 Neighborhoods, Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i**

Dear Ms. Yankova Kukin:

This final summary of findings report (SoFR) presents the results of import stockpile soil sampling conducted on behalf of Hickam Communities LLC (HC), on HC property at Joint Base Pearl Harbor-Hickam, O`ahu, Hawai`i. Tetra Tech performed the stockpile soil sampling under Task Order #56.

The purpose of this investigation was to evaluate the stockpiled soil for the presence (if any) of organochlorine pesticides, and to determine the suitability of the soil for import as clean backfill for the HC neighborhoods Earhart I-2 and Earhart I-3. The soil sampling and evaluation of the analytical results was done in accordance with the *Pesticide Impacted Soils Investigation and Management Program Manual* (Program Manual) (Tetra Tech 2009), and the *Removal Action Work Plan No. 1* (RO# 1) (Tetra Tech 2010c). This SoFR documents the sampling and analysis of the two soil stockpiles described below:

- **DB Contractor Stockpile.** An approximately 1,200-cubic yard (CY) soil stockpile located west of the DB Contractor's Office (Figure 1). The soil in this stockpile was generated during grading operations at various HC residential sites within JBPHH.

- **Onizuka II-3 Stockpile.** An approximately 1,600-CY soil stockpile located in a parking lot off Apollo Avenue (Figure 2). The soil in this stockpile was generated during burial pit excavation within open areas at the Onizuka II-3 Neighborhood.

## FIELD METHODS

Tetra Tech mobilized to sample the stockpile near the DB Contractor's Office on October 6, 2010, and to sample the Onizuka II-3 stockpile on October 8, 2010. All sampling activities were conducted in accordance to the Sampling Analysis Plans (SAP) prepared for these sampling events (Tetra Tech 2010a and 2010b, respectively).

Before sampling, each stockpile was separated into decision units (DU) as shown in Figures 1 and 2. The stockpile located near the DB Contractor's Office was separated into three DUs (DB-STP-1 through DB-STP-3) and the Onizuka II-3 stockpile was separated into four DUs (ONI-STP-1 through ONI-STP-4). Tetra Tech followed the MI soil sampling protocols recommended by Hawai`i Department of Health (HDOH) for this event (HDOH 2009a). For each stockpile DU, one multi-incremental (MI) soil sample was collected Tetra Tech collected fifty (50) soil increments (subsamples) using dedicated stainless steel spoons. Samples were collected from each DU at depths ranging from the surface down to the original grade. Soil at depths greater than 6-inches was collected from the bucket of an excavator, which safely accessed and collected material from various locations from the interiors of the individual stockpile DUs. For quality assurance/quality control purposes, Tetra Tech collected triplicate (one MI sample and two replicates) from one DU at each stockpile (DB-STP-3 and ONI-STP-4).

The collected soil was composited in the field by placing the subsamples for each MI soil sample into a 1-gallon sealable plastic bag. To preserve sample integrity during sample collection and transport, the MI soil sample bag was sealed, labeled, and placed into an ice-cooled insulated chest for transport under a chain-of-custody to the analytical laboratory.

## ANALYTICAL METHODS

A total of eleven MI soil samples were submitted to Torrent Laboratory, Milpitas, California for analysis. The MI soil samples were prepared according to the HDOH MI sub-sampling protocol (HDOH 2009a). Material from each 1-gallon bag was air dried at room temperature, sieved through a 2 millimeter (mm) sieve. The sieved material was then spread out and thirty sub-samples collected by the laboratory were combined into one MI sample and prepared for analysis. Each MI soil sample was analyzed for Organochlorine Pesticides by US Environmental Protection Agency (EPA) Method 8081A.

## ANALYTICAL RESULTS

The analytical results were compared to the following screening levels:

- The HDOH Tier 1 Environmental Action Levels (EALs) for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is not a drinking water resource (Table B-1) (HDOH 2009b);
- The Site-specific Tier 2 EALs for aldrin, dieldrin, and technical chlordane established for HC property (Tetra Tech 2009); and
- The Tier 2-based cumulative risk was calculated for organochlorine pesticides and compared to the 1 x $10^{-5}$ cumulative risk threshold established for HC property (Tetra Tech 2009).

The laboratory analytical results are summarized below, and presented in Table 1. Copies of the analytical reports are provided in Appendix B. Only analytes detected at or above the laboratory reporting limit are shown in Table 1.

### Results

- **DB Contractor Stockpile.** Organochlorine pesticides were detected at concentrations at or above laboratory reporting limits in the DB Contractor Stockpile.
    - Dieldrin concentrations ranged from 0.12 to 0.19 milligrams per kilogram (mg/kg) which exceed the HDOH Tier 1 EAL for dieldrin (0.03 mg/kg); however these detections are below the Tier 2 EAL.
    - There were no other detections of organochlorine pesticides exceeding the respective Tier 1 EALs in the DB Contractor Stockpile.
- **Onizuka II-3 Stockpile.** Organochlorine pesticides were not detected at concentrations at or above laboratory reporting limits in the MI soil samples collected from the Onizuka II-3 Stockpile. [1]

## CUMULATIVE RISK

Cumulative risk is the sum of the carcinogenic risks of the individual compounds. For HC sites, the calculated Tier 2-based cumulative risk posed by aldrin, chlordane, and dieldrin is compared to the 1 x $10^{-5}$ risk threshold established for HC (Tetra Tech 2009). The cumulative risk can be exceeded even if there are no detections above the HC Tier 2 EALs. If the calculated cumulative risk exceeds the risk threshold, the soil is designated as pesticide-impacted (PI) soil.

[1] Since there were no detections at or above the laboratory reporting limit in the MI soil samples collected from the Onizuka II-3 stockpile, a table was not generated.

- For the DB Contractor Stockpile, the calculated Tier 2-based cumulative risk does not exceed the $1 \times 10^{-5}$ risk threshold for any of the MI soil samples.

## CONCLUSIONS

Based on Tetra Tech's evaluation of the analytical results, and the project plans (Tetra Tech 2009 and 2010c), Tetra Tech concludes that the soil in both stockpiles located at the Site **is not PI soil** and is therefore suitable for unrestricted use on HC property.

**DB Contractor Stockpile.** Organochlorine pesticides were detected at concentrations at or above laboratory reporting limits in all of the MI soil samples collected from the DB Contractor Stockpile. There are no detections exceeding the respective Tier 2 EALs established for HC property, and the Tier 2-based calculated risk is below the $1 \times 10^{-5}$ risk threshold established for HC property (Tetra Tech 2009). Detections for dieldrin were at concentrations exceeding the Tier 1 EAL for dieldrin.

**Onizuka II-3 Stockpile.** Organochlorine pesticides were not detected at concentrations at or above laboratory reporting limits in the MI soil samples collected from the Onizuka II-3 Stockpile

## REFERENCES

CFR (Code of Federal Regulations). 2010. CFR Title 40: 261.24 Table 1—Maximum Concentration of Contaminants for the Toxicity Characteristic. Accessed at internet website URL: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9b8d30a98d2bd8ffe90e6b8042d2ffc6&rgn=div8&view=text&node=40:25.0.1.1.2.3.1.5&idno=40

HDOH (Hawai`i Department of Health). 2009a. *Interim Final Technical Guidance Manual for Implementation of the Hawaii State Contingency Plan.* Prepared by: Hawai`i Department of Health Environmental Management Division. June 21.

HDOH (Hawai`i Department of Health). 2009b. HDOH Environmental Action Levels, Supplemental Models in Excel Format, EAL Surfer. March 2009. Accessed at internet website URL: http://hawaii.gov/health/environmental/hazard/eal2005.html

Tetra Tech. 2009. *Pesticide-Impacted Soils Investigation and Management Program Manual, Hickam Air Force Base,* O`ahu, Hawai`i. Prepared for Hickam Community Housing LLC. May 2009.

Tetra Tech. 2010a. *Sampling and Analysis Plan, Stockpile Sampling, West of the Design/Build Contractor Office, Hickam Air Force Base, Hawai`i.* Prepared for Prepared for Hickam Communities LLC. October 6, 2010.

Tetra Tech. 2010b. *Sampling and Analysis Plan, Stockpile Sampling, Onizuka II-3, Hickam Air Force Base, Hawai`i.* Prepared for Prepared for Hickam Communities LLC. October 8, 2010.

Tetra Tech. 2010c. *Removal Action Work Plan No. 1, Immediate Actions for Pesticide-Impacted Soil, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, O`ahu Hawai`i.* Prepared for Hickam Communities, LLC. DCN 2653504.001.F05. October 11, 2010.

If you have any questions or comments about this report, please do not hesitate to contact me at (415) 490-2975 or Yvonne Parry in our Honolulu office, at (808) 533-3366. Tetra Tech appreciates the opportunity to provide continued environmental support to HC.

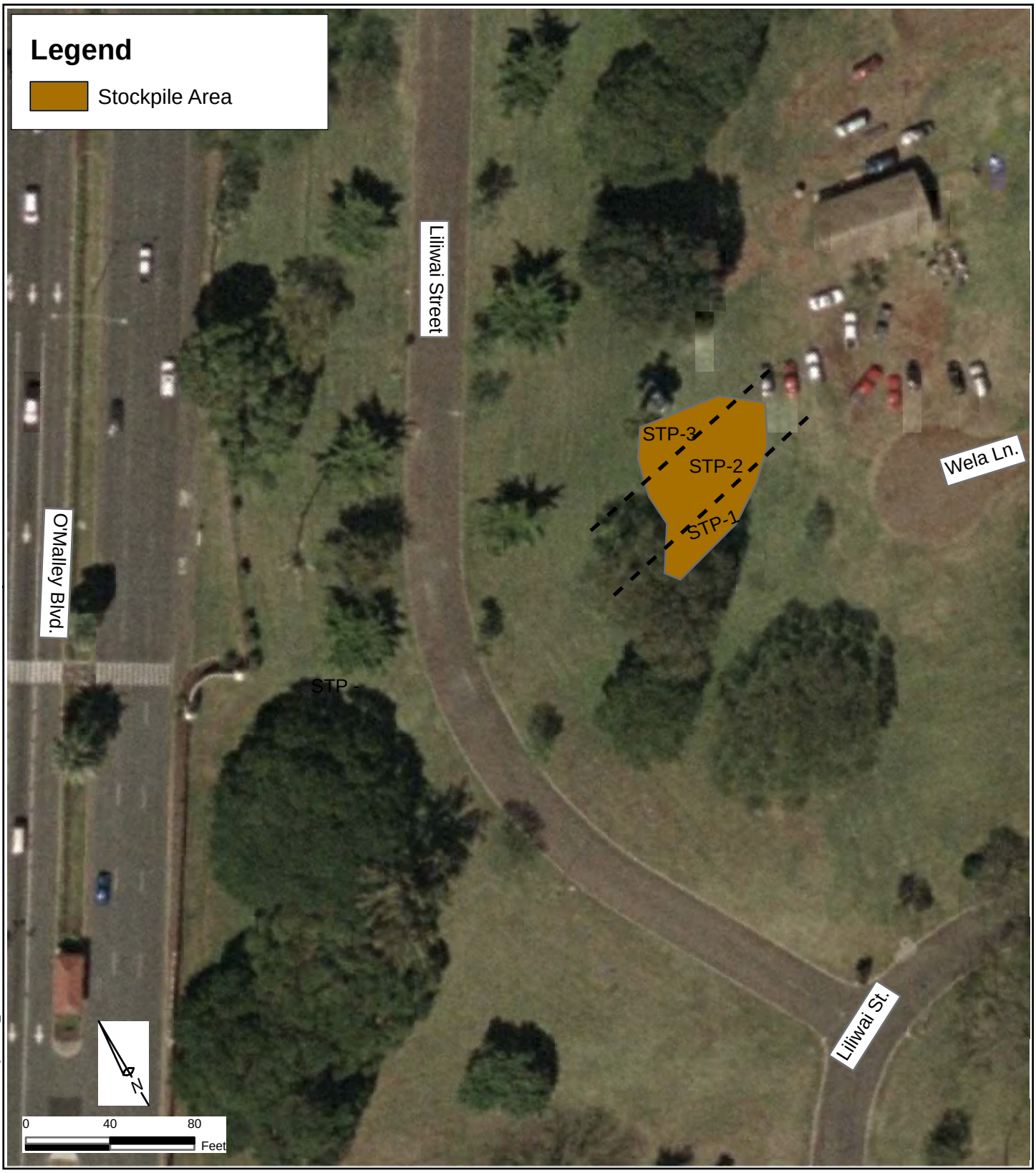
Sincerely,
**TETRA TECH**

Gail Eaton, P.G.
Senior Geologist
Tetra Tech

Attachments:
Figure 1 – DB Contractor Office Stockpile Location
Figure 2 – Onizuka II-3 Stockpile Location
Table 1 – Summary of DB Contractor Office Stockpile Analytical Results
Appendix A – Field Records
Appendix B – Laboratory Analytical Reports

cc: Gary Floyd, Program Manager, Tetra Tech
Tom Whitehead C.HG., Technical Lead, Tetra Tech
Yvonne Parry, Project Manager, Tetra Tech

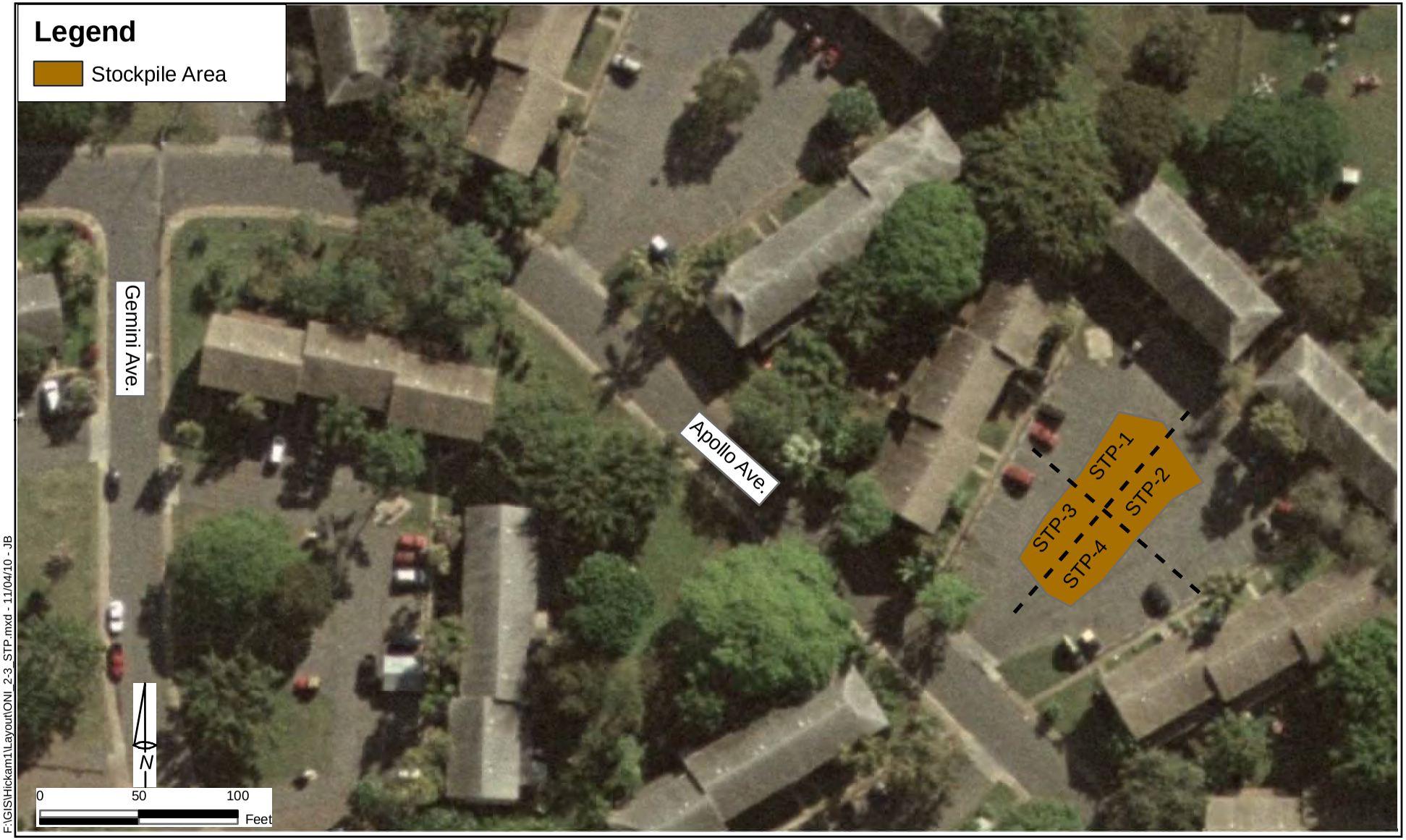
# FIGURES




***Location Map For Stockpiles Near DB Contractor Office***

Hickam Air Force Base, O'ahu, Hawai'i

**Figure 1**

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# *Onizuka II-3 Stockpile Location Map*

Hickam Air Force Base, O'ahu, Hawai'i

Tetra Tech, Inc

**Figure 2**

# TABLE

**Table 1**
**Analytical Results for Pesticides in Soil**
**D/B Contractor Office Stockpile**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Sample Name → | HDOH Tier 1 EAL[1] (mg/kg) | HC Tier 2 EAL[2] (mg/kg) | DB-STP-1 (mg/kg) | DB-STP-2 (mg/kg) | DB-STP-3A (mg/kg) | DB-STP-3B (mg/kg) | DB-STP-3C (mg/kg) |
|---|---|---|---|---|---|---|---|
| ***Sample Date →*** | | | ***10/6/2010*** | ***10/6/2010*** | ***10/6/2010*** | ***10/6/2010*** | ***10/6/2010*** |
| ***Analyte*** | | | | | | | |
| 4,4´-DDD | 2.0 | NE | 0.023 | 0.013 | 0.026 | 0.0057 | 0.0053 |
| 4,4´-DDE | 1.4 | NE | 0.34 | 0.25 | 0.16 | 0.16 | 0.14 |
| 4,4´-DDT | 1.7 | NE | 0.56 | 0.16 | 0.45 | 0.083 | 0.08 |
| Aldrin | 0.029 | 0.42 | 0.0062 | 0.0076 | 0.012 | 0.015 | 0.011 |
| Dieldrin | 0.03 | 0.45 | 0.14 | 0.12 | 0.19 | 0.18 | 0.15 |
| Techncial chlordane[3] | 16 | 23.4 | 0.61 | 0.41 | 0.41 | 0.36 | 0.35 |
| Heptachlor epoxide | 0.046 | NE | 0.0061 | <0.02 | <0.04 | <0.02 | <0.02 |
| | | | | | | | |
| ***Cumulative Risk*** | | | 4 E-06 | 3 E-06 | 5 E-06 | 5 E-06 | 4 E-06 |

***Notes:***

Only detected analytes are shown in this table.

Exceeds HDOH Tier 1 EAL

Exceeds HC Tier 2 EAL

Below 1 x $10^{-5}$ risk threshold

Above 1 x $10^{-5}$ risk threshold

| | |
|---|---|
| HDOH | Hawai`i Department of Health |
| EAL | Environmental Action Level |
| mg/kg | milligram per kilogram |
| < | less than the laboratory reporting limit |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethylene |
| DDT | dichlorodiphenyltrichloroethane |
| NE | not established |
| 1 | HDOH Tier 1 EALs are for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is a non drinking water resource (Table B-1) (HDOH 2009). |
| 2 | Site-specific HC Tier 2 EALs calculated for Hickam Communities property (Tetra Tech 2009). |
| 3 | Technical chlordane. The technical chlordane constituents alpha- and gamma-chlordane not reported in this table. Any detections of alpha- and gamma-chlordane are provided in the laboratory analytical report. |

# APPENDIX A

## FIELD RECORDS

TETRA TECH



# FIELD NOTES

**Project Title:** DB office Stockpile Sampling
**Project #:** 100-SFO-T26535-04
**Date:** 10/6/10 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities LLC
**Tt Personnel:** J Mollison

**Misc. Personnel:**

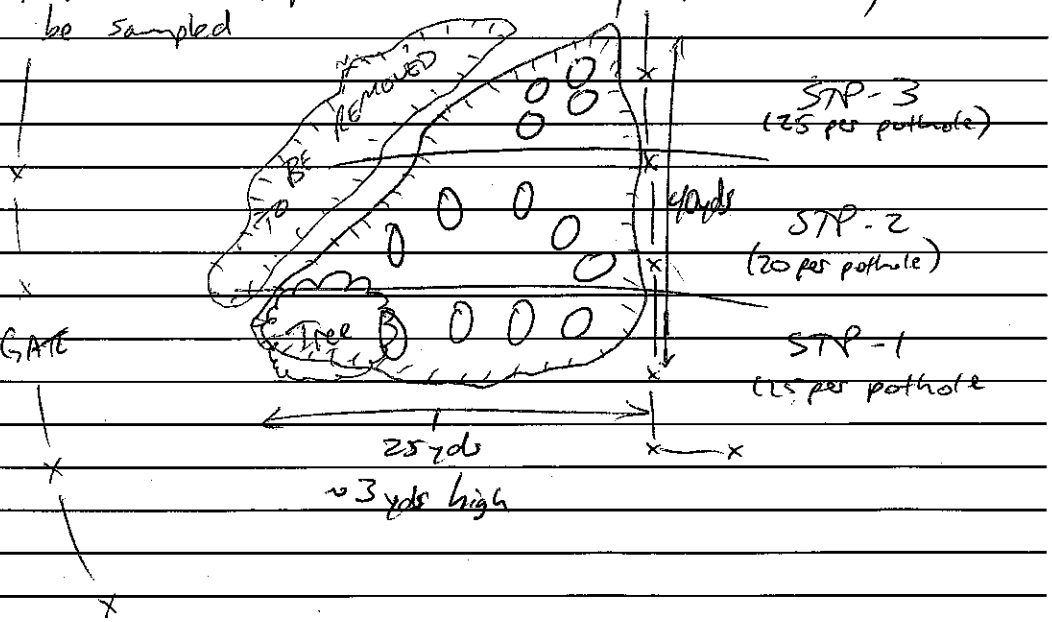
**Statement of Work:** Stockpile soil sampling

**Equipment Used:**

**Weather:** Sunny, breezy

| Time | Project Activity |
|---|---|
| 1000 | Tt arrived on site |
| 1005 | Health & Safety Meeting |

Meet with Stephen "Mac" Mackey to identify soils to be sampled




- Begin collecting samples from outer shell of stockpiles, 50 increments per pile, while waiting for excavator

1035 Excavator arrives on site

1040 Begin collecting interior increments by installing 4 to 5 potholes per DU and collecting 20-25 increments per pothole for a total of 100 interior increments or 150 increments per sample

1055 Collect DB-STP-3A

1100 Collect DB-STP-3B

1105 Collect DB-STP-3C

1130 Collect DB-STP-2

1155 Collect DB-STP-1

1200 off-site

TETRA TECH



# FIELD NOTES: SOIL MANAGEMENT

**Project #:** 100-SFO-T26535-04
**Project Title:** Oniziuka II-3 Soil Stockpile Sampling
**Date:** 10/8/10
**Time:** 800AM
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** S Mollison

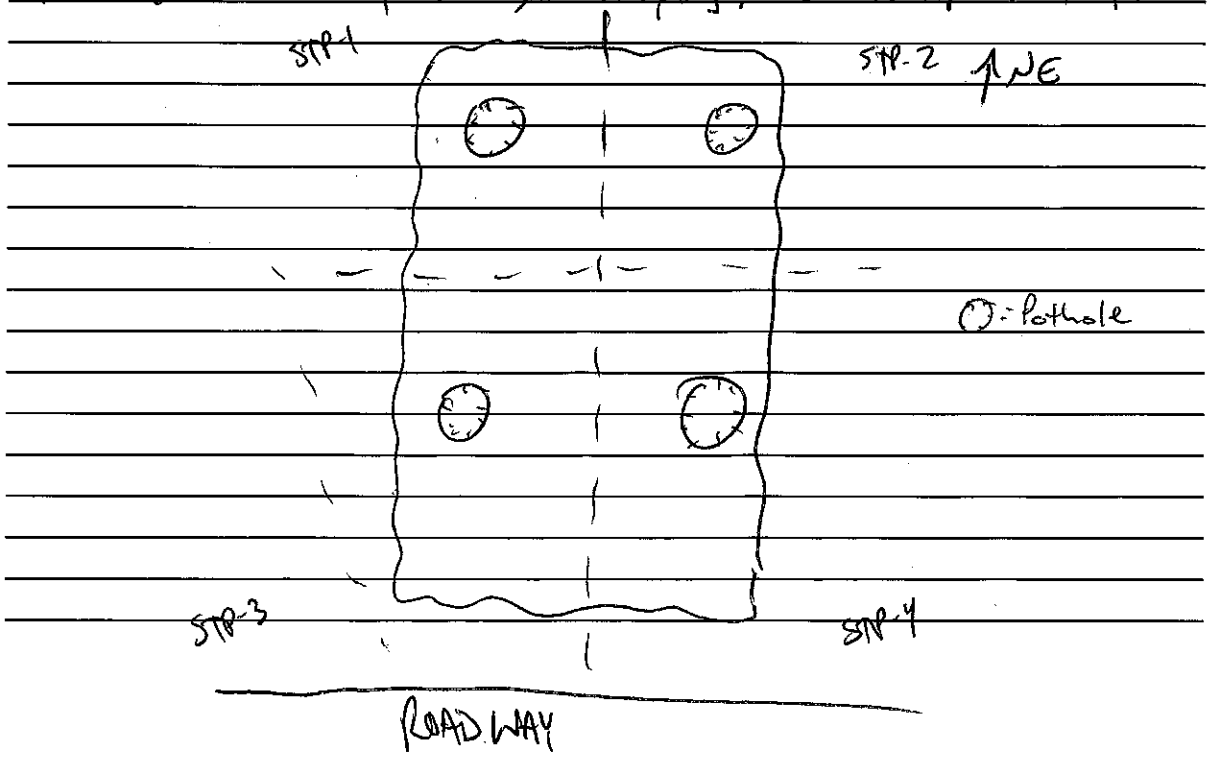
**Misc. Personnel:**

**Statement of Work:** Stockpile sampling

**Equipment Used:**

**Weather:** Sunny, light breeze

| Time | Project Activity |
|---|---|
| | Tt arrived on site |
| | Health & Safety Meeting |
| 700AM | ON-SITE FOR Standard Health & Safety Meeting at DB Contractor office |
| 805 | Arrive on site - Oniziuka II-3 |
| | Co-ordinate with Actus Site Superintendent |
| 845 | Excavator ready to begin sampling, levels at top of stockpile |



10/8/10 DB CONTRACTOR OFFICE

For each DU, the following sample process was used:

1. Install one pothole in the rentroid of the DU
   - Collect 3 increments from every other bucket load removed from the pothole
   - Total of 21 increments collected from interior of the DU
   - Collect 29 increments from the outer shell of the DU
   - Total of 50 increments per sample

900 Sample ON13-STP-1
915 Sample ON13-STP-2
930 Sample ON13-STP-3
945 Sample ON1-STP-4A
950 Sample ON1-STP-4B
955 Sample ON1-STP-4C

1015 off-site

# APPENDIX B

## LABORATORY ANALYTICAL REPORTS

Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306

RE: D/B Contractor Stockpile

Work Order No.: 1010063

Dear Yvonne Parry:

Torrent Laboratory, Inc. received 5 sample(s) on October 07, 2010 for the analyses presented in the following Report.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.

Patti Sandrock

October 14, 2010
Date

**Date:** 10/14/2010

**Client:** Tetra Tech Inc (HI)

**Project:** D/B Contractor Stockpile

**Work Order:** 1010063

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Analytical Comments, General, For all samples -Note:Samples processed under Incremental Sampling Procedure SOP TCI0109. Sample collection date and time is reflective of Hawaiian Standard Time (HST) while all anlaytical dates and times are reflective of Pacific Standard Time (PST).

Analytical Comments for METHOD 8081S_Tetra Tech, ALL SAMPLE, Note: Per client request, whenever possible (where matrix interference does not preclude it),sample data is reported to the MDL. Results reported between the MDL and PQL are qualified with the appropriate "J" flag and should be considered as estimated values

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

**DB-STP-3A** 1010063-001

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 20 | 0.0088 | 0.040 | 0.012 | mg/Kg |
| gamma-Chlordane | SW8081A | 20 | 0.0084 | 0.040 | 0.057 | mg/Kg |
| alpha-Chlordane | SW8081A | 20 | 0.0072 | 0.040 | 0.060 | mg/Kg |
| 4,4'-DDE | SW8081A | 20 | 0.0095 | 0.040 | 0.16 | mg/Kg |
| Dieldrin | SW8081A | 20 | 0.0085 | 0.040 | 0.19 | mg/Kg |
| 4,4'-DDD | SW8081A | 20 | 0.0094 | 0.040 | 0.026 | mg/Kg |
| 4,4'-DDT | SW8081A | 20 | 0.016 | 0.040 | 0.45 | mg/Kg |
| Chlordane | SW8081A | 20 | 0.20 | 0.40 | 0.41 | mg/Kg |

**DB-STP-3B** 1010063-002

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.015 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.050 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.053 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.16 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.18 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0057 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.083 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.36 | mg/Kg |

**DB-STP-3C** 1010063-003

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.011 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.049 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.052 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.14 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.15 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0053 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.080 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.35 | mg/Kg |

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

**DB-STP-2** 1010063-004

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.0076 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.054 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.055 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.25 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.12 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.013 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.16 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.41 | mg/Kg |

**DB-STP-1** 1010063-005

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Aldrin | SW8081A | 10 | 0.0044 | 0.020 | 0.0062 | mg/Kg |
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0061 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.085 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.097 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.34 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.14 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.023 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.56 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.61 | mg/Kg |

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-3A | **Lab Sample ID:** | 1010063-001A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 10:55 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0088 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0079 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0073 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0098 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.022 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0088 | 0.040 | 0.012 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0063 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0084 | 0.040 | 0.057 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0072 | 0.040 | 0.060 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.012 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0095 | 0.040 | 0.16 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0085 | 0.040 | 0.19 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.011 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0094 | 0.040 | 0.026 | J | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.031 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.016 | 0.040 | 0.45 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.021 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0098 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.012 | 0.10 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.0080 | 0.040 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.20 | 0.40 | 0.41 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 20 | 0.20 | 2.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 20 | 52.5 | 139 | 129 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 20 | 50.2 | 139 | 129 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-3B | **Lab Sample ID:** | 1010063-002A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 11:00 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | 0.015 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0042 | 0.020 | 0.050 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | 0.053 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0048 | 0.020 | 0.16 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0043 | 0.020 | 0.18 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0047 | 0.020 | 0.0057 | J | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0081 | 0.020 | 0.083 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 0.20 | 0.36 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 52.5 | 139 | 124 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 50.2 | 139 | 124 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-3C | **Lab Sample ID:** | 1010063-003A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 11:05 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | 0.011 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0042 | 0.020 | 0.049 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | 0.052 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0048 | 0.020 | 0.14 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0043 | 0.020 | 0.15 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0047 | 0.020 | 0.0053 | J | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0081 | 0.020 | 0.080 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 0.20 | 0.35 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 52.5 | 139 | 117 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 50.2 | 139 | 112 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-2 | **Lab Sample ID:** | 1010063-004A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 11:30 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | 0.0076 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0042 | 0.020 | 0.054 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | 0.055 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0048 | 0.020 | 0.25 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0043 | 0.020 | 0.12 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0047 | 0.020 | 0.013 | J | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0081 | 0.020 | 0.16 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 0.20 | 0.41 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 52.5 | 139 | 123 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 50.2 | 139 | 121 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/07/10
**Date Reported:** 10/14/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | DB-STP-1 | **Lab Sample ID:** | 1010063-005A |
| **Project Name/Location:** | D/B Contractor Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-26535-04 | | |
| **Date/Time Sampled:** | 10/06/10 / 11:55 | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| gamma-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| beta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| delta-BHC | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Heptachlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Aldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0044 | 0.020 | 0.0062 | J | mg/Kg | 402587 | 1312 |
| Heptachlor epoxide | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0032 | 0.020 | 0.0061 | J | mg/Kg | 402587 | 1312 |
| gamma-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0042 | 0.020 | 0.085 | | mg/Kg | 402587 | 1312 |
| alpha-Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0036 | 0.020 | 0.097 | | mg/Kg | 402587 | 1312 |
| Endosulfan I | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDE | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0048 | 0.020 | 0.34 | | mg/Kg | 402587 | 1312 |
| Dieldrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0043 | 0.020 | 0.14 | | mg/Kg | 402587 | 1312 |
| Endrin | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDD | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0047 | 0.020 | 0.023 | | mg/Kg | 402587 | 1312 |
| Endosulfan II | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| 4,4'-DDT | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0081 | 0.020 | 0.56 | | mg/Kg | 402587 | 1312 |
| Endrin aldehyde | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Endosulfan sulfate | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Methoxychlor | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402587 | 1312 |
| Endrin Ketone | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402587 | 1312 |
| Chlordane | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 0.20 | 0.61 | | mg/Kg | 402587 | 1312 |
| Toxaphene | SW8081A | 10/13/10 | 10/14/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402587 | 1312 |
| TCMX (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 52.5 | 139 | 118 | | % | 402587 | 1312 |
| DCBP (S) | SW8081A | 10/13/10 | 10/14/10 | 10 | 50.2 | 139 | 122 | | % | 402587 | 1312 |

**NOTE:** Reporting limits increased due to dilution necessary for quantitation.

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1010063 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 10/13/10 | **Prep Batch:** | 1312 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 10/14/10 | **Analytical Batch:** | 402587 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | ND | |
| gamma-BHC | 0.40 | 2.0 | ND | |
| beta-BHC | 0.36 | 2.0 | ND | |
| delta-BHC | 0.49 | 2.0 | ND | |
| Heptachlor | 1.1 | 2.0 | ND | |
| Aldrin | 0.44 | 2.0 | ND | |
| Heptachlor epoxide | 0.32 | 2.0 | ND | |
| gamma-Chlordane | 0.42 | 2.0 | ND | |
| alpha-Chlordane | 0.36 | 2.0 | ND | |
| Endosulfan I | 0.59 | 2.0 | ND | |
| 4,4'-DDE | 0.48 | 2.0 | ND | |
| Dieldrin | 0.43 | 2.0 | ND | |
| Endrin | 0.57 | 2.0 | ND | |
| 4,4'-DDD | 0.47 | 2.0 | ND | |
| Endosulfan II | 1.5 | 2.0 | ND | |
| 4,4'-DDT | 0.81 | 2.0 | ND | |
| Endrin aldehyde | 1.0 | 2.0 | ND | |
| Endosulfan sulfate | 0.49 | 2.0 | ND | |
| Methoxychlor | 0.62 | 5.0 | ND | |
| Endrin Ketone | 0.40 | 2.0 | ND | |
| Chlordane | 10 | 20 | ND | |
| Toxaphene | 10 | 100 | ND | |
| TCMX (S) | | | 105 | |
| DCBP (S) | | | 105 | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1010063 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 10/13/10 | **Prep Batch:** | 1312 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 10/14/10 | **Analytical Batch:** | 402587 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | | 20 | 92.0 | 104 | 12.3 | 44.2 - 125 | 30 | |
| gamma-BHC | 0.40 | 2.0 | | 20 | 89.2 | 100 | 12.1 | 56.9 - 124 | 30 | |
| beta-BHC | 0.36 | 2.0 | | 20 | 93.8 | 106 | 11.6 | 44.2 - 125 | 30 | |
| delta-BHC | 0.49 | 2.0 | | 20 | 85.4 | 97.8 | 13.4 | 61.5 - 116 | 30 | |
| Heptachlor | 1.1 | 2.0 | | 20 | 101 | 114 | 12.3 | 63.6 - 125 | 30 | |
| Aldrin | 0.44 | 2.0 | | 20 | 96.6 | 109 | 12.4 | 53 - 126 | 30 | |
| Heptachlor epoxide | 0.32 | 2.0 | | 20 | 98.7 | 112 | 12.8 | 54.6 - 130 | 30 | |
| gamma-Chlordane | 0.42 | 2.0 | | 20 | 97.0 | 109 | 12.0 | 68.7 - 123 | 30 | |
| alpha-Chlordane | 0.36 | 2.0 | | 20 | 95.2 | 107 | 12.3 | 42.4 - 128 | 30 | |
| Endosulfan I | 0.59 | 2.0 | | 20 | 91.3 | 104 | 12.6 | 61.2 - 119 | 30 | |
| 4,4'-DDE | 0.48 | 2.0 | | 20 | 95.0 | 107 | 12.3 | 45.3 - 123 | 30 | |
| Dieldrin | 0.43 | 2.0 | | 20 | 96.1 | 109 | 12.7 | 44 - 128 | 30 | |
| Endrin | 0.57 | 2.0 | | 20 | 100 | 112 | 10.8 | 44.1 - 126 | 30 | |
| 4,4'-DDD | 0.47 | 2.0 | | 20 | 91.0 | 104 | 13.8 | 39.6 - 123 | 30 | |
| Endosulfan II | 1.5 | 2.0 | | 20 | 81.0 | 91.7 | 12.4 | 56.7 - 112 | 30 | |
| 4,4'-DDT | 0.81 | 2.0 | | 20 | 99.2 | 114 | 14.1 | 52.8 - 134 | 30 | |
| Endrin aldehyde | 1.0 | 2.0 | | 20 | 78.1 | 86.4 | 10.3 | 50.2 - 113 | 30 | |
| Endosulfan sulfate | 0.49 | 2.0 | | 20 | 88.5 | 101 | 13.7 | 62.1 - 116 | 30 | |
| Methoxychlor | 0.62 | 5.0 | | 20 | 105 | 115 | 9.06 | 55.2 - 126 | 30 | |
| Endrin Ketone | 0.40 | 2.0 | | 20 | 78.1 | 93.9 | 18.5 | 53.9 - 120 | 30 | |
| TCMX (S) | | | | 2100 | 91.8 | 105 | | 52.5 - 121 | | |
| DCBP (S) | | | | 2100 | 88.4 | 101 | | 50.2 - 121 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: D/B Contractor Stockpile

Work Order No.: 1010063

Date and Time Received: 10/7/2010 13:30

Received By: NK

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 6 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | | | | |
| pH Checked by: | pH Adjusted by: | | | |

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)
**QC Level:**
**Project Name:** D/B Contractor Stockpile
**TAT Requested:** 3 day:25
**Project # :** 100-SFO-26535-04
**Date Received:** 10/7/2010
**Report Due Date:** 10/14/2010
**Time Received:** 13:30

**Comments:** 3 Day RUSH (plus 2 Days drying)! MI 8081 (OCP)! Report to Yvonne, Gail Jon and Tom! Needs EDD

**Work Order # :** ***1010063***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1010063-001A | DB-STP-3A | 10/06/10 10:55 | Soil | 04/05/11 | | | EDD<br>S_8081MITetra | |
| 1010063-002A | DB-STP-3B | 10/06/10 11:00 | Soil | 04/05/11 | | | S_8081MITetra | |
| 1010063-003A | DB-STP-3C | 10/06/10 11:05 | Soil | 04/05/11 | | | S_8081MITetra | |
| 1010063-004A | DB-STP-2 | 10/06/10 11:30 | Soil | 04/05/11 | | | S_8081MITetra | |
| 1010063-005A | DB-STP-1 | 10/06/10 11:55 | Soil | 04/05/11 | | | S_8081MITetra | |

Torrent LABORATORY, INC.

# CHAIN-OF-CUSTODY RECORD

TETRA TECH

1010063

Client Name/Account #: TetraTech, Inc.
Address: 737 Bishop St., Suite 3020
City/State/Zip: Honolulu, HI 96813
Project Manager: Y. Parry
Telephone Number: (808)533-3366 Fax No.: (808)533-3306
Sampler Name: (Print) Jon Mollison
Sampler Signature:

Report To: Y. Parry, G. Eaton, T. Whitehead, J. Mollison
Invoice To: Y. Parry
Project ID:
Project #:

| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Preservative: Ice | Preservative: $HNO_3$ (Red Label) | Preservative: HCl (Blue Label) | Preservative: NaOH ( Orange Label) | Preservative: $H_2SO_4$ Plastic (Yellow Label) | Preservative: $H_2SO_4$ Glass(Yellow Label) | Preservative: None (Black Label) | Preservative: Other (one MeOH VOA) | Matrix: Groundwater | Matrix: Wastewater | Matrix: Drinking Water | Matrix: Sludge | Matrix: Soil | Matrix: Other (specify): | Analyze For: Multi-Incremental Preparatio | Analyze For: 8081 | RUSH TAT (Pre-Schedule) | Standard TAT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001A | DB-STP-3A | 10/6/10 | 1055 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 002A | DB-STP-3B | 10/6/10 | 1100 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 003A | DB-STP-3C | 10/6/10 | 1105 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 004A | DB-STP-2 | 10/6/10 | 1130 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 005A | DB-STP-1 | 10/6/10 | 1155 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |

RUSH
3 DAYS

Special Instructions: Please proceed with air-drying, sieving and subsampling as per HDOH guidance

Method of Shipment: FEDEX

Laboratory Comments:
Temperature Upon Receipt: 6 °C
VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| Jon Mollison | 10/6/10 | 1300 | FED EX | | |
| Relinquished by: | Date | Time | Received by Torrent: | Date | Time |
| Fed Ex | 10/7/10 | 1:30p | | 10/7/10 | 1:30p |

Page 1 of 1

Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306

RE: Onizuka II-3 Stockpile

Work Order No.: 1010080 Rev: 1

Dear Yvonne Parry:

Torrent Laboratory, Inc. received 6 sample(s) on October 11, 2010 for the analyses presented in the following Report.

Report revised 10/19/10 - See narrative for revision details.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.

Patti Sandrock

October 18, 2010
Date

**Date:** 10/18/2010

**Client:** Tetra Tech Inc (HI)

**Project:** Onizuka II-3 Stockpile

**Work Order:** 1010080

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Analytical Comments, General, For all samples -Note:Samples processed under Incremental Sampling Procedure SOP TCI0109. Sample collection date and time is reflective of Hawaiian Standard Time (HST) while all anlaytical dates and times are reflective of Pacific Standard Time (PST).

Analytical Comments for METHOD 8081S_Tetra Tech, ALL SAMPLE, Note: Per client request, whenever possible (where matrix interference does not preclude it),sample data is reported to the MDL. Results reported between the MDL and PQL are qualified with the appropriate "J" flag and should be considered as estimated values

REVISIONS:

Revised to report all sample data units as mg/Kg rather than ug/Kg (samples 001, 003 and 006 originally reported in ug/Kg). No QC data was affected by this revision.
Rev 1 (10/19/10)

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

**ONI3-STP-1** 1010080-001

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-2** 1010080-002

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-3** 1010080-003

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-4A** 1010080-004

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-4B** 1010080-005

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**ONI3-STP-4C** 1010080-006

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-1 | **Lab Sample ID:** | 1010080-001A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:00 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 115 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 106 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-2 | **Lab Sample ID:** | 1010080-002A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:15 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 119 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 119 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-3 | **Lab Sample ID:** | 1010080-003A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:30 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 113 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 112 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-4A | **Lab Sample ID:** | 1010080-004A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:45 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 124 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 106 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-4B | **Lab Sample ID:** | 1010080-005A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:50 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 105 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 108 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 10/11/10
**Date Reported:** 10/18/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | ONI3-STP-4C | **Lab Sample ID:** | 1010080-006A |
| **Project Name/Location:** | Onizuka II-3 Stockpile | **Sample Matrix:** | Soil |
| **Project Number:** | | | |
| **Date/Time Sampled:** | 10/08/10 / 9:55 | | |
| **Tag Number:** | Onizuka II-3 Stockpile | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| beta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| delta-BHC | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Aldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Heptachlor epoxide | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0032 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| gamma-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0042 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| alpha-Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan I | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDE | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0048 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Dieldrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0043 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDD | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0047 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan II | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| 4,4'-DDT | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0081 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endrin aldehyde | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Endosulfan sulfate | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Methoxychlor | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 402630 | 1334 |
| Endrin Ketone | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 402630 | 1334 |
| Chlordane | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 0.20 | ND | | mg/Kg | 402630 | 1334 |
| Toxaphene | SW8081A | 10/16/10 | 10/17/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 402630 | 1334 |
| TCMX (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 52.5 | 139 | 116 | | % | 402630 | 1334 |
| DCBP (S) | SW8081A | 10/16/10 | 10/17/10 | 10 | 50.2 | 139 | 95.8 | | % | 402630 | 1334 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1010080 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 10/16/10 | **Prep Batch:** | 1334 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 10/17/10 | **Analytical Batch:** | 402630 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | ND | |
| gamma-BHC | 0.40 | 2.0 | ND | |
| beta-BHC | 0.36 | 2.0 | ND | |
| delta-BHC | 0.49 | 2.0 | ND | |
| Heptachlor | 1.1 | 2.0 | ND | |
| Aldrin | 0.44 | 2.0 | ND | |
| Heptachlor epoxide | 0.32 | 2.0 | ND | |
| gamma-Chlordane | 0.42 | 2.0 | ND | |
| alpha-Chlordane | 0.36 | 2.0 | ND | |
| Endosulfan I | 0.59 | 2.0 | ND | |
| 4,4'-DDE | 0.48 | 2.0 | ND | |
| Dieldrin | 0.43 | 2.0 | ND | |
| Endrin | 0.57 | 2.0 | ND | |
| 4,4'-DDD | 0.47 | 2.0 | ND | |
| Endosulfan II | 1.5 | 2.0 | ND | |
| 4,4'-DDT | 0.81 | 2.0 | ND | |
| Endrin aldehyde | 1.0 | 2.0 | ND | |
| Endosulfan sulfate | 0.49 | 2.0 | ND | |
| Methoxychlor | 0.62 | 5.0 | ND | |
| Endrin Ketone | 0.40 | 2.0 | ND | |
| Chlordane | 10 | 20 | ND | |
| Toxaphene | 10 | 100 | ND | |
| TCMX (S) | | | 87.7 | |
| DCBP (S) | | | 77.2 | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1010080 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 10/16/10 | **Prep Batch:** | 1334 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 10/17/10 | **Analytical Batch:** | 402630 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | | 20 | 98.9 | 95.6 | 3.51 | 44.2 - 125 | 30 | |
| gamma-BHC | 0.40 | 2.0 | | 20 | 95.5 | 92.6 | 3.12 | 56.9 - 124 | 30 | |
| beta-BHC | 0.36 | 2.0 | | 20 | 103 | 97.5 | 5.45 | 44.2 - 125 | 30 | |
| delta-BHC | 0.49 | 2.0 | | 20 | 90.0 | 85.0 | 5.66 | 61.5 - 116 | 30 | |
| Heptachlor | 1.1 | 2.0 | | 20 | 104 | 99.3 | 4.66 | 63.6 - 125 | 30 | |
| Aldrin | 0.44 | 2.0 | | 20 | 105 | 98.7 | 5.72 | 53 - 126 | 30 | |
| Heptachlor epoxide | 0.32 | 2.0 | | 20 | 102 | 96.3 | 6.29 | 54.6 - 130 | 30 | |
| gamma-Chlordane | 0.42 | 2.0 | | 20 | 105 | 99.1 | 5.83 | 68.7 - 123 | 30 | |
| alpha-Chlordane | 0.36 | 2.0 | | 20 | 104 | 97.6 | 5.85 | 42.4 - 128 | 30 | |
| Endosulfan I | 0.59 | 2.0 | | 20 | 95.9 | 89.0 | 7.61 | 61.2 - 119 | 30 | |
| 4,4'-DDE | 0.48 | 2.0 | | 20 | 102 | 98.3 | 4.15 | 45.3 - 123 | 30 | |
| Dieldrin | 0.43 | 2.0 | | 20 | 101 | 94.1 | 6.62 | 44 - 128 | 30 | |
| Endrin | 0.57 | 2.0 | | 20 | 98.0 | 95.5 | 2.63 | 44.1 - 126 | 30 | |
| 4,4'-DDD | 0.47 | 2.0 | | 20 | 95.3 | 91.6 | 4.22 | 39.6 - 123 | 30 | |
| Endosulfan II | 1.5 | 2.0 | | 20 | 80.5 | 69.7 | 14.4 | 56.7 - 112 | 30 | |
| 4,4'-DDT | 0.81 | 2.0 | | 20 | 103 | 100 | 2.60 | 52.8 - 134 | 30 | |
| Endrin aldehyde | 1.0 | 2.0 | | 20 | 72.9 | 57.0 | 24.6 | 50.2 - 113 | 30 | |
| Endosulfan sulfate | 0.49 | 2.0 | | 20 | 89.1 | 68.7 | 25.7 | 62.1 - 116 | 30 | |
| Methoxychlor | 0.62 | 5.0 | | 20 | 99.1 | 95.2 | 3.88 | 55.2 - 126 | 30 | |
| Endrin Ketone | 0.40 | 2.0 | | 20 | 82.7 | 74.5 | 10.2 | 53.9 - 120 | 30 | |
| TCMX (S) | | | | 2100 | 97.3 | 93.8 | | 52.5 - 121 | | |
| DCBP (S) | | | | 2100 | 91.3 | 87.8 | | 50.2 - 121 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: Onizuka II-3 Stockpile

Work Order No.: 1010080

Date and Time Received: 10/11/2010 10:10

Received By: NGH

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 6 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | | | | |
| pH Checked by: | pH Adjusted by: | | | |

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)

**Project Name:** Onizuka II-3 Stockpile

**Project # :**

**Report Due Date:** 10/18/2010

**QC Level:**

**TAT Requested:** 3 day:25

**Date Received:** 10/11/2010

**Time Received:** 10:10

**Comments:** 3 day Rush! (+2 days for drying) Received 6 soils @ 6'C for multi incremental sampling for 8081. Samples need to be air dried, sieved and subsampled.

**Work Order # :** ***1010080***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1010080-001A | ONI3-STP-1 | 10/08/10 9:00 | Soil | 04/09/11 | | | EDD<br>S_8081MITetra | |
| **Sample Note:** | 3 day Rush! proceed with air-drying, Sieving and subsampling as per HDOH guidance.Multi incremental sampling. | | | | | | | |
| 1010080-002A | ONI3-STP-2 | 10/08/10 9:15 | Soil | 04/09/11 | | | S_8081MITetra | |
| 1010080-003A | ONI3-STP-3 | 10/08/10 9:30 | Soil | 04/09/11 | | | S_8081MITetra | |
| 1010080-004A | ONI3-STP-4A | 10/08/10 9:45 | Soil | 04/09/11 | | | S_8081MITetra | |
| 1010080-005A | ONI3-STP-4B | 10/08/10 9:50 | Soil | 04/09/11 | | | S_8081MITetra | |
| 1010080-006A | ONI3-STP-4C | 10/08/10 9:55 | Soil | 04/09/11 | | | S_8081MITetra | |

Torrent LABORATORY, INC.

# CHAIN-OF-CUSTODY RECORD

TETRA TECH

1010080

Client Name/Account #: TetraTech, Inc.
Address: 737 Bishop St., Suite 3020
City/State/Zip: Honolulu, HI 96813
Project Manager: Y. Parry
Telephone Number: (808)533-3366 Fax No.: (808)533-3306
Sampler Name: (Print) Jon Mollison
Sampler Signature:

Report To: Y. Parry, G. Eaton, T. Whitehead, J. Mollison
Invoice To: Y. Parry
Project ID: Onizuka II-3 Stockpile
Project #:

| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Preservative: Ice | Preservative: $HNO_3$ (Red Label) | Preservative: HCl (Blue Label) | Preservative: NaOH ( Orange Label) | Preservative: $H_2SO_4$ Plastic (Yellow Label) | Preservative: $H_2SO_4$ Glass(Yellow Label) | Preservative: None (Black Label) | Preservative: Other (one MeOH VOA) | Matrix: Groundwater | Matrix: Wastewater | Matrix: Drinking Water | Matrix: Sludge | Matrix: Soil | Matrix: Other (specify): | Analyze For: Multi-Incremental Preparatio | Analyze For: 8081 | RUSH TAT (Pre-Schedule) | Standard TAT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001A | ON13-STP-1 | 10/8/10 | 900 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 002A | ON13-STP-2 | " | 915 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 003A | ON13-STP-3 | " | 930 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 004A | ON13-STP-4A | " | 945 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 005A | ON13-STP-4B | " | 950 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |
| 006A | ON13-STP-4C | ▼ | 955 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | |

RUSH
3 DAYS

Special Instructions: Please proceed with air-drying, sieving and subsampling as per HDOH guidance

Method of Shipment: FEDEX

Laboratory Comments:
Temperature Upon Receipt: 6 0
VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| Jon Mollison | 10/8/10 | 1300 | FedEx | | |
| Relinquished by: | Date | Time | Received by Torrent: | Date | Time |
| FedEx | 10-11-10 | 10:10 Am. | | 10-11-10 | 10:10 Am |

Page 1 of 1

TETRA TECH

December 28, 2010

Mladena Yankova Kukin mladena.yankovakukin@actuslendlease.com
Development Manager
Hickam Communities LLC
211 Mercury Street
Honolulu, HI 96818

**Subject: TO#56: Summary of Findings Report on Sampling and Chemical Analysis of the Onizuka II-2 Import Soil Stockpiles, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi**

Dear Ms. Yankova Kukin:

This summary of findings report (SoFR) presents the results of import stockpile soil sampling conducted on behalf of Hickam Communities LLC (HC), on HC property at Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi. Tetra Tech performed the stockpile soil sampling under Task Order #56.

The purpose of this investigation was to evaluate stockpiled soil for the presence of organochlorine pesticides, and to determine the suitability of the soil for import as clean topsoil at the HC project sites located in the Onizuka II-2 and Earhart I-2/I-3 neighborhoods. The soil sampling and evaluation of the analytical results was done in accordance with the *Pesticide Impacted Soils Investigation and Management Program Manual* (Program Manual) (Tetra Tech 2009), and the *Removal Action Work Plan No. 1* (RO# 1) (Tetra Tech 2010a).

This SoFR documents the sampling and analysis of two soil stockpiles located at the Onizuka II-2 Neighborhood (hereinafter the "Site"). The stockpiles have a cumulative volume of approximately 500 cubic yards (CY) and consist of topsoil imported from Hawaiian Earth Products, Ltd. (HIE). The two stockpiles contain 200-CY and 300-CY of topsoil.

## FIELD METHODS

Tetra Tech mobilized to the Site on November 22, 2010. All soil sampling activities were conducted in accordance to the Sampling Analysis Plan (SAP) prepared for this event (Tetra Tech 2010b). A copy of the field records is provided in Appendix A.

Before beginning the soil sampling effort, each stockpile was designated as a single decision unit (DU) as shown in Figure 1. The 200-CY stockpile was designated HIE-STP-1, and the 300-CY stockpile was designated HIE-STP-2. Tetra Tech followed the MI soil sampling protocols recommended by Hawai'i Department of Health (HDOH) for this event (HDOH 2009a). For each stockpile DU, Tetra Tech collected one multi-incremental (MI) soil sample, consisting of 75 soil increments (subsamples). The subsamples were collected from the outer layer of the stockpiles using dedicated stainless steel spoons. Since the height of both stockpiles was less than 5-feet above grade, an excavator was not used to access deeper portions of the stockpiles; to access soil inside the stockpiles Tetra Tech used hand tools and soil probes. For quality assurance/quality control purposes, a triplicate sample (one MI sample and two replicates) from HIE-STP-2.

The collected soil was composited in the field by placing the subsamples for each MI soil sample into a 1-gallon sealable plastic bag. To preserve sample integrity during sample collection and transport, the MI soil sample bag was sealed, labeled, and placed into an ice-cooled insulated chest for transport under a chain-of-custody to the analytical laboratory.

## ANALYTICAL METHODS

A total of four MI soil samples (two MI soil samples and two replicates) were submitted to Torrent Laboratory, Milpitas, California for analysis. The MI soil samples were prepared according to the HDOH MI sub-sampling protocol (HDOH 2009a). Material from each 1-gallon bag was air dried at room temperature, sieved through a 2 millimeter (mm) sieve. The sieved material was then spread out and thirty sub-samples collected by the laboratory were combined into one MI sample and prepared for analysis. Each MI soil sample was analyzed for:

- Organochlorine Pesticides by US Environmental Protection Agency (EPA) Method 8081A;
- Resource Conservation and Recovery Act (RCRA) 8 Metals (arsenic, barium, cadmium, total chromium, lead, mercury, silver, and selenium) by EPA Method 6010; and
- Total Petroleum Hydrocarbons (TPH) as diesel and motor oil by EPA Method 8015B, with silica gel cleanup.

## ANALYTICAL RESULTS

The analytical results were compared to the following screening levels:

- The HDOH Tier 1 Environmental Action Levels (EALs) for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is not a drinking water resource (Table B-1) (HDOH 2009b);
- The Site-specific Tier 2 EALs for aldrin, dieldrin, and technical chlordane established for HC property (Tetra Tech 2009); and
- The Tier 2-based cumulative risk was calculated for organochlorine pesticides and compared to the 1 x $10^{-5}$ cumulative risk threshold established for HC property (Tetra Tech 2009).

The laboratory analytical results are summarized below, and presented in Table 1. A copy of the analytical report is provided Appendix B. Only analytes detected at or above the laboratory reporting limit are shown in Table 1.

### Pesticides

- Chlordane was detected in all four MI soil samples at concentrations ranging from 0.016 milligrams per kilogram (mg/kg) to 0.017 mg/kg. These detections are below the Tier 1 EAL for chlordane (16 mg/kg)..
- Dieldrin was detected in all four MI soil samples at concentrations ranging from 0.012 mg/kg to 0.015 mg/kg. These detections are below the Tier 1 EAL for dieldrin (0.03 mg/kg)..
- Heptachlor epoxide was detected in all four MI soil samples at concentrations ranging from 0.0051 mg/kg to 0.0071 mg/kg. There is no Tier 1 or Tier 2 established for heptachlor epoxide.
- Minor concentrations of 4,4–dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyldichloroethane (DDE), and 4,4'-dichlorodiphenyltrichloroethane (DDT) were detected in all four MI soil samples. These detections are below the respective Tier 1 EALs. There is no Tier 2 EAL established for DDD, DDE, or DDT.

### Metals

- Arsenic was detected in all four MI soil samples at concentrations ranging from 6.4 mg/kg to 7.9 mg/kg. These detections are below the Tier 1 EAL for arsenic (20 mg/kg).

- Lead was detected in all four MI soil samples at concentrations ranging from 13 mg/kg to 14 mg/kg. These detections are below the Tier 1 EAL for lead (200 mg/kg).

### Petroleum Hydrocarbons

- TPH as motor oil was detected in all four MI soil samples at concentrations ranging from 180 mg/kg to 200 mg/kg. These detections are below the Tier 1 EAL (500 mg/kg).

## CUMULATIVE RISK

Cumulative risk is the sum of the carcinogenic risks of the individual compounds. For HC sites, the calculated Tier 2-based cumulative risk posed by aldrin, chlordane, and dieldrin is compared to the $1 \times 10^{-5}$ risk threshold established for HC (Tetra Tech 2009). The cumulative risk can be exceeded even if there are no detections above the HC Tier 2 EALs. If the calculated cumulative risk exceeds the risk threshold, the soil is designated as pesticide-impacted (PI) soil.

- The calculated Tier 2-based cumulative risk does not exceed the $1 \times 10^{-5}$ risk threshold in any of the four MI soil samples collected from the HIE stockpiles.

## CONCLUSIONS

For the MI soil samples collected from the HIE stockpiles at the Site:

- Organochlorine compounds were detected at concentrations above the laboratory reporting limits in all four of the MI soil samples. There were no detections of organochlorine pesticides exceeding the respective Tier 1 or Tier 2 EALs.
- The RCRA-8 metals lead and arsenic were detected at concentrations at or above the laboratory reporting limits in all four of the MI soil samples. There were no detections exceeding the respective Tier 1 EALs.
- TPH as motor oil was detected in all four MI soil samples. None of these detections exceeded the Tier 1 EAL. No other petroleum hydrocarbons were detected in the MI soil samples collected from the HIE stockpiles.
- The Tier 2-based calculated cumulative risk for all four MI soil samples is below the $1 \times 10^{-5}$ risk threshold.

Based on Tetra Tech's evaluation of the analytical results, and in accordance with the project plans (Tetra Tech 2009 and 2010a), Tetra Tech concludes that the soil in both HIE stockpiles located at the Site **is not PI soil** and is therefore suitable for unrestricted use on HC property.

## REFERENCES

CFR (Code of Federal Regulations). 2010. CFR Title 40: 261.24 Table 1—Maximum Concentration of Contaminants for the Toxicity Characteristic. Accessed at internet website URL: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9b8d30a98d2bd8ffe90e6b8042d2ffc6&rgn=div8&view=text&node=40:25.0.1.1.2.3.1.5&idno=40

HDOH (Hawai'i Department of Health). 2009a. *Interim Final Technical Guidance Manual for Implementation of the Hawaii State Contingency Plan.* Prepared by: Hawai'i Department of Health Environmental Management Division. June 21.

HDOH (Hawai'i Department of Health). 2009b. HDOH Environmental Action Levels, Supplemental Models in Excel Format, EAL Surfer. March 2009. Accessed at internet website URL: http://hawaii.gov/health/environmental/hazard/eal2005.html

Tetra Tech. 2009. *Pesticide-Impacted Soils Investigation and Management Program Manual, Hickam Air Force Base, O'ahu, Hawai'i.* Prepared for Hickam Community Housing LLC. May 2009.

Tetra Tech. 2010a. *Removal Action Work Plan No. 1, Immediate Actions for Pesticide-Impacted Soil, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl Harbor-Hickam, O'ahu Hawai'i.* Prepared for Hickam Communities, LLC. DCN 2653504.001.F05. October 11, 2010.

Tetra Tech. 2010b. *Sampling and Analysis Plan, Stockpile Sampling, Onizuka II-2, Hickam Air Force Base, Hawai'i.* Prepared for Prepared for Hickam Communities LLC. November 22, 2010.

If you have any questions or comments about this report, please do not hesitate to contact me at (415) 490-2975 or Yvonne Parry in our Honolulu office, at (808) 533-3366. Tetra Tech appreciates the opportunity to provide continued environmental support to HC.

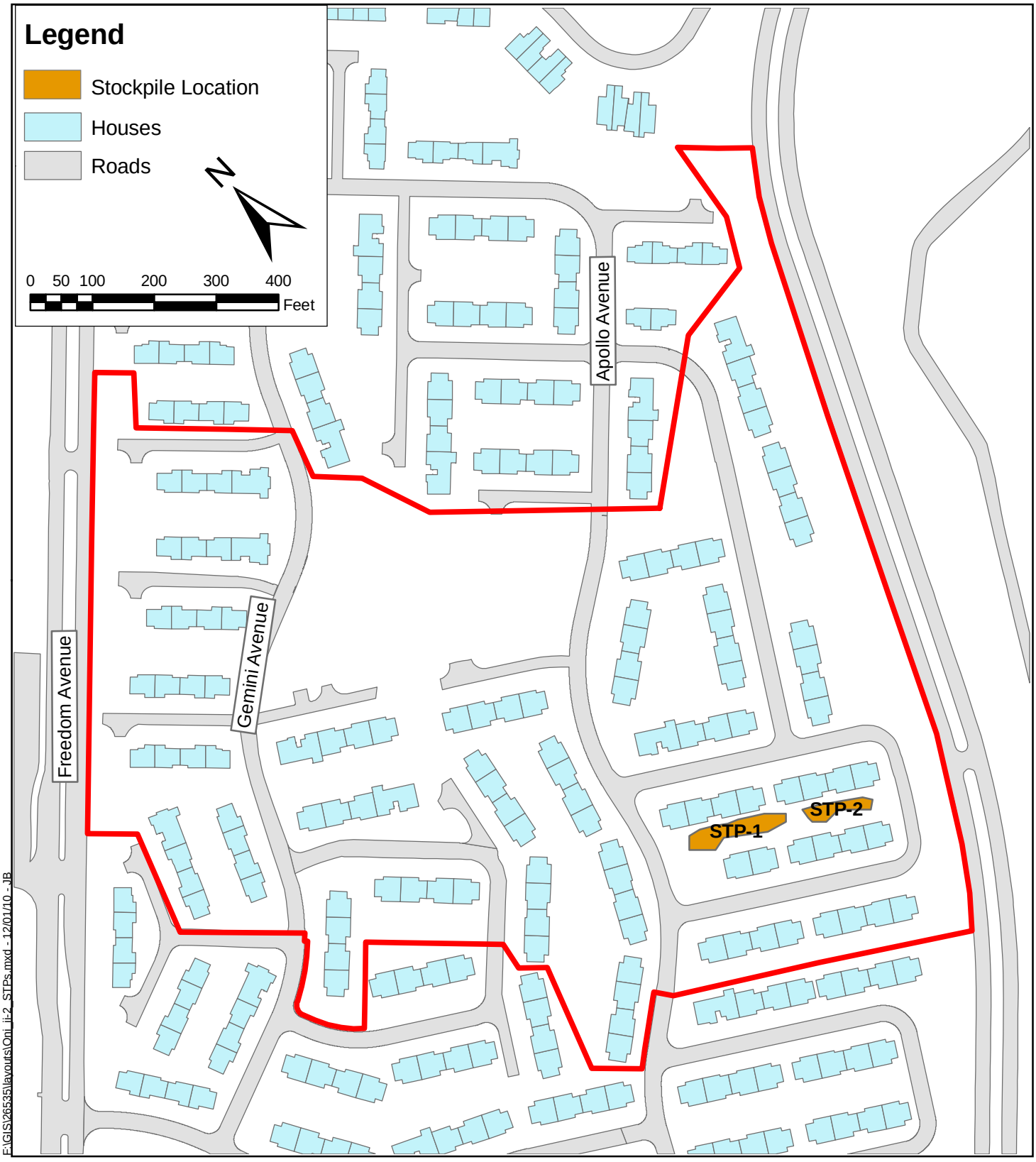
Sincerely,
**TETRA TECH**

Gail Eaton, P.G.
Senior Geologist
Tetra Tech

Attachments:
Figure 1 – Onizuka II-2 Stockpile Location
Table 1 – Analytical Results for Soil, Onizuka II-2 Import Stockpiles.
Appendix A – Field Records
Appendix B – Laboratory Analytical Reports

cc: Gary Floyd, Program Manager, Tetra Tech
Tom Whitehead C.HG., Technical Lead, Tetra Tech
Yvonne Parry, Project Manager, Tetra Tech

# FIGURE




# *Onizuka II-2 Confirmation Sampling Decision Unit Map*

Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i

# TABLE

**Table 1**
**Hickam Communities**
**Analytical Results for Soil**
**Onizuka II-2 Import Stockpiles**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Sample ID → | HDOH Tier 1 EAL[1] (mg/kg) | HC Tier 2 EAL[2] (mg/kg) | HIE-STP-1 (mg/kg) | HIE-STP-2A (mg/kg) | HIE-STP-2B (mg/kg) | HIE-STP-2C (mg/kg) |
|---|---|---|---|---|---|---|
| ***Sample Date →*** | | | ***11/22/2010*** | ***11/22/2010*** | ***11/22/2010*** | ***11/22/2010*** |
| **Analyte** | | | | | | |
| 4,4´-DDD | 2.0 | NE | 0.0099 | 0.0084 | 0.0091 | 0.0095 |
| 4,4´-DDE | 1.4 | NE | 0.039 | 0.033 | 0.038 | 0.032 |
| 4,4´-DDT | 1.7 | NE | 0.041 | 0.031 | 0.038 | 0.03 |
| Chlordane[3] | 16 | 23.4 | 0.16 | 0.16 | 0.17 | 0.16 |
| Dieldrin | 0.03 | 0.45 | 0.015 | 0.012 | 0.015 | 0.014 |
| Heptachlor epoxide | NE | NE | 0.0079 | 0.0068 | 0.0063 | 0.0051 |
| | | | | | | |
| ***Cumulative Risk*** | | | 4.E-07 | 3.E-07 | 4.E-07 | 4.E-07 |
| *RCRA 8 Metals* | | | | | | |
| Arsenic | 20 | NE | 6.6 | 6.4 | 7.9 | 6.8 |
| Lead | 200 | NE | 14 | 13 | 14 | 14 |
| *Petroleum Hydrocarbons* | | | | | | |
| TPH as Motor Oil | 500 | NE | 180 | 200 | 200 | 190 |

***Notes:***

Only detected analytes are shown in this table.

Sample HIE-STP-2 is a triplicate.

Exceeds HDOH Tier 1 EAL

Exceeds HC Tier 2 EAL

At or below 1 x $10^{-5}$ risk threshold

Above 1 x $10^{-5}$ risk threshold

| | |
|---|---|
| HDOH | Hawai'i Department of Health |
| HC | Hickam Communities LLC |
| HIE | Hawaiian Earth Produces, Ltd. |
| STP | stockpile |
| EAL | Environmental Action Level |
| mg/kg | milligram per kilogram |
| < | less than the laboratory reporting limit |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethylene |
| DDT | dichlorodiphenyltrichloroethane |
| NE | not established |
| RCRA | Resource Conservation and Recovery Act |
| 1 | HDOH Tier 1 EALs are for soil with an unrestricted land use at a distance greater than 150 meters from surface water, and groundwater is a non drinking water resource (Table B-1) (HDOH 2009). |
| 2 | HC Tier 2 EALs established for Hickam Communities LLC Tetra Tech 2009). |
| 3 | Technical chlordane constituents alpha- and gamma-chlordane not reported in this table. Detections of these compounds are provided in the laboratory analytical report. |

# APPENDIX A

## FIELD RECORDS

TETRA TECH



# FIELD NOTES

**Project Title:** ONIZUKA II-2
**Project #:** 26535-04
**Date:** 11/22/10 **Time:** 1215
**Location:** ONIZUKA II-2
**Client:**
**Tt Personnel:** J. BARNES

**Misc. Personnel:**

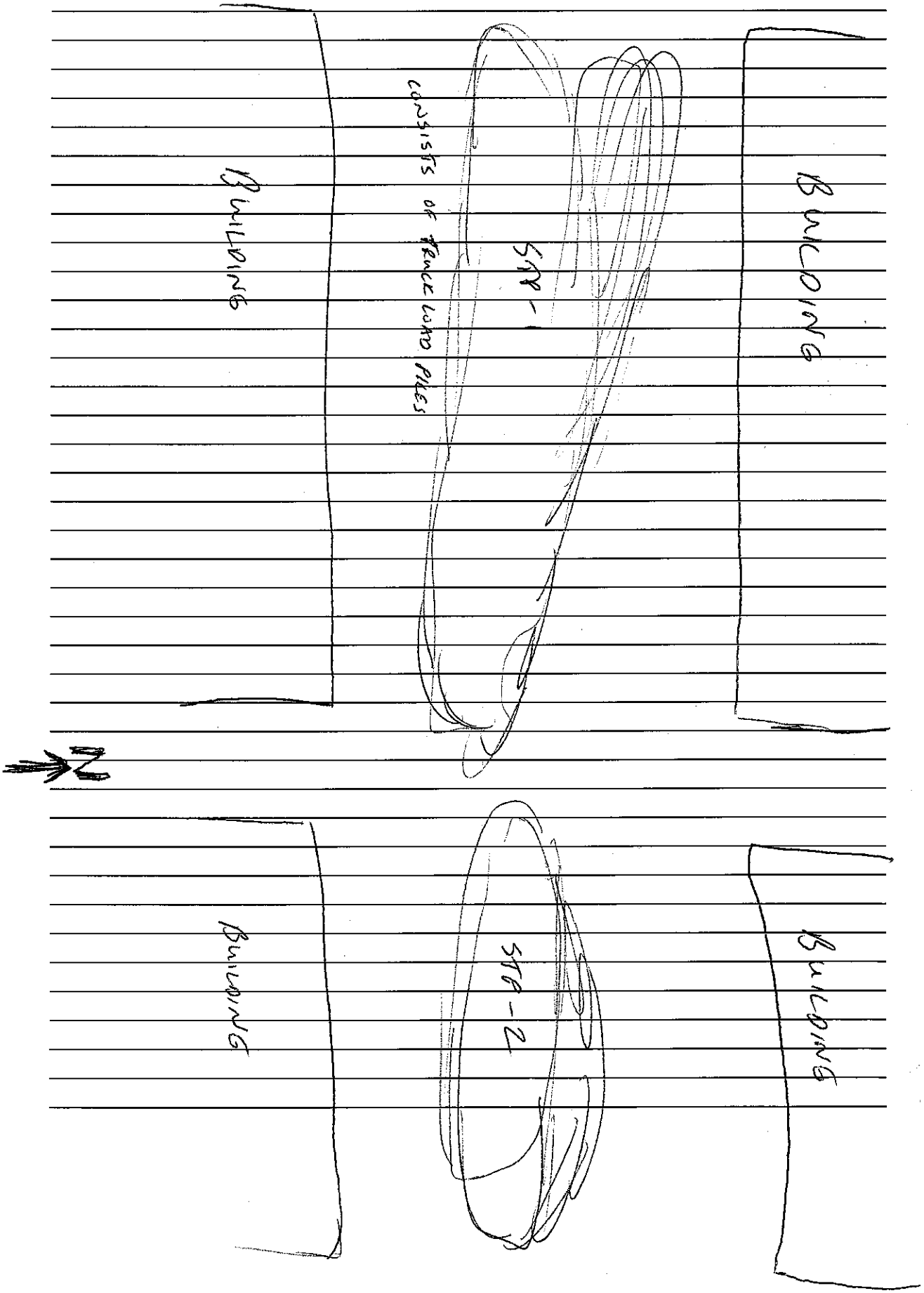
**Statement of Work:** STOCKPILE SAMPLING

**Equipment Used:** SPOONS + SOIL PROBES

**Weather:** SUNNY ≈ 85°

| Time | Project Activity |
|---|---|
| 1215 | Tt arrived on site |
| 1220 | Health & Safety Meeting |
| 1221 | CALLED PAUL AND MEL OF ACTNS TO GET LOCATION OF STOCKPILES. |
| 1230 | MEL (ACTNS) ESCORTS TT JBS TO STOCKPILES. STOCKPILES ARE FAIRLY SPREAD OUT AND NOT TOO CONCENTRATED NO EXCAVATOR OR DEEP DIGGING TOOLS WILL BE REQUIRED. MAXIMUM HEIGHT IS 5'. (SEE DRAWING FOR REFERENCE) |
| 1240 | BEGIN SAMPLING HIE-STP-1 |
| 1317 | HIE-STP-1 SAMPLE COLLECTED 75 increments |
| 1319 | BEGIN SAMPLING HIE-STP-2 (TRIPLICATE) |
| 1425 | HIE-STP-2A SAMPLE COLLECTED |
| 1430 | HIE-STP-2B SAMPLE COLLECTED |
| 1435 | HIE-STP-2C SAMPLE COLLECTED |
| 1437 | DECON EQUIPMENT. |
| 1442 | TT OFF-SITE |

SEE SKETCH ON BACK


BUILDING
STR-1
CONSISTS OF FENCE AND PILES
BUILDING
BUILDING
STR-2
BUILDING
N

# APPENDIX B

## LABORATORY ANALYTICAL REPORTS

Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306

RE: Onizuka II-2 HIE Stockpiles

Work Order No.: 1011186

Dear Yvonne Parry:

Torrent Laboratory, Inc. received 4 sample(s) on November 24, 2010 for the analyses presented in the following Report.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.

Patti Sandrock

December 03, 2010
Date

**Date:** 12/3/2010

**Client:** Tetra Tech Inc (HI)

**Project:** Onizuka II-2 HIE Stockpiles

**Work Order:** 1011186

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Analytical Comments, General, For all samples -Note:Samples processed under Incremental Sampling Procedure SOP TCI0109. Sample collection date and time is reflective of Hawaiian Standard Time (HST) while all anlaytical dates and times are reflective of Pacific Standard Time (PST).

Analytical Comments for METHOD 8081S_Tetra Tech, ALL SAMPLE, Note: Per client request, whenever possible (where matrix interference does not preclude it),sample data is reported to the MDL. Results reported between the MDL and PQL are qualified with the appropriate "J" flag and should be considered as estimated values

Analytical Comments for method SW6010B, For MS/MSD, QC Analytical Batch ID 403173, Note:The % recoveries for Arsenic and Lead are outside of laboratory control limits but are within % RPD limits. The associated LCS/LCSD % recoveries and % RPD are within limits. No corrective action required.

Analytical Comments for method 8081MI For MS, QC Analytical Batch ID 403179, Note:The % recovery for DDT in the MS is outside of laboratory control limits but within % RPD limits. The associated LCS/LCSD % recoveries and % RPD are within limits. No corrective action required.

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

**HIE-STP-1** 1011186-001

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0079 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.022 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.016 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.039 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.015 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0099 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.041 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.16 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 2 | 3.6 | 7.9 | 180 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 6.6 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 14 | mg/Kg |

**HIE-STP-2A** 1011186-002

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0068 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.020 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.016 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.033 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.012 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0084 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.031 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.16 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 2 | 3.6 | 7.9 | 200 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 6.4 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 13 | mg/Kg |

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

**HIE-STP-2B** 1011186-003

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0063 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.021 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.018 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.038 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.015 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0091 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.038 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.17 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 2 | 3.6 | 7.9 | 200 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 7.9 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 14 | mg/Kg |

**HIE-STP-2C** 1011186-004

| Parameters: | Analysis Method | DF | MDL | PQL | Results | Unit |
|---|---|---|---|---|---|---|
| Heptachlor epoxide | SW8081A | 10 | 0.0032 | 0.020 | 0.0051 | mg/Kg |
| gamma-Chlordane | SW8081A | 10 | 0.0042 | 0.020 | 0.020 | mg/Kg |
| alpha-Chlordane | SW8081A | 10 | 0.0036 | 0.020 | 0.017 | mg/Kg |
| 4,4'-DDE | SW8081A | 10 | 0.0048 | 0.020 | 0.032 | mg/Kg |
| Dieldrin | SW8081A | 10 | 0.0043 | 0.020 | 0.014 | mg/Kg |
| 4,4'-DDD | SW8081A | 10 | 0.0047 | 0.020 | 0.0095 | mg/Kg |
| 4,4'-DDT | SW8081A | 10 | 0.0081 | 0.020 | 0.030 | mg/Kg |
| Chlordane | SW8081A | 10 | 0.10 | 0.20 | 0.16 | mg/Kg |
| TPH as Motor Oil (SG) | SW8015B(M) | 2 | 3.6 | 7.9 | 190 | mg/Kg |
| Arsenic | SW6010B | 1 | 0.0560 | 0.34 | 6.8 | mg/Kg |
| Lead | SW6010B | 1 | 0.0740 | 0.260 | 14 | mg/Kg |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-1 | **Lab Sample ID:** | 1011186-001A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 13:17 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0560 | 0.34 | 6.6 | | mg/Kg | 403173 | 1650 |
| Lead | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0740 | 0.260 | 14 | | mg/Kg | 403173 | 1650 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| gamma-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| beta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| delta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Aldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor epoxide | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0032 | 0.020 | 0.0079 | J | mg/Kg | 403179 | 1647 |
| gamma-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0042 | 0.020 | 0.022 | | mg/Kg | 403179 | 1647 |
| alpha-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | 0.016 | J | mg/Kg | 403179 | 1647 |
| Endosulfan I | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDE | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0048 | 0.020 | 0.039 | | mg/Kg | 403179 | 1647 |
| Dieldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0043 | 0.020 | 0.015 | J | mg/Kg | 403179 | 1647 |
| Endrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDD | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0047 | 0.020 | 0.0099 | J | mg/Kg | 403179 | 1647 |
| Endosulfan II | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDT | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0081 | 0.020 | 0.041 | | mg/Kg | 403179 | 1647 |
| Endrin aldehyde | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Endosulfan sulfate | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Methoxychlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 403179 | 1647 |
| Endrin Ketone | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 0.20 | 0.16 | J | mg/Kg | 403179 | 1647 |
| Toxaphene | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 403179 | 1647 |
| TCMX (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 52.5 | 139 | 107 | | % | 403179 | 1647 |
| DCBP (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 50.2 | 139 | 135 | | % | 403179 | 1647 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-1 | **Lab Sample ID:** | 1011186-001A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 13:17 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 1.5 | 4.0 | ND | | mg/Kg | 403184 | 1651 |
| TPH as Motor Oil (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 3.6 | 7.9 | 180 | | mg/Kg | 403184 | 1651 |
| Pentacosane (S) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 61.5 | 133 | 99.6 | | % | 403184 | 1651 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2A | **Lab Sample ID:** | 1011186-002A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:25 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0560 | 0.34 | 6.4 | | mg/Kg | 403173 | 1650 |
| Lead | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0740 | 0.260 | 13 | | mg/Kg | 403173 | 1650 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| gamma-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| beta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| delta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Aldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor epoxide | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0032 | 0.020 | 0.0068 | J | mg/Kg | 403179 | 1647 |
| gamma-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0042 | 0.020 | 0.020 | | mg/Kg | 403179 | 1647 |
| alpha-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | 0.016 | J | mg/Kg | 403179 | 1647 |
| Endosulfan I | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDE | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0048 | 0.020 | 0.033 | | mg/Kg | 403179 | 1647 |
| Dieldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0043 | 0.020 | 0.012 | J | mg/Kg | 403179 | 1647 |
| Endrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDD | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0047 | 0.020 | 0.0084 | J | mg/Kg | 403179 | 1647 |
| Endosulfan II | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDT | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0081 | 0.020 | 0.031 | | mg/Kg | 403179 | 1647 |
| Endrin aldehyde | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Endosulfan sulfate | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Methoxychlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 403179 | 1647 |
| Endrin Ketone | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 0.20 | 0.16 | J | mg/Kg | 403179 | 1647 |
| Toxaphene | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 403179 | 1647 |
| TCMX (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 52.5 | 139 | 123 | | % | 403179 | 1647 |
| DCBP (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 50.2 | 139 | 112 | | % | 403179 | 1647 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2A | **Lab Sample ID:** | 1011186-002A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:25 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 1.5 | 4.0 | ND | | mg/Kg | 403184 | 1651 |
| TPH as Motor Oil (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 3.6 | 7.9 | 200 | | mg/Kg | 403184 | 1651 |
| Pentacosane (S) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 61.5 | 133 | 99.4 | | % | 403184 | 1651 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2B | **Lab Sample ID:** | 1011186-003A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:30 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0560 | 0.34 | 7.9 | | mg/Kg | 403173 | 1650 |
| Lead | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0740 | 0.260 | 14 | | mg/Kg | 403173 | 1650 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| gamma-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| beta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| delta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Aldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor epoxide | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0032 | 0.020 | 0.0063 | J | mg/Kg | 403179 | 1647 |
| gamma-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0042 | 0.020 | 0.021 | | mg/Kg | 403179 | 1647 |
| alpha-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | 0.018 | J | mg/Kg | 403179 | 1647 |
| Endosulfan I | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDE | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0048 | 0.020 | 0.038 | | mg/Kg | 403179 | 1647 |
| Dieldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0043 | 0.020 | 0.015 | J | mg/Kg | 403179 | 1647 |
| Endrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDD | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0047 | 0.020 | 0.0091 | J | mg/Kg | 403179 | 1647 |
| Endosulfan II | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDT | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0081 | 0.020 | 0.038 | | mg/Kg | 403179 | 1647 |
| Endrin aldehyde | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Endosulfan sulfate | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Methoxychlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 403179 | 1647 |
| Endrin Ketone | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 0.20 | 0.17 | J | mg/Kg | 403179 | 1647 |
| Toxaphene | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 403179 | 1647 |
| TCMX (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 52.5 | 139 | 103 | | % | 403179 | 1647 |
| DCBP (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 50.2 | 139 | 130 | | % | 403179 | 1647 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2B | **Lab Sample ID:** | 1011186-003A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:30 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 1.5 | 4.0 | ND | | mg/Kg | 403184 | 1651 |
| TPH as Motor Oil (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 3.6 | 7.9 | 200 | | mg/Kg | 403184 | 1651 |
| Pentacosane (S) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 61.5 | 133 | 99.9 | | % | 403184 | 1651 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2C | **Lab Sample ID:** | 1011186-004A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:35 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0560 | 0.34 | 6.8 | | mg/Kg | 403173 | 1650 |
| Lead | SW6010B | 12/1/10 | 12/02/10 | 1 | 0.0740 | 0.260 | 14 | | mg/Kg | 403173 | 1650 |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***The results shown below are reported using their MDL.*** | | | | | | | | | | | |
| alpha-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| gamma-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| beta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| delta-BHC | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.011 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Aldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0044 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Heptachlor epoxide | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0032 | 0.020 | 0.0051 | J | mg/Kg | 403179 | 1647 |
| gamma-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0042 | 0.020 | 0.020 | J | mg/Kg | 403179 | 1647 |
| alpha-Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0036 | 0.020 | 0.017 | J | mg/Kg | 403179 | 1647 |
| Endosulfan I | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0059 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDE | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0048 | 0.020 | 0.032 | | mg/Kg | 403179 | 1647 |
| Dieldrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0043 | 0.020 | 0.014 | J | mg/Kg | 403179 | 1647 |
| Endrin | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0057 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDD | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0047 | 0.020 | 0.0095 | J | mg/Kg | 403179 | 1647 |
| Endosulfan II | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.015 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| 4,4'-DDT | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0081 | 0.020 | 0.030 | | mg/Kg | 403179 | 1647 |
| Endrin aldehyde | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.010 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Endosulfan sulfate | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0049 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Methoxychlor | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0062 | 0.050 | ND | | mg/Kg | 403179 | 1647 |
| Endrin Ketone | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.0040 | 0.020 | ND | | mg/Kg | 403179 | 1647 |
| Chlordane | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 0.20 | 0.16 | J | mg/Kg | 403179 | 1647 |
| Toxaphene | SW8081A | 12/1/10 | 12/02/10 | 10 | 0.10 | 1.0 | ND | | mg/Kg | 403179 | 1647 |
| TCMX (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 52.5 | 139 | 103 | | % | 403179 | 1647 |
| DCBP (S) | SW8081A | 12/1/10 | 12/02/10 | 10 | 50.2 | 139 | 112 | | % | 403179 | 1647 |

**NOTE:** Reporting limits increased due to the nature of the sample matrix (dark color extract).

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Yvonne Parry
Tetra Tech Inc (HI)

**Date Received:** 11/24/10
**Date Reported:** 12/03/10

| | | | |
|---|---|---|---|
| **Client Sample ID:** | HIE-STP-2C | **Lab Sample ID:** | 1011186-004A |
| **Project Name/Location:** | Onizuka II-2 HIE Stockpiles | **Sample Matrix:** | Soil |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 11/22/10 / 14:35 | | |
| **Tag Number:** | Onizuka II-2 HIE Stockpiles | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL | PQL | Results | Lab Qualifier | Unit | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 1.5 | 4.0 | ND | | mg/Kg | 403184 | 1651 |
| TPH as Motor Oil (SG) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 3.6 | 7.9 | 190 | | mg/Kg | 403184 | 1651 |
| Pentacosane (S) | SW8015B(M) | 12/2/10 | 12/02/10 | 2 | 61.5 | 133 | 99.1 | | % | 403184 | 1651 |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1647 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403179 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.00044 | 0.0020 | ND | |
| gamma-BHC | 0.00040 | 0.0020 | ND | |
| beta-BHC | 0.00036 | 0.0020 | ND | |
| delta-BHC | 0.00049 | 0.0020 | ND | |
| Heptachlor | 0.0011 | 0.0020 | ND | |
| Aldrin | 0.00044 | 0.0020 | ND | |
| Heptachlor epoxide | 0.00032 | 0.0020 | ND | |
| gamma-Chlordane | 0.00042 | 0.0020 | ND | |
| alpha-Chlordane | 0.00036 | 0.0020 | ND | |
| Endosulfan I | 0.00059 | 0.0020 | ND | |
| 4,4'-DDE | 0.00048 | 0.0020 | ND | |
| Dieldrin | 0.00043 | 0.0020 | ND | |
| Endrin | 0.00057 | 0.0020 | ND | |
| 4,4'-DDD | 0.00047 | 0.0020 | ND | |
| Endosulfan II | 0.0015 | 0.0020 | ND | |
| 4,4'-DDT | 0.00081 | 0.0020 | ND | |
| Endrin aldehyde | 0.0010 | 0.0020 | ND | |
| Endosulfan sulfate | 0.00049 | 0.0020 | ND | |
| Methoxychlor | 0.00062 | 0.0050 | ND | |
| Endrin Ketone | 0.00040 | 0.0020 | ND | |
| Chlordane | 0.010 | 0.020 | ND | |
| Toxaphene | 0.010 | 0.10 | ND | |
| TCMX (S) | | | 105 | |
| DCBP (S) | | | 103 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3050B_MI | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1650 |
| **Matrix:** | Soil | **Analytical Method:** | SW6010B | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403173 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| Arsenic | 0.0560 | 0.34 | 0.15 | |
| Lead | 0.0740 | 0.260 | 0.21 | |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545_TPHSG | **Prep Date:** | 12/02/10 | **Prep Batch:** | 1651 |
| **Matrix:** | Soil | **Analytical Method:** | SW8015B(M) | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403184 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier | |
|---|---|---|---|---|---|
| TPH as Diesel (SG) | 0.76 | 2.0 | ND | | |
| TPH as Motor Oil (SG) | 1.8 | 4.0 | ND | | |
| Pentacosane (S) | | | 90.9 | | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1647 |
| **Matrix:** | Soil | **Analytical Method:** | SW8081A | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403179 |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | 0.44 | 2.0 | ND | 20 | 105 | 99.4 | 5.03 | 44.2 - 125 | 30 | |
| gamma-BHC | 0.40 | 2.0 | ND | 20 | 103 | 95.8 | 7.29 | 56.9 - 124 | 30 | |
| beta-BHC | 0.36 | 2.0 | ND | 20 | 109 | 98.5 | 10.2 | 44.2 - 125 | 30 | |
| delta-BHC | 0.49 | 2.0 | ND | 20 | 81.9 | 85.8 | 4.48 | 61.5 - 116 | 30 | |
| Heptachlor | 1.1 | 2.0 | ND | 20 | 106 | 99.6 | 6.74 | 63.6 - 125 | 30 | |
| Aldrin | 0.44 | 2.0 | ND | 20 | 109 | 102 | 6.54 | 53 - 126 | 30 | |
| Heptachlor epoxide | 0.32 | 2.0 | ND | 20 | 110 | 100 | 9.35 | 54.6 - 130 | 30 | |
| gamma-Chlordane | 0.42 | 2.0 | ND | 20 | 110 | 99.5 | 10.5 | 68.7 - 123 | 30 | |
| alpha-Chlordane | 0.36 | 2.0 | ND | 20 | 111 | 101 | 10.3 | 42.4 - 128 | 30 | |
| Endosulfan I | 0.59 | 2.0 | ND | 20 | 90.0 | 97.7 | 8.20 | 61.2 - 119 | 30 | |
| 4,4'-DDE | 0.48 | 2.0 | ND | 20 | 111 | 98.5 | 11.5 | 45.3 - 123 | 30 | |
| Dieldrin | 0.43 | 2.0 | ND | 20 | 110 | 98.8 | 10.7 | 44 - 128 | 30 | |
| Endrin | 0.57 | 2.0 | ND | 20 | 108 | 97.3 | 9.99 | 44.1 - 126 | 30 | |
| 4,4'-DDD | 0.47 | 2.0 | ND | 20 | 104 | 93.0 | 11.2 | 39.6 - 123 | 30 | |
| Endosulfan II | 1.5 | 2.0 | ND | 20 | 75.8 | 92.0 | 19.1 | 56.7 - 112 | 30 | |
| 4,4'-DDT | 0.81 | 2.0 | ND | 20 | 117 | 94.7 | 20.7 | 52.8 - 134 | 30 | |
| Endrin aldehyde | 1.0 | 2.0 | ND | 20 | 68.8 | 89.5 | 25.8 | 50.2 - 113 | 30 | |
| Endosulfan sulfate | 0.49 | 2.0 | ND | 20 | 79.0 | 94.7 | 18.1 | 62.1 - 116 | 30 | |
| Methoxychlor | 0.62 | 5.0 | ND | 20 | 94.5 | 77.8 | 19.4 | 55.2 - 126 | 30 | |
| Endrin Ketone | 0.40 | 2.0 | ND | 20 | 92.0 | 93.3 | 1.43 | 53.9 - 120 | 30 | |
| TCMX (S) | | | ND | 2100 | 101 | 94.2 | | 52.5 - 121 | | |
| DCBP (S) | | | ND | 2100 | 103 | 91.4 | | 50.2 - 121 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3050B_MI | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1650 |
| **Matrix:** | Soil | **Analytical Method:** | SW6010B | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403173 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.056 | 0.34 | 0.15 | 10 | 98.72 | 97.8 | 0.97 | 75 - 125 | 30 | |
| Lead | 0.074 | 0.26 | 0.21 | 10 | 105.9 | 105 | 0.57 | 75 - 125 | 30 | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545_TPHSG | **Prep Date:** | 12/02/10 | **Prep Batch:** | 1651 |
| **Matrix:** | Soil | **Analytical Method:** | SW8015B(M) | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403184 |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| TPH as Diesel (SG) | 0.76 | 2.0 | ND | 33.33 | 80.1 | 84.7 | 5.58 | 50.8 - 111 | 30 | |
| Pentacosane (S) | | | ND | 100 | 92.4 | 98.4 | | 61.5 - 133 | | |

Torrent LABORATORY, INC.

# MS/MSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3050B_MI | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1650 |
| **Matrix:** | **Soil** | **Analytical Method:** | SW6010B | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403173 |
| **Spiked Sample:** | 1011186-001A | | | | | | |
| **Units:** | mg/Kg | | | | | | |

| Parameters | MDL | PQL | Sample Conc. | Spike Conc. | MS % Recovery | MSD % Recovery | MS/MSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.0560 | 0.34 | 0.66 | 10 | 47.9 | 44.3 | 3.30 | 75 - 125 | 30 | S |
| Lead | 0.0740 | 0.260 | 1.4 | 10 | 34.7 | 1240 | 155 | 75 - 125 | 30 | S,R |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1011186 | **Prep Method:** | 3545MI_OCP | **Prep Date:** | 12/01/10 | **Prep Batch:** | 1647 |
| **Matrix:** | **Soil** | **Analytical Method:** | SW8081A | **Analyzed Date:** | 12/02/10 | **Analytical Batch:** | 403179 |
| **Spiked Sample:** | 1011186-002A | | | | | | |
| **Units:** | ug/Kg | | | | | | |

| Parameters | MDL | PQL | Sample Conc. | Spike Conc. | MS % Recovery | MSD % Recovery | MS/MSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| Aldrin | 4.4 | 20 | 0.12 | 20 | 109 | 103 | 4.56 | 53.9 - 142 | 30 | |
| gamma-BHC | 4.0 | 20 | 0.14 | 20 | 75.1 | 101 | 27.1 | 56.9 - 120 | 30 | |
| Heptachlor | 11 | 20 | 0.08 | 20 | 102 | 101 | 1.11 | 52.2 - 117 | 30 | |
| Dieldrin | 4.3 | 20 | 1.18 | 20 | 120 | 121 | 0.103 | 29.2 - 130 | 30 | |
| Endrin | 5.7 | 20 | 0.00 | 20 | 111 | 102 | 7.78 | 44.1 - 121 | 30 | |
| 4,4'-DDT | 8.1 | 20 | 3.13 | 20 | 142 | 130 | 4.10 | 24.6 - 134 | 30 | S |
| TCMX (S) | | | | 2100 | 119 | 110 | | 52.5 - 139 | | |
| DCBP (S) | | | | 2100 | 118 | 116 | | 50.2 - 139 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: Onizuka II-2 HIE Stockpiles

Work Order No.: 1011186

Date and Time Received: 11/24/2010 10:40

Received By: NG

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 4 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | | | | |
| pH Checked by: | pH Adjusted by: | | | |

Torrent LABORATORY, INC.

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)
**QC Level:**
**Project Name:** Onizuka II-2 HIE Stockpiles
**TAT Requested:** 3 day:25
**Project # :** 100-SFO-T26535-04
**Date Received:** 11/24/2010
**Report Due Date:** 12/3/2010
**Time Received:** 10:40

**Comments:** 3 Day TAT (plus 2 days drying) 4 soils rece'd at 4'C ! Report to Yvonne, Gail and Tom! MI for 8081, TPHDOSG and Lead and Arsenic! Needs EDD!

**Work Order # :** ***1011186***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1011186-001A | HIE-STP-1 | 11/22/10 13:17 | Soil | 05/23/11 | | | S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |
| **Sample Note:** | 3 day Rush! Proceed with air-drying, sieving and subsampling as per HDOH guidance. 8081, TPHD/MoSG,Pb,As for all samples. | | | | | | | |
| 1011186-002A | HIE-STP-2A | 11/22/10 14:25 | Soil | 05/23/11 | | | S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |
| 1011186-003A | HIE-STP-2B | 11/22/10 14:30 | Soil | 05/23/11 | | | S_6010BMI<br>S_TPHDOSG<br>S_8081MITetra | |
| 1011186-004A | HIE-STP-2C | 11/22/10 14:35 | Soil | 05/23/11 | | | S_6010BMI<br>S_8081MITetra<br>S_TPHDOSG | |

Torrent LABORATORY, INC.

RUSH 3-DAY TAT

# CHAIN-OF-CUSTODY RECORD

TETRA TECH

1011186

Client Name/Account #: TetraTech, Inc.

Address: 737 Bishop St., Suite 3020

City/State/Zip: Honolulu, HI 96813

Project Manager: Y. Parry

Report To: Y. Parry, G. Eaton, T. Whitehead

Telephone Number: (808)533-3366 Fax No.: (808)533-3306

Invoice To: Y. Parry

Sampler Name: (Print) J. Barlos

Project ID: Onizuka II-2 HIE Stockpiles

Sampler Signature:

Project #: 100-SFO-T26535-04

| | | | | | | | | Preservative | | | | | | | | Matrix | | | | | | Analyze For: | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Ice | $HNO_3$ (Red Label) | HCl (Blue Label) | NaOH ( Orange Label) | $H_2SO_4$ Plastic (Yellow Label) | $H_2SO_4$ Glass(Yellow Label) | None (Black Label) | Other (one MeOH VOA) | Groundwater | Wastewater | Drinking Water | Sludge | Soil | Other (specify): | Multi-Incremental Preparatic | 8081 | 8015B TPH Diesel and Motor Oil + silica gel clean up | Lead & Arsenic (6010) | | | | | | | RUSH TAT (Pre-Schedule | Standard TAT | | |
| 001A | HIE-STP-1 | 11/22/10 | 1317 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | | |
| 002A | HIE-STP-2A | 11/22/10 | 1425 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | | |
| 003A | HIE-STP-2B | 11/22/10 | 1430 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | | |
| 004A | HIE-STP-2C | 11/22/10 | 1435 | 1 | | | X | X | | | | | | | | | | | | X | | X | X | X | X | | | | | | | X | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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RUSH
3 DAYS

**Special Instructions:**

Please proceed with air-drying, sieving and subsampling as per HDOH guidance

Method of Shipment: FEDEX

**Laboratory Comments:**

Temperature Upon Receipt: 4° C

VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| Jaymes Barlos | 11/23/2010 | 1200 | FedEx | 11/23/2010 | 1200 |
| Relinquished by: | Date | Time | Received by Laboratory: | Date | Time |
| FedEx | 11-24-10 | 10:40 Am. | NAVIN G. | 11-24-10 | 10:40 Am |

Page 1 of 1

# APPENDIX G

## Air Monitoring Reports for Removal Actions No. 1, No. 2, and No. 3

TETRA TECH

**MEMORANDUM**

TETRA TECH PROJECT: T26545.04

TO: Gary Floyd, Program Manager

Cc: Matt Horrigan, Risk Assessor
Tom Whitehead, CHG, Senior Technical Lead
Randy Westhaus, PE, Remedial Engineer

FROM: Gail Eaton, PG, Senior Geologist
Dr. Kay Johnson, Risk Assessor
Yvonne Parry, Project Manager

**SUBJECT: Hickam Communities Residential Dust and Air Monitoring Results for Removal Action No. 1, October and November 2010, Earhart I-2, Earhart I-3, and Soil Stockpiling Area, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi.**
**DCN# 2653504.009.F01**

February 8, 2011

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## INTRODUCTION

The purpose of this memorandum is present the results of residential dust and air monitoring for the removal action that was conducted at the Earhart I-2 and Earhart I-3 Neighborhoods, Joint Base Pearl Harbor-Hickam, Oʻahu, Hawaiʻi (hereinafter the "Site"). The residential dust and air monitoring was done in support of the removal action at the Site, and conducted in accordance with the Removal Action Work Plan No. 1 (RO #1) (Tetra Tech 2010). This memorandum includes a summary of the field methods used to collect dust and air monitoring samples in October and November 2010, and the analytical results which were reported by Quinn Consultants, Inc. (QCI) (QCI 2011). The dust and air monitoring samples were collected from the excavation areas at the Site, and the temporary soil stockpiling area located south of the Earhart I-4 Neighborhood, across Ohana Nui Circle.

Tetra Tech
737 Bishop Street, Suite 3020, Honolulu, HI 96813
Tel 808.533.3366 Fax 808.533.5306 www.tetratech.com

## RO #1 IMPLEMENTATION: FIELD METHODS

Tetra Tech contracted with QCI to conduct residential dust and air monitoring during excavation activities at the Site on October 15, 18 through 22, 25 through 28 and November 9, 12, 15 and 23, 2010. Two dust monitors were used at Site excavations to collect the dust monitoring data.

- The dust monitoring samples were collected at a rate of one reading per minute over an 8-hour work day (Quinn 2011). Due to problems with on-site dust monitoring equipment, there is no available dust monitoring data for the November activities (QCI 2011).

- Up to three air monitors for collection of samples for analysis of airborne organochlorine pesticides (aldrin, dieldrin, chlordane, and heptachlor) were used at the Site. The air monitoring samples were collected on filter cassettes at a rate of approximately 1 liter of air/minute over an 8-hour work day (QCI 2011).

A summary of the field and analytical methods are provided in this section; a detailed description of the field and analytical methods is provided in the QCI report (QCI 2011). A copy of the QCI report is provided in Attachment A of this memorandum. The analytical results are summarized below and provided in Tables 1 and 2.

### Monitor Locations

The dust and air monitoring samples were collected during excavation activities conducted under the RO #1. In order to collect representative samples, air monitoring stations were placed at the perimeter of the excavation areas. A personal sampler for the collection of airborne pesticide samples was worn by select Site personnel working within some of the excavation areas.

The air monitors were placed at two stations around the excavation perimeters. One was "reasonably" upwind of the soil removal activities, outside of the immediate vicinity of the excavation, but sufficiently close enough to ensure that monitoring data were representative of the neighborhood. Samplers were also placed downwind of key activity areas and as close to the affected housing units as feasible, such that the collected air samples are as representative as possible of potential exposures of nearby residents. The air sampling locations are provided in Figures 1 through 3.

- Earhart I-2 DUs. Monitoring stations were placed at DU-6b, DU-9d and e, DU-42c, and DU-52b. The monitor locations shown at DU-42c were changed based on whether excavations were being conducted in the front yard of building 6375 or the area between buildings 6375 and 6376. No air monitoring samples were collected at DU-15d.

- Earhart I-3 DUs. Monitoring stations were placed at DU-2a.

- Soil Stockpile Area. One monitoring station was installed daily on a post near the access gate, and one was installed in the southeast corner of the stockpile area.

## RO #1 IMPLEMENTATION: ANALYTICAL METHODS AND RESULTS

The collected air samples for airborne pesticides were submitted to INALAB, Inc. of Honolulu for analysis of organochlorine pesticides. Upon receipt, QCI provided draft reports to Tetra Tech; however, the initial laboratory reporting limits exceeded the site-specific thresholds for pesticides in air. Tetra Tech and QCI subsequently worked with the analytical laboratory to provide analytical reports for pesticides in air reported to the method detection limits (MDLs), which are below the site-specific exposure goals (REGs). The analytical results are summarized below and provided in Tables 1 and 2. The details for air monitoring are provided in a copy QCIs report in Attachment A.

Airborne dust and pesticide data were compared to the following environmental screening levels:

**Environmental Screening Levels for Airborne Dust and Pesticides**

| Constituent[1] | Screening Level [2, 3] (µg/m$^3$) | Basis for Screening Level |
|---|---|---|
| ***Dust*** | | |
| Dust, as Particulate Matter ($PM_{10}$) | 150 | 24-hour National Ambient Air Quality Standard |
| ***Airborne Pesticides*** | | |
| Aldrin | 0.075 | REG-Site-specific, risk-based concentration |
| | 250 | OSHA PEL –8-hour average |
| Chlordane | 3.60 | REG-Site-specific, risk-based concentration |
| | 500 | OSHA PEL –8-hour average |
| Dieldrin | 0.0795 | REG-Site-specific, risk-based concentration |
| | 250 | OSHA PEL –8-hour average |
| Heptachlor | 0.285 | REG-Site-specific, risk-based concentration |
| | 50 | ACGIH TLV –8-hour average |

µg/m$^3$ = micrograms per cubic meter.
$PM_{10}$ = Ambient Air Quality Standard for 10 micrometer particulate matter.
[1] Aldrin, chlordane, dieldrin, and heptachlor are organochlorine pesticide compounds.
[2] The pesticide screening levels are the site specific residential exposure goals (REG) developed for residential areas outside the excavation area. The OSHA PELs are applied to worker exposure within the excavation area only.
[3]There is no OSHA PEL established for heptachlor. The ACGIH TLV is referenced instead.

As noted in the table *Environmental Screening Levels for Airborne Dust and Pesticides* above, the environmental screening level for dust is based on the National Ambient Air Quality Standard (NAAQS) for 10 micrometer (µm) particulate matter ($PM_{10}$), while those for the pesticides are based on site-specific determinations of risk-based air concentrations. The REGs are site-specific thresholds which were determined using the standard US Environmental Protection Agency (EPA) approach for calculating acceptable airborne chemical concentrations, a target risk of $1 \times 10^{-5}$, and site-specific exposure parameters. For the Site, it was assumed that residents could potentially be exposed to airborne pesticides (via inhalation) for 8-hours per day (i.e., during excavation activities) for 6 years (i.e., the residency period for military housing [U.S. AFRL, 1998]).

For workers within the excavation area, the Occupational Safety and Health Administration (OSHA) Permissible Exposure Levels (PELs) (for aldrin, dieldrin, and chlordane) and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) (for heptachlor)[1] are applied. These screening levels are 8-hour time-weighted average concentrations.

***Airborne Dust***

The dust monitoring results from October 2010 were compared to the NAAQS $PM_{10}$ screening level for airborne dust. The results were reported as average, minimum, and maximum values for each 8-hour monitoring period, where the dust readings were collected at a rate on one reading per minute. These results are summarized below:

- The average dust concentrations ranged from 7 to 24 µg/m$^3$, all of which are below the NAAQS $PM_{10}$ standard (150 µg/m$^3$).
- The minimum dust concentrations ranged from 0 to 36 micrograms per cubic meter (µg/m$^3$), all of which are below the NAAQS $PM_{10}$ standard.
- The maximum dust concentrations ranged from 15 to 1,206 µg/m$^3$. Three of the upwind samples and four of the downwind samples had detections exceeding the NAAQS $PM_{10}$ standard.

***Airborne Pesticides***

The analytical results for airborne pesticides in the residential areas outside the excavation perimeters are summarized below.

- Aldrin was detected in two of the 33 residential air monitoring samples at concentrations of 0.012 µg/m$^3$ and 0.01 µg/m$^3$. These detections are below the risk-based REG for aldrin (0.075 µg/m$^3$). One of these detections was at a

[1] The ACGIH TLV is applied for heptachlor since an OSHA PEL has not been established for heptachlor.

concentration below the laboratory reporting limit but above the MDL, this detection is flagged as an estimated value in the laboratory report.

- Chlordane was not detected in any of the 33 air monitoring samples collected at the Site during the RO #1 excavation.
- Dieldrin was detected in two of the 33 air monitoring samples at concentrations of 0.016 and 0.056 µg/m$^3$, which are below the risk-based REG for dieldrin (0.0795 µg/m$^3$).
- Heptachlor was detected in one of the 33 air monitoring samples at a concentration of 0.007 µg/m$^3$. This detection is below the risk-based REG for heptachlor (0.285 µg/m$^3$). Since this detection was at a concentration below the laboratory reporting limit but above the MDL, this detection is flagged as an estimated value in the laboratory report.

The analytical results for airborne pesticides, collected from personal monitors within the excavation perimeters are summarized below.

- Chlordane and heptachlor were not detected in the air samples collected from the personal monitors.
- Aldrin was detected in two air samples collected from personal monitors at concentrations of 0.029 and 0.01 µg/m$^3$. These detections are below the PEL (250 µg/m$^3$) and the REG (0.075 µg/m$^3$) for aldrin.
- Dieldrin was detected in two air samples collected from personal monitors at concentrations of 0.026 and 0.093 µg/m$^3$. These detections are below the PEL (250 µg/m$^3$) for dieldrin; one detection exceeds the REG (0.0795 µg/m$^3$) for dieldrin.

## DISCUSSION

The average and minimum dust levels for excavation activities conducted under the RO #1 are below the NAAQS $PM_{10}$ threshold for particulate dust. The maximum dust detections exceeded the $PM_{10}$ threshold in three of the upwind samples and four of the downwind samples; however since the dust samples were collected at a rate of one reading per minute over an 8-hour day, the exceedances in the maximum detections are likely due short dust emission bursts and not the result of prolonged dust emissions. This is supported by the average daily readings being below the $PM_{10}$ threshold. Even though no dust monitoring data was available for excavation activities conducted at the Site in November, based on the dust monitoring results from October, the best management practices (BMPs) implemented to control fugitive dust emissions, and observations from Tetra Tech's environmental oversight, and QCI (QCI 2011), dust concentrations were likely within acceptable levels.

Although the airborne pesticide concentrations detected in samples collected from the residential air monitors placed at the excavation perimeters were below REGs, there was one detection from a personal monitor which slightly exceeded the REG for dieldrin. Since the REGs are conservative thresholds that are calculated to be protective for long-term residential exposures (e.g., 6 years), the one-day exceedance of the REG in a sample from workers involved in active excavation indicates there was limited potential for prolonged exposure to airborne pesticides by nearby residents.. For the excavation workers potentially impacted by the airborne pesticides, all of the detections were below the OSHA PELs.

## REFERENCES

QCI (Quinn Consultants, Inc.). 2011. *Revised Report on Pesticide Air Monitoring and Dust Samples Collected During Excavation of Pesticide-Impacted Soil by Delta Construction in Various Tetra Tech-Selected Locations in the Earhart I-2 and I-3 Neighborhoods at Hickam Air Force Base.* Prepared for Tetra Tech. January 27, 2011.

Quinn, Kevin. 2011. Email subject: *Re: Followup-Hickam/Dust Data / Collection interval from Dust Track Monitors.* January 31, 2011.

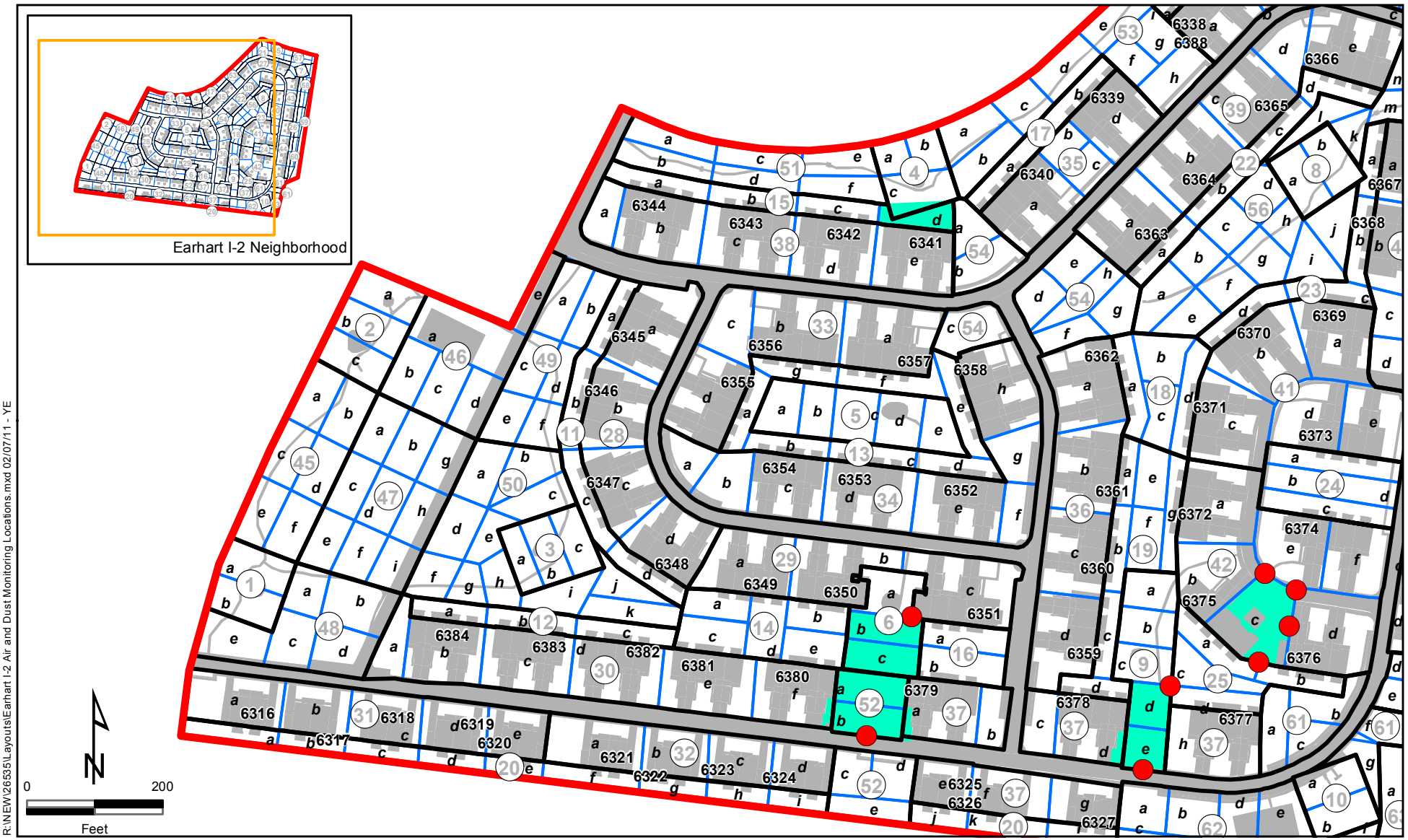
Tetra Tech. 2010. *Removal Action Work Plan No. 1, Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods, Joint Base Pearl-Harbor Hickam, Oʻahu, Hawaiʻi.* Prepared for Hickam Communities LLC. October 11, 2010.

US AFRL (US Air Force Research Laboratory). 1998. *Military-Specific Exposure Factors Study. Final*. AFRL-HE-WP-TR-1998-0127. September.

Attachments:

| | |
|---|---|
| Figure 1. | Dust and Air Monitoring Stations -2010, Earhart I-2 |
| Figure 2. | Dust and Air Monitoring Stations -2010, Earhart I-3 |
| Figure 3. | Dust and Air Monitoring Stations -2010, Soil Stockpiling Area |
| Table 1. | Analytical Results for Dust in Air, October 2010, Residential Air Monitoring at the Earhart I-2, Earhart I-3, and Soil Stockpile Area. |
| Table 2. | Analytical Results for Pesticides in Air, October and November 2010, Residential Air Monitoring at the Earhart I-2, Earhart I-3, and Soil Stockpile Area |
| Attachment A. | Quinn Consultants, Inc. Report |

# FIGURES

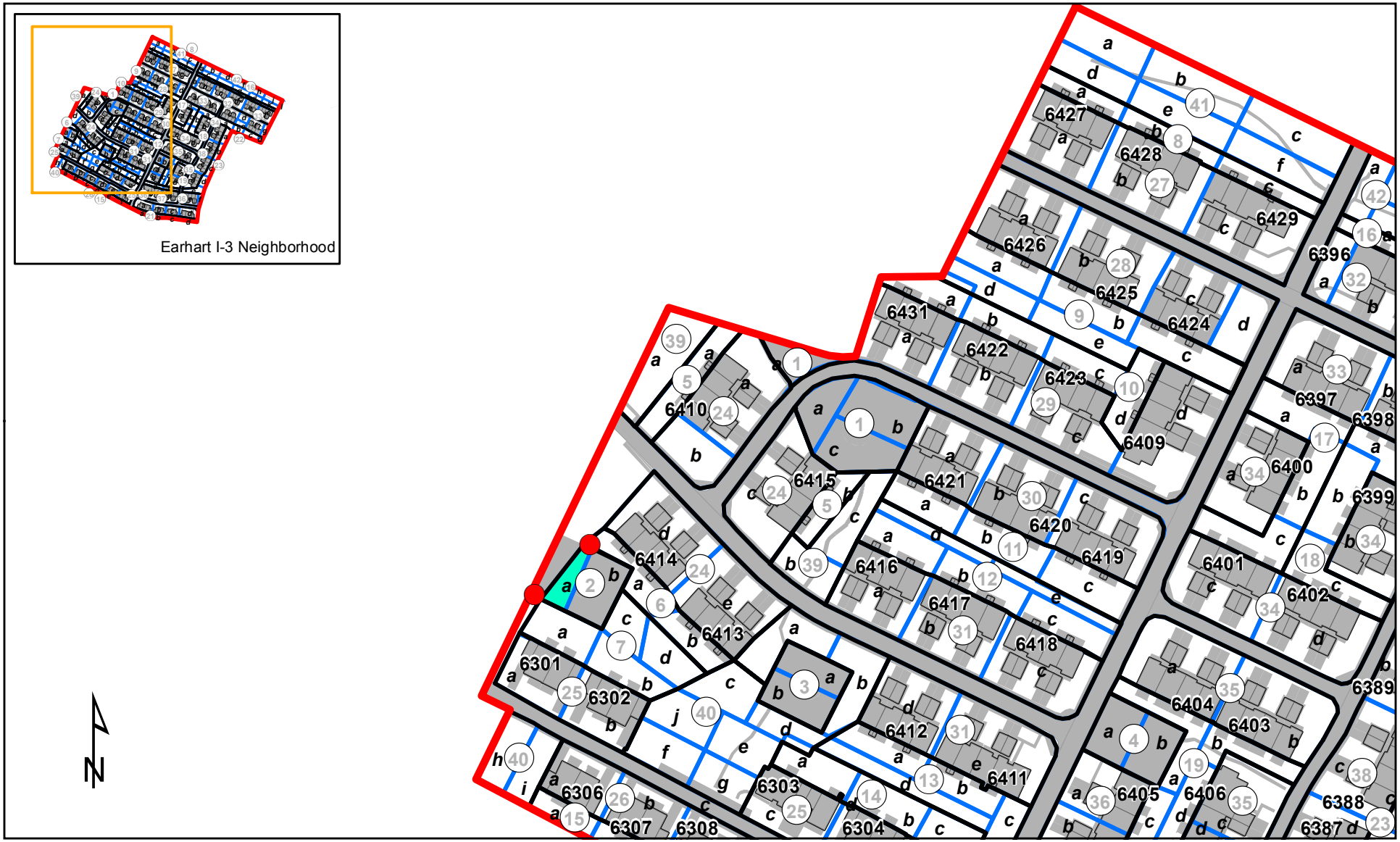



# Dust and Air Monitoring Locations - 2010
# Earhart I-2 Neighborhood

Joint Base Pearl Harbor-Hickam, Hawai'i

TETRA TECH

**Figure 1**

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# *Dust and Air Monitoring Locations - 2010*
# *Earhart I-3 Neighborhood*

Joint Base Pearl Harbor-Hickam, Hawai'i

Earhart Village I-2
Hardscapes
P.I. Soil Excavation Area

*b* Decision Units
10 Grouped Decision Units
Perimeter Dust/Air Monitoring Stations

TETRA TECH

**Figure 2**

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# *Dust and Air Monitoring Locations - 2010*
# *Soil Stockpiling Area*

● Perimeter Dust/Air Monitoring Stations

Joint Base Pearl Harbor-Hickam, Hawai'i

TETRA TECH

**Figure 3**

# TABLES

**Table 1**
**Analytical Results for Airborne Dust, October 2010**
**Resitential Air Monitoring**
**at the Earhart I-2, Earhart I-3, and Soil Stockpile Area**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Dust Monitor Location | Sample Date | Dust Concentration[1] | | |
|---|---|---|---|---|
| | | Average ($\mu g/m^3$) | Minimum ($\mu g/m^3$) | Maximum ($\mu g/m^3$) |
| **Upwind Monitor** | 10/19/2010 | 24 | 0 | **424** |
| | 10/20/2010 | 7 | 1 | **225** |
| | 10/21/2010 | 8 | 2 | 65 |
| | 10/22/2010 | 9 | 6 | 19 |
| | 10/25/2010 | 7 | 2 | 16 |
| | 10/26/2010 | 7 | 1 | **169** |
| | 10/27/2010 | 8 | 5 | 114 |
| | 10/28/2010 | 8 | 3 | 15 |
| **Downwind Monitor** | 10/19/2010 | 68 | 33 | **1,206** |
| | 10/20/2010 | 63 | 7 | **541** |
| | 10/21/2010 | 53 | 3 | 95 |
| | 10/22/2010 | 28 | 0 | 85 |
| | 10/25/2010 | 21 | 6 | **785** |
| | 10/26/2010 | 60 | 36 | **874** |
| | 10/27/2010 | 28 | 0 | 28 |
| | 10/28/2010 | NA | NA | NA |
| ***NAAQS $PM_{10}$*** | | ***150*** | | |
| ***OSHA PEL*** | | ***15,000*** | | |
| ***HDOH Monitoring Station[2]*** | | ***2 to 10 (monthy 24 hour average)<br>18 to 34 (24 hour average)*** | | |

***Notes:***

**Bolded** values are detections exceeding the $PM_{10}$ standard

| | |
|---|---|
| $\mu g/m^3$ | microgram per cubic meter |
| NA | not available |
| $PM_{10}$ | National Ambient Air Quality Standard (NAAQS) for 10 millimeter (mm) particulate matter |
| OSHA | Occupational Safety and Health Adminstration |
| PEL | permissible exposure limit; over an 8-hour day |
| HDOH | Hawai'I Department of Health |
| 1 | Dust readings collected from two separate monitors at a rate of one per minute over an 8-hour work day. |
| 2 | Kinau Hale HDOH Monitoring Station: Range of 2 to 10 $\mu g/m^3$ (monthly 24-hour average $PM_{10}$ concentration) for 2009; the maximum average 24-hour average $PM_{10}$ concentration ranges form approximately 18 to 34 $\mu g/m^3$ |

**Table 2**
**Analytical Results for Airborne Pesticides, October and November 2010**
**Residential Air Monitoring at the Earhart I-2, Earhart I-3, and Soil Stockpile Area**
**Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i**

| Sample ID | Sample Description | Sample Date | Lab Report | Aldrin ($\mu g/m^3$) | Chlordane [1] ($\mu g/m^3$) | Dieldrin ($\mu g/m^3$) | Heptachlor ($\mu g/m^3$) |
|---|---|---|---|---|---|---|---|
| | ***EARHART I-2*** | | | | | | |
| **Earhart101510-1** | upwind, residential PI soil abatement | 10/15/2010 | 20103074rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **Earhart101510-2** | downwind, residential PI soil abatement | 10/15/2010 | 20103074rev | **0.012** | <0.006 | **0.056** | <0.006 |
| **E12101810-1** | upwind, residential PI soil abatement | 10/18/2010 | 20103074rev | <0.005 | <0.005 | <0.005 | <0.005 |
| **E12101810-2** | downwind, residential PI soil abatement | 10/18/2010 | 20103074rev | <0.005 | <0.005 | **0.016** | <0.005 |
| **E12101910-1** | upwind, residential PI soil abatement | 10/19/2010 | 20103132rev | <0.004 | <0.004 | <0.004 | <0.004 |
| **E12101910-2** | downwind, residential PI soil abatement | 10/19/2010 | 20103132rev | <0.004 | <0.004 | <0.004 | <0.004 |
| **E12102010-1** | upwind, residential PI soil abatement | 10/20/2010 | 20103132rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102010-1 (D)** | upwind, residential PI soil abatement (Duplicate) | 10/20/2010 | 20103132rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102010-2** | downwind, residential PI soil abatement | 10/20/2010 | 20103132rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102110-1** | upwind, residential PI soil abatement | 10/21/2010 | 20103132rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **E12102110-2** | downwind, residential PI soil abatement | 10/21/2010 | 20103132rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **E12102210-1** | upwind, residential PI soil abatement | 10/22/2010 | 20103159 rev | <0.008 | <0.008 | <0.008 | <0.008 |
| **E12102210-2** | downwind, residential PI soil abatement | 10/22/2010 | 20103159 rev | <0.008 | <0.008 | <0.008 | <0.008 |
| **E12102510-1** | upwind, residential PI soil abatement | 10/25/2010 | 20103199rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102510-1 (D)** | upwind, residential PI soil abatement (Duplicate) | 10/25/2010 | 20103199rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102510-2** | downwind, residential PI soil abatement | 10/25/2010 | 20103199rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102610-1** | upwind, residential PI soil abatement | 10/26/2010 | 20103199rev | <0.007 | <0.007 | <0.007 | <0.007 |
| **E12102610-2** | downwind, residential PI soil abatement | 10/26/2010 | 20103199rev | <0.007 | <0.007 | <0.007 | <0.007 |
| **E12102710-1** | upwind, residential PI soil abatement | 10/27/2010 | 20103251rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **E12102710-2** | downwind, residential PI soil abatement | 10/27/2010 | 20103251rev | <0.006 | <0.006 | <0.006 | <0.006 |
| **E12102810-1** | upwind, residential PI soil abatement | 10/28/2010 | 20103251rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102810-1 (D)** | upwind, residential PI soil abatement (Duplicate) | 10/28/2010 | 20103251rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **E12102810-2** | downwind, residential PI soil abatement | 10/28/2010 | 20103251rev | **0.01 J** | <0.01 | <0.01 | <0.01 |
| | ***EARHART I-3*** | | | | | | |
| **E13112310-1** | upwind, residential PI soil abatement | 11/23/2010 | 20103550rev | <0.0008 | <0.0008 | <0.0008 | <0.0008 |
| **E13112310-2** | downwind, residential PI soil abatement | 11/23/2010 | 20103550rev | <0.0008 | <0.0008 | <0.0008 | <0.0008 |
| | ***SOIL STOCKPILING AREA*** | | | | | | |
| **EI3110910-1** | upwind, PI soil stockpile area | 11/9/2010 | 20103416 rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **EI3110910-1 (D)** | upwind, PI soil stockpile area (Duplicate) | 11/9/2010 | 20103416 rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **EI3110910-2** | downwind, PI soil stockpile area | 11/9/2010 | 20103416 rev | <0.01 | <0.01 | <0.01 | <0.01 |
| **EI3111210-1** | upwind, PI soil stockpile area | 11/12/2010 | 20103416 rev | <0.007 | <0.007 | <0.007 | <0.007 |
| **EI3111210-2** | downwind, PI soil stockpile area | 11/12/2010 | 20103416 rev | <0.007 | <0.007 | <0.007 | **0.007 J** |
| **EI3111510-1** | upwind, PI soil stockpile area | 11/15/2010 | 20103492 rev | <0.008 | <0.008 | <0.008 | <0.008 |
| **EI3111510-2** | downwind, PI soil stockpile area | 11/15/2010 | 20103492 rev | <0.008 | <0.008 | <0.008 | <0.008 |
| | ***Worker Exposure Monitoring (Personal Monitors)*** | | | | | | |
| **Earhart101510-3** | site worker personal monitor; residential PI soil abatement | 10/15/2010 | 20103074rev | **0.01** | <0.006 | **0.056** | <0.006 |
| **Earhart101510-4** | site worker personal monitor; residential PI soil abatement | 10/15/2010 | 20103074rev | **0.029** | <0.006 | **0.093** | <0.006 |
| **E12101810-3** | site worker personal monitor; residential PI soil abatement | 10/18/2010 | 20103074rev | <0.005 | <0.005 | **0.028** | <0.005 |
| **E12101810-4** | site worker personal monitor; residential PI soil abatement | 10/18/2010 | 20103074rev | <0.005 | <0.005 | **0.026** | <0.005 |
| **E12101910-3** | site worker personal monitor; residential PI soil abatement | 10/19/2010 | 20103132rev | <0.004 | <0.004 | <0.004 | <0.004 |
| **E12101910-4** | site worker personal monitor; residential PI soil abatement | 10/19/2010 | 20103132rev | <0.004 | <0.004 | <0.004 | <0.004 |
| **E12102010-3** | site worker personal monitor; residential PI soil abatement; equipment operator | 10/20/2010 | 20103132rev | <0.005 | <0.005 | <0.005 | <0.005 |
| | ***Site-Specific Residential Exposure Goal [2]*** | | | ***0.075*** | ***3.60*** | ***0.0795*** | ***0.285*** |
| | ***OSHA PEL (Worker Exposure)*** | | | ***250*** | ***500*** | ***250*** | ***NE*** |
| | ***ACGIH TLV (Worker Exposure)*** | | | ***250*** | ***50*** | ***250*** | ***50*** |

***Notes:***

**Bolded** values indicate detected concentrations of airborne pesticides

| | |
|---|---|
| $\mu g/m^3$ | microgram per cubic meter |
| < | less than the laboratory reporting limit/minimum detection limit |
| J | estimated value |
| PI | pesticide-impacted |
| NE | not established |
| OSHA | Occupational Safety and Health Administration |
| PEL | permissible exposure limit; over an 8-hour day |
| ACGIH | American Conference of Governmental Industrial Hygienists |
| TLV | threshold limit value; over an 8-hour day |
| 1 | reported as gamma-chlordane |
| 2 | The site-specific Residential Exposure Goals (REGs) were developed for monitoring of airborne pesticides in the residential neighborhoods outside of the excavation area during RO #1 implementation. Concentrations for personal monitors should be compared to the OSHA PELs. |

# ATTACHMENT A

**Quinn Consultants, Inc.**
*Environmental, Health and Safety*

Mr. Gary Floyd
Vice President
Tetra Tech
737 Bishop Street
Honolulu, Hawaii 96813-3202

January 27, 2011

Subject: Revised Report on Pesticide Air Monitoring and Dust Samples Collected During Excavation of Pesticide-Impacted Soil by Delta Construction in Various Tetra Tech-Selected Locations in the Earhart I-2 and I-3 Neighborhoods at Hickam Air Force Base

Dear Mr. Floyd:

On October 15, 18-22, October 25-28, November 9, 12, 15 and 23, 2010, Quinn Consultants, Inc. (QCI) collected air samples for airborne organo-chlorine pesticides (aldrin, chlordane, dieldrin and heptachlor) at Tetra Tech-selected locations at the Earhart I-2 and I-3 neighborhoods. Ambient dust readings were collected concurrently at these same Tetra Tech-selected locations on October 19-22, October 25-27 (upwind and downwind), and October 28, 2010 (upwind only), at Hickam Air Force Base, during pesticide-impacted soil excavation by Delta Construction. The purpose of the sampling was to evaluate Delta employee and public exposure to the above-listed pesticides, and also to ambient dust levels during the excavation of pesticide-impacted soil. Aldrin, chlordane, dieldrin and heptachlor were sampled because Tetra Tech confirmed their presence through extensive soil testing.

During the monitoring periods, QCI observed that the sod-covered soil at the pesticide-impacted soil sites was sufficiently moist that no visible dust emissions were seen. In several locations, QCI observed standing water on the ground within and adjacent to the soil excavation sites. In addition, occasional rains fell during the sampling period. All of these factors minimized airborne dust.

Airborne Pesticides

The methodology QCI used for the pesticide air monitoring was modified National Institute of Occupational Safety and Health Method 5510. Pesticide air samples were collected using Gilian personnel sampling pumps calibrated by a primary standard Bios Dry-Cal calibrator to run at approximately 1 liter of air/minute; 37-mm MCE filter cassettes were used as the sampling media without using an additional absorptive sampling media due to the tendency of the pesticides to adhere to the soil particles and not have a significant vapor component.

QCI submitted the pesticide air samples to Inalab, Inc., Honolulu, Hawaii, for analyses. Inalab, Inc., of Honolulu, Hawaii, analyzed the pesticide air samples. Inalab is American Industrial Hygiene Association (AIHA) Industrial Hygiene Laboratory Accreditation Program (IHLAP)-accredited. Inalab analyzed the samples following Environmental Protection Agency (EPA) Laboratory Analytical Method 8081-A (Gas Chromatography – ECD). Modifications were made to both the field sampling methodology and the laboratory reporting limit methodology to accommodate Tetra Tech's request for detection limits that would fit their risk assessment algorithm. For the field sampling, both the air collection sample flow rate and the total air volume were above the upper limits indicated in the NIOSH method.

Although this sampling was not conducted for comparison to Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs), it may be useful to list the OSHA limits for the various pesticides of concern at this site. The PELs are as follows: aldrin (0.25 milligram/cubic meter [$m^3$]), chlordane (0.5 $mg/m^3$), and dieldrin (0.25 $mg/m^3$). For heptachlor, for which there is no OSHA PEL, the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for an 8-hour time-weighted average (TWA) was referenced (0.05 $mg/m^3$). For dust, the PEL for total dust is 15 $mg/m^3$). All of the sample results were well below the OSHA limits.

Results for the pesticide air sampling are attached to this report. Based upon the Inalab reports, the following samples had detectable concentrations of organochlorine pesticides:

- 0.01 microgram/ $m^3$, heptachlor, collected on October 26, 2010, upwind of the pesticide-impacted (PI) soil excavation.
- 0.01 microgram/ $m^3$, chlordane, collected on October 20, 2010, downwind of the PI soil excavation.
- 0.04 microgram/ $m^3$, chlordane, collected on October 19, 2010, downwind of the PI soil excavation.
- 0.004 microgram/ $m^3$, dieldrin, collected on October 19, 2010, upwind of the PI soil excavation.
- 0.009 microgram/ $m^3$, dieldrin, collected on October 19, 2010, downwind of the PI soil excavation.
- 0.004 microgram/ $m^3$, dieldrin, collected on October 19, 2010, on a personnel sample during PI soil excavation.
- 0.009 microgram/ $m^3$, dieldrin, collected on October 21, 2010, upwind of the PI soil excavation.

Dust

Dust samples were collected using two TSI DustTrak 8520 particulate monitors operating inside environmental enclosures to protect them from moisture. The DustTrak monitors detect particulate in the range of 0.1 to approximately 10 micrometers aerodynamic diameter. Particulate concentrations are reported in a range from 0.001to 100 milligrams/cubic meter.

Note that although the DustTrak monitors were operated on October 28, 2010 and November 9, 12, 15, and 23, 2010, both upwind and downwind data from the November dates and downwind data from October 28 could not be retrieved by both QCI and the equipment supplier. The data from these dates is not available.

Table 1 (next page) summarizes the upwind and downwind dust data and compares the readings at Earhart I-2 and I-3 to data from 2009 (the most recent available data) collected at the Hawaii State Department of Health ambient air monitoring station at Kinau Hale on Punchbowl Street near downtown Honolulu.

Table 1: Earhart I-2 and I-3 Earhart I-2 and I-3 Dust Monitoring Data in Comparison to 2009 Data Hawaii State Department of Health (DOH) Ambient $PM_{10}$ Monitoring Station Located at Kinau Hale (micrograms/cubic meter [ug/$m^3$])*

| QCI's Sampling Date | Upwind, Earhart I-2/I-3 Sites | Downwind, Earhart I-2/I-3 Sites | Kinau Hale DOH Monitoring Station |
|---|---|---|---|
| October 19, 2010 | Minimum: 0<br>Maximum: 424<br>Average: 24 | Minimum: 33<br>Maximum: 1206<br>Average: 68 | Range of 2-10 (monthly 24-hour average $PM_{10}$ concentration) for 2009; the maximum average 24-hour average $PM_{10}$ concentration ranges from approximately 18-34 |
| October 20, 2010 | Minimum: 1<br>Maximum: 225<br>Average: 7 | Minimum: 7<br>Maximum: 305<br>Average: 63 | |
| October 21, 2010 | Minimum: 2<br>Maximum: 65<br>Average: 8 | Minimum: 3<br>Maximum: 541<br>Average: 53 | |
| October 22, 2010 | Minimum: 6<br>Maximum: 19<br>Average: 9 | Minimum: 0<br>Maximum: 95<br>Average: 28 | |
| October 25, 2010 | Minimum: 2<br>Maximum: 16<br>Average: 7 | Minimum: 6<br>Maximum: 85<br>Average: 21 | |
| October 26, 2010 | Minimum: 1<br>Maximum: 169<br>Average: 7 | Minimum: 36<br>Maximum: 785<br>Average: 60 | |
| October 27, 2010 | Minimum: 5<br>Maximum: 114<br>Average: 8 | Minimum: 0<br>Maximum: 874<br>Average: 28 | |
| October 28, 2010 | Minimum: 3<br>Maximum: 15<br>Average: 8 | Data not available | |

*Source: State of Hawaii Annual Summary 2009 Air Quality Data. Note that $PM_{10}$ refers to particulate matter under 10 micrometers in aerodynamic diameter. These are considered "coarse" particulates, generally from sources such as road and windblown dust and crushing and grinding activities. For comparison, the State of Hawaii 24-hour average $PM_{10}$ concentration Standard is 150 ug/$m^3$.

The pesticide and dust monitoring data should be evaluated in light of the following points:

- The downwind dust monitoring station was located adjacent to streets with considerable vehicular traffic that may have influenced the concentration of particulates indicated by the downwind monitor.
- Events that occurred during the monitoring period included mowing, landscape maintenance and gusty winds; these may have influenced the particulate counts.
- The project site is located within approximately one-half mile of the Honolulu International Airport, a significant source of particulate emissions. Also, major construction sites and heavily- trafficked roadways are located within approximately one mile of the site. These sites may also have influenced the amount of particulate measured.
- Pre-excavation background dust and pesticide air sampling data was not requested of QCI, and thus, this data is not available for comparison to the above-listed data.
- Department of Health ambient dust monitoring data available are not available for this location and this data is not available for comparison to the above-listed data.
- Based upon hundreds of air sampling data points with similarly wet conditions at other sites that QCI has collected, it was highly unlikely that airborne pesticide exposure would have resulted from the Earhart I-2 and I-3 sites. It was more likely that detected levels, particularly of the dust, came from off-site.
- This monitoring did not account for indoor residential exposure to dust and pesticide concentrations that should be considered an integral portion of human exposure assessment in residential settings.

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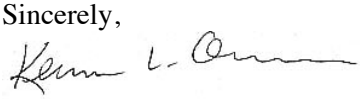
- Collection of the pesticide air samples followed a modified sampling procedure that did not fit the NIOSH standard. As mentioned earlier, these modifications were made in order to meet the risk assessment algorithm. It is unclear how these modifications to the sampling standard altered the sample collection efficiencies.
- Note that the above-listed results were not 24-hour average concentrations of dust and pesticides. QCI's monitoring lasted for the duration of excavation work. However, the short duration of the excavation work, coupled with the need to remove the equipment daily from these residential areas, constrained the length of time that samples could be collected. The maximum sampling period was 8 hours. The remaining 16 hours of each day produced little or no additional exposure because no active disturbance of PI soil was occurring and care had been taken to minimize off-hours exposure to the excavated areas. Thus, the work-shift sampling period sampling does not provide an accurate representation of a 24-hour time-weighted average.

Based upon the above-listed factors, the air concentrations of pesticides and dust measured during QCI's sampling may have been influenced by a number of factors that could have considerably influenced the results. Care must be taken in applying these results to a risk assessment algorithm. In addition, as with any air sampling, detectable air concentrations of contaminants do not equate to actual human exposure.

If you have any questions or need further information, please do not hesitate to contact me.

Sincerely,



Kevin L. Quinn, MPH, CIH, CSP
Quinn Consultants, Inc.

INALAB, Inc.

*Serving Hawaii for 33 years*

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**Monday, October 25, 2010**

**3615 Harding Avenue, Ste. 308, Honolulu, Hawaii 96816**
**VOICE: (808) 735-0422 / FAX: (808) 735-0047**
**WWW.INALAB.COM**

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 LAB # 101812

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL LEAD ISO/IEC 17025:2005 LAB # 101812

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE ISO/IEC 17025:2005 LAB # 101812

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103074
**Your Project:** Earhart I-2, PI Soil Excavation 10/18/10,10/15/10

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019001** | **E12101810-1 upwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019002** | **E12101810-2 downwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019003** | **E12101810-3 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019004** | **E12101810-4 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103074
**Your Project:** Earhart I-2, PI Soil Excavation 10/18/10,10/15/10

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019005** | **Earhart101510-1 upwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019006** | **Earhart101510-2 downwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019007** | **Earhart101510-3 personnel Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019008** | **Earhart101510-4 personnel,Lindsey, Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019001** | **E12101810-1 upwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019002** | **E12101810-2 downwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019003** | **E12101810-3 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019004** | **E12101810-4 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019005** | **Earhart101510-1 upwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019006** | **Earhart101510-2 downwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019007** | **Earhart101510-3 personnel Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019008** | **Earhart101510-4 personnel,Lindsey, Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019001** | **E12101810-1 upwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019002** | **E12101810-2 downwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019003** | **E12101810-3 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019004** | **E12101810-4 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019005** | **Earhart101510-1 upwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019006** | **Earhart101510-2 downwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019007** | **Earhart101510-3 personnel Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019008** | **Earhart101510-4 personnel,Lindsey, Residential PI Soil Abatement 10-15-10** | UNK | 0.09 | ug/m3 | 10/19/2010 | 10/20/2010 |

Comments

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## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019001** | **E12101810-1 upwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019002** | **E12101810-2 downwind Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/19/2010 |
| Comments | | | | | | |
| **20101019003** | **E12101810-3 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019004** | **E12101810-4 personnel Residential PI Soil Abatement 10-18-10** | UNK | < 0.05 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019005** | **Earhart101510-1 upwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019006** | **Earhart101510-2 downwind Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |
| **20101019007** | **Earhart101510-3 personnel Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |
| Comments | | | | | | |

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## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101019008** | **Earhart101510-4 personnel,Lindsey, Residential PI Soil Abatement 10-15-10** | UNK | < 0.06 | ug/m3 | 10/19/2010 | 10/20/2010 |

Comments

**All Quality Control data are acceptable unless otherwise noted.**

**General Comments**
**All analysts participate in interlaboratory quality control testing to continuously document profiency. The samples analyses subject of this analytical report were conducted in general accordance with the procedures associated with the" analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sampl relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. This report is not to be duplicated except in full without the expressed written permission of INALAB, Inc. This report should not be construed as an endorsement for a product or a service by the AIHA or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. For air samples, results are calculated based on the reported air volumes. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.**

**Results and Symbols Definitions**
**UNK = sample submitted for this evaluation / analysis.**
**DUP = duplicate sample analysis of the UNK sample.**
**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
**Tr = TRACE, i.e., the analyte of interest was, to a reasonable degree of scientific certainty present, but was BELOW the quantifiable limits of this determination (stated).**
**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
**# = Analytical methods marked with an "#" are not within our AIHA Scope of Accreditation.**
**MRL = Method Reporting Limit.**

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Kimberly Llanos**
**Laboratory Manager**

INALAB, Inc.

*Serving Hawaii for 33 years*

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**30 November 2010 issued a corrected report to replace original report dated 27 October 2010.**

**3615 Harding Avenue, Ste. 308, Honolulu, Hawaii 96816**
**VOICE: (808) 735-0422 / FAX: (808) 735-0047**
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AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL LEAD ISO/IEC 17025:2005 LAB # 101812

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE ISO/IEC 17025:2005 LAB # 101812

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**INALAB Job No:** 20103132
**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021046** | **E12102010-1 Upwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021046** | **E12102010-1 Upwind 10/20/10** | DUP | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021047** | **E12102010-2 Downwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021048** | **E12102010-3 Equipment operator 10/20/10** | UNK | < 0.005 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.005 ug/m3 | | | | | |

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## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021049** | **E12101910-1 Upwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021050** | **E12101910-2 Downwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021051** | **E12101910-3 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021052** | **E12101910-4 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021053** | **E12102110-1 Upwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101021054** | **E12102110-2 Downwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103132
**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021046** | **E12102010-1 Upwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021046** | **E12102010-1 Upwind 10/20/10** | DUP | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021047** | **E12102010-2 Downwind 10/20/10** | UNK | 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021048** | **E12102010-3 Equipment operator 10/20/10** | UNK | < 0.005 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.005 ug/m3 | | | | | |
| **20101021049** | **E12101910-1 Upwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021050** | **E12101910-2 Downwind 10/19/10** | UNK | 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021051** | **E12101910-3 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |

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**INALAB Job No:** 20103132
**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021052** | **E12101910-4 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021053** | **E12102110-1 Upwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101021054** | **E12102110-2 Downwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021046** | **E12102010-1 Upwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021046** | **E12102010-1 Upwind 10/20/10** | DUP | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021047** | **E12102010-2 Downwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021048** | **E12102010-3 Equipment operator 10/20/10** | UNK | < 0.005 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.005 ug/m3 | | | | | |
| **20101021049** | **E12101910-1 Upwind 10/19/10** | UNK | 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021050** | **E12101910-2 Downwind 10/19/10** | UNK | 0.009 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021051** | **E12101910-3 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103132
**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021052** | **E12101910-4 Personnel 10/19/10** | UNK | 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021053** | **E12102110-1 Upwind 10/21/10** | UNK | 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101021054** | **E12102110-2 Downwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103132
**Your Project:** Excavation of PI soil by Delta Construction in selected areas

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021046** | **E12102010-1 Upwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021046** | **E12102010-1 Upwind 10/20/10** | DUP | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021047** | **E12102010-2 Downwind 10/20/10** | UNK | < 0.01 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101021048** | **E12102010-3 Equipment operator 10/20/10** | UNK | < 0.005 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.005 ug/m3 | | | | | |
| **20101021049** | **E12101910-1 Upwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021050** | **E12101910-2 Downwind 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021051** | **E12101910-3 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |

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## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101021052** | **E12101910-4 Personnel 10/19/10** | UNK | < 0.004 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.004 ug/m3 | | | | | |
| **20101021053** | **E12102110-1 Upwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101021054** | **E12102110-2 Downwind 10/21/10** | UNK | < 0.006 | ug/m3 | 10/21/2010 | 10/25/2010 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**General Comments**
**All analysts participate in interlaboratory quality control testing to continuously document profiency. The samples analyses subject of this analytical report were conducted in general accordance with the procedures associated with the" analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sampl relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. This report is not to be duplicated except in full without the expressed written permission of INALAB, Inc. This report should not be construed as an endorsement for a product or a service by the AIHA or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. For air samples, results are calculated based on the reported air volumes. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.**

**Results and Symbols Definitions**
**UNK = sample submitted for this evaluation / analysis.**
**DUP = duplicate sample analysis of the UNK sample.**
**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
**Tr = TRACE, i.e., the analyte of interest was, to a reasonable degree of scientific certainty present, but was BELOW the quantifiable limits of this determination (stated).**
**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
**# = Analytical methods marked with an "#" are not within our AIHA Scope of Accreditation.**
**MRL = Method Reporting Limit.**

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Jennifer Hsu**
**Laboratory Manager**

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**30 November 2010 issued a corrected report to replace original report dated 29 October 2010.**

*Serving Hawaii for 33 years*

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103159
**Your Project:** Earhart I-2 PI Soil Excavation, 10/22/10

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101025022** | **E12102210-1 Upwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |
| **20101025023** | **E12102210-2 Downwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |

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**INALAB Job No:** 20103159
**Your Project:** Earhart I-2 PI Soil Excavation, 10/22/10

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101025022** | **E12102210-1 Upwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |
| **20101025023** | **E12102210-2 Downwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |

**All Quality Control data are acceptable unless otherwise noted.**

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101025022** | **E12102210-1 Upwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |
| **20101025023** | **E12102210-2 Downwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |

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**INALAB Job No:** 20103159
**Your Project:** Earhart I-2 PI Soil Excavation, 10/22/10

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
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| Comments | MDL = 0.008 ug/m3 | | | | | |
| **20101025023** | **E12102210-2 Downwind, PI Soil Excavation** | UNK | < 0.008 | ug/m3 | 10/25/2010 | 10/26/2010 |
| Comments | MDL = 0.008 ug/m3 | | | | | |

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**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
**Tr = TRACE, i.e., the analyte of interest was, to a reasonable degree of scientific certainty present, but was BELOW the quantifiable limits of this determination (stated).**
**> This testing result is greater than the numerical value listed.**
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**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
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**Ms. Jennifer Hsu**
**Laboratory Manager**

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# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**30 November 2010 issued a corrected report to replace original report dated 1 November 2010.**

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | DUP | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026065** | **E12102510-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026066** | **E12102610-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101026067** | **E12102610-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | DUP | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026065** | **E12102510-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026066** | **E12102610-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101026067** | **E12102610-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
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| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026066** | **E12102610-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101026067** | **E12102610-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026064** | **E12102510-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | DUP | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026065** | **E12102510-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/25/10** | UNK | < 0.01 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101026066** | **E12102610-1 Upwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101026067** | **E12102610-2 Downwind of PI Soil Excavation, Removal of Residual PI Soil, 10/26/10** | UNK | < 0.007 | ug/m3 | 10/26/2010 | 10/28/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

**All Quality Control data are acceptable unless otherwise noted.**

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**INALAB Job No:** 20103199
**Your Project:** Earhart I-2 HAFB

**General Comments**
**All analysts participate in interlaboratory quality control testing to continuously document profiency. The samples analyses subject of this analytical report were conducted in general accordance with the procedures associated with the" analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sampl relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. This report is not to be duplicated except in full without the expressed written permission of INALAB, Inc. This report should not be construed as an endorsement for a product or a service by the AIHA or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. For air samples, results are calculated based on the reported air volumes. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.**

**Results and Symbols Definitions**
**UNK = sample submitted for this evaluation / analysis.**
**DUP = duplicate sample analysis of the UNK sample.**
**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
**Tr = TRACE, i.e., the analyte of interest was, to a reasonable degree of scientific certainty present, but was BELOW the quantifiable limits of this determination (stated).**
**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
**# = Analytical methods marked with an "#" are not within our AIHA Scope of Accreditation.**
**MRL = Method Reporting Limit.**

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

**Ms. Jennifer Hsu**
**Laboratory Manager**

# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**6 December 2010 issued amended report to replace original report dated 4 November 2010.**

*Serving Hawaii for 33 years*

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | DUP | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029056** | **E12102810-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029057** | **E12102710-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029058** | **E12102710-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | DUP | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029056** | **E12102810-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029057** | **E12102710-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |
| **20101029058** | **E12102710-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | DUP | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029056** | **E12102810-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
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| **20101029058** | **E12102710-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
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**INALAB Job No:** 20103251
**Your Project:** Earhart I-2 PI soil abatement

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029055** | **E12102810-1 upwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | DUP | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101029056** | **E12102810-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.01 | ug/m3 | 10/29/2010 | 11/1/210 |
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| **20101029058** | **E12102710-2 downwind of PI soil excavation, Excav. of residual PI soil in already const. neigh.** | UNK | < 0.006 | ug/m3 | 10/29/2010 | 11/1/210 |
| Comments | MDL = 0.006 ug/m3 | | | | | |

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**INALAB Job No:** 20103251
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**General Comments**
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**Results and Symbols Definitions**
**UNK = sample submitted for this evaluation / analysis.**
**DUP = duplicate sample analysis of the UNK sample.**
**REP = replicate sample analysis which is a second preparation of the UNK sample analysis.**
**Tr = TRACE, i.e., the analyte of interest was, to a reasonable degree of scientific certainty present, but was BELOW the quantifiable limits of this determination (stated).**
**> This testing result is greater than the numerical value listed.**
**< This testing result is less than the numerical value listed.**
**ND = NOT DETECTED which means the analyte, if present below our stated detection limit/ level.**
**RPD = Relative Percent Deviation [unk-dup]/ave(unk,dup)*100.**
**# = Analytical methods marked with an "#" are not within our AIHA Scope of Accreditation.**
**MRL = Method Reporting Limit.**

DID INALAB FORENSIC DIVISION COLLECT THESE SAMPLES? No

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# INALAB, Inc.
# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**6 December 2010 issued amended report to replace original report dated 19 November 2010.**

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 LAB # 101812

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL LEAD ISO/IEC 17025:2005 LAB # 101812

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103416
**Your Project:** Earhart I-3, PI Soil Air Monitoring

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | DUP | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115004** | **EI3110910-2 Downwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115005** | **EI3111210-1 Upwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103416
**Your Project:** Earhart I-3, PI Soil Air Monitoring

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115006** | **EI3111210-2 Downwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

**All Quality Control data are acceptable unless otherwise noted.**

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | DUP | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115004** | **EI3110910-2 Downwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115005** | **EI3111210-1 Upwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101115006** | **EI3111210-2 Downwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103416
**Your Project:** Earhart I-3, PI Soil Air Monitoring

## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | DUP | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115004** | **EI3110910-2 Downwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115005** | **EI3111210-1 Upwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101115006** | **EI3111210-2 Downwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103416
**Your Project:** Earhart I-3, PI Soil Air Monitoring

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115003** | **EI3110910-1 Upwind, PI Soil Stockpile 11-9-10** | DUP | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115004** | **EI3110910-2 Downwind, PI Soil Stockpile 11-9-10** | UNK | < 0.01 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.01 ug/m3 | | | | | |
| **20101115005** | **EI3111210-1 Upwind, PI Soil Stockpile 11-12-10** | UNK | < 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |
| **20101115006** | **EI3111210-2 Downwind, PI Soil Stockpile 11-12-10** | UNK | 0.007 | ug/m3 | 11/15/2010 | 11/17/2010 |
| Comments | MDL = 0.007 ug/m3 | | | | | |

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**INALAB Job No:** 20103416
**Your Project:** Earhart I-3, PI Soil Air Monitoring

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**Ms. Jennifer Hsu**
**Laboratory Manager**

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# LABORATORY DIVISION
# ANALYTICAL REPORT

NVLAP LAB CODE 200655-0

**Tuesday, November 30, 2010**

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**INALAB Job No:** 20103492
**Your Project:** Earhart I-3 PI, Soil Stockpile, Hickam AFB

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101122067** | **EI3111510-1 upwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |
| **20101122068** | **EI3111510-2 downwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |

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**INALAB Job No:** 20103492
**Your Project:** Earhart I-3 PI, Soil Stockpile, Hickam AFB

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101122067** | **EI3111510-1 upwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
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| **20101122068** | **EI3111510-2 downwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |

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## Dieldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101122067** | **EI3111510-1 upwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |
| **20101122068** | **EI3111510-2 downwind, Earhart Neighborhood, PI Soil Stockpile, 11/15/10** | UNK | < 0.04 | ug/m3 | 11/22/2010 | 11/24/2010 |
| Comments | | | | | | |

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**INALAB Job No:** 20103492
**Your Project:** Earhart I-3 PI, Soil Stockpile, Hickam AFB

## Heptachlor #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
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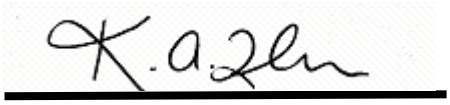

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**Ms. Kimberly Llanos**
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**Thursday, December 02, 2010**

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103550
**Your Project:** EARHART I-3

## Aldrin #

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101129014** | **E13112310-1 Upwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
| Comments | | | | | | |
| **20101129015** | **E13112310-2 Downwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
| Comments | | | | | | |

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**Email:** kquinn@hawaii.rr.com

**INALAB Job No:** 20103550
**Your Project:** EARHART I-3

## Chlordane (reported as gamma chlordane)#

**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

| Sample No. | Your Sample Description | Sample Type | Results | Units | Date Submitted | Date Analyzed |
|---|---|---|---|---|---|---|
| **20101129014** | **E13112310-1 Upwind, Soil excavation of PI soil 11/23/10** | UNK | < 0.0008 | ug/m3 | 11/29/2010 | 12/1/2010 |
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**EPA** **Method:** 8081A -m [Gas Chromatography - ECD]

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**INALAB Job No:** 20103550
**Your Project:** EARHART I-3

## Heptachlor #

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**Ms. Jennifer Hsu**
**Laboratory Manager**

DCN: 2653504.017.D01

# AIR MONITORING REPORT

## REMOVAL ACTION No. 2
## EARHART I-2 NEIGHBORHOOD
## JOINT BASE PEARL HARBOR-HICKAM
## OʻAHU, HAWAIʻI

April 2011

*Prepared for:*

**Lend Lease Americas LLC**
and
**Hickam Communities, LLC**
211 Mercury Street
Honolulu, HI 96818

*Prepared by:*

**Tetra Tech, Inc.**
737 Bishop Street, Suite 3020
Honolulu, HI 96813-3202

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| EPA | US Environmental Protection Agency |
| HC | Hickam Communities LLC |
| HCAB | Hawai‘i Clean Air Branch |
| HNL | Honolulu International Airport |
| HRA | Health Risk Assessment |
| JBPHH | Joint Base Pearl Harbor-Hickam |
| LAB | Laborer |
| µg/m$^3$ | micrograms per cubic meter |
| ND | Non-detected |
| NAAQS | National Ambient Air Quality Standard |
| NIOSH | National Institution for Occupational Safety and Health |
| OEHHA | Office of Environmental Health and Hazard Assessment |
| OSHA | Occupational Safety and Health Administration |
| OP | Operator |
| PEL | permissible exposure limit |
| PI | pesticide-impacted |
| $PM_{10}$ | fine particulate matter equal to or less than 10 microns |
| PUF | polyurethane foam |
| REG | residential exposure goal |
| RO | Removal Action |
| TO | Technical Order |
| TLV | threshold limit value |

# EXECUTIVE SUMMARY

This report documents the results of air monitoring that Tetra Tech conducted on behalf of Hickam Communities LLC (HC) from February 15 through 17, 2011, at the Earhart I-2 neighborhood of Joint Base Pearl Harbor-Hickam, Hawai'i (hereinafter the "Site"). The purpose of the air monitoring was to evaluate the potential exposure to HC workers and the public (i.e. HC residents and guests) to airborne pesticides (if any) during pesticide-impacted soil excavation activities being performed at the Site under *Removal Action No. 2 Work Plan* (Tetra Tech 2011b). Tetra Tech confirmed the presence of pesticides in the Site soil through extensive soil testing conducted during the Site Investigation from August through October 2010 (Tetra Tech 2010a and 2010b). The preliminary analytical results indicated that there were concentrations of aldrin and dieldrin in Site soil that exceed the regulatory guidelines established for HC (Tetra Tech 2009). The results of the Site Investigation will be reported in the *Remedial Investigation Report* (Tetra Tech 2011c).

Specifically, the air monitoring for Removal Action No. 2 Work Plan intends to:

1. Monitor health and safety for the HC workers who performed the soil disturbing activities.
2. Monitor the levels of airborne pesticides that HC residents and guests may be exposed to during the soil disturbing activities.

The work scope for conducting the air monitoring was as follows:

- **HC Workers – Personal Air Monitoring Scope of Work.** Air samples were collected in the breathing zones of two HC workers using personal air monitors. One personal monitor was placed on an HC laborer and one on an equipment operator within the work zone. The results of the personal air monitoring were used to evaluate the health impact on the HC workers from exposure to pesticides.

- **HC Residents and Guests – Residential Air Monitoring Scope of Work.** For the exposure assessment, air samples were collected at upwind and downwind

locations near the excavation Site boundary line. Sampling locations were moved periodically depending on excavation work locations and the prevailing wind direction at the time of sampling.

- **Residential Dust Monitoring Scope of Work.** Residential dust monitoring was conducted during excavation activities at the Site. The dust monitoring samples were collected from one upwind and one downwind air monitoring station that coincided with the residential air monitors. Dust data was collected at a rate of one reading per minute during excavation activities over an 8-hour work day.

The monitoring results are summarized as follows:

- **HC Workers – Personal Air Monitoring Results.** For HC worker health and safety monitoring, the organochlorine pesticides aldrin and dieldrin were detected in the air samples collected from the personal air monitors. The detected pesticide concentrations are below the Occupational Safety and Health Administration Permissible Exposure Levels and the American Conference of Governmental Industrial Hygienists Threshold Limit Values. The health risk screening concludes that the potential for health effects to HC workers due to exposure of pesticides is low.
- **HC Residents and Guests – Residential Air Monitoring Results.** The organochlorine pesticides aldrin, dieldrin and chlordane were detected in the air samples collected at residential air monitoring stations located upwind and downwind from excavation activities at the Site. The detected concentrations were below the Residential Exposure Goals established for HC (Tetra Tech 2011). The health risk screening concludes that the potential for health effects to HC residents and guests due to exposure of pesticides is low.

- **Residential Dust Monitoring Results.** The average and minimum dust levels for excavation activities conducted under the RO #2 are below the National Ambient Air Quality Standard $PM_{10}$ threshold for particulate dust. The maximum dust detections exceeded the $PM_{10}$ threshold in all of the upwind and downwind samples; however since the average daily readings being below the $PM_{10}$ threshold, and the dust samples were collected at a rate of one reading per minute during excavation activities, the exceedances in the maximum detections are likely due short dust emission bursts and not the result of prolonged dust emissions.

# SECTION 1
# AIR MONITORING SCOPE OF WORK

## 1.1 INTRODUCTION

This report documents the results of air monitoring that Tetra Tech conducted on behalf of Hickam Communities LLC (HC) from February 15 through 17, 2011, at the Earhart I-2 neighborhood of Joint Base Pearl Harbor-Hickam (JBPHH), Hawai'i (hereinafter the "Site"). The purpose of the air monitoring was to evaluate the potential exposure to HC workers and the public (i.e. HC residents and guests) from airborne pesticides (if any) during pesticide-impacted soil excavation activities being performed at the Site under *Removal Action No. 2 Work Plan* (RO #2; Tetra Tech 2011b). Tetra Tech confirmed the presence of pesticides in the Site soil through extensive soil testing conducted during the Site Investigation from August through October 2010 (Tetra Tech 2010a and 2010b). The preliminary analytical results indicated that there were concentrations of aldrin and dieldrin in Site soil that exceed the regulatory guidelines established for HC (Tetra Tech 2009). The results of the Site Investigation will be reported in the *Remedial Investigation Report* (RI Report) (Tetra Tech 2011c).

Specifically, the air monitoring for RO #2 intends to:

1. Monitor health and safety for the HC workers who performed the soil disturbing activities.
2. Monitor the levels of airborne pesticides that HC residents and guests may be exposed to during the soil disturbing activities.

The sampling protocol is shown in Table 1a.

## 1.2 APPLICABLE REGULATIONS

To determine the actual thresholds and specific monitoring procedures for the project, Tetra Tech used the applicable regulations presented in Sections 1.2.1 and 1.2.2.

### 1.2.1 Worker Health & Safety Monitoring

Monitoring of worker exposure to airborne pesticides followed guidelines established by the: (1) Hawai'i Department of Labor and Industrial Relation – Occupational Safety & Health Division, (2) Occupational Safety and Health Administration (OSHA), and (3) National institution for Occupational Safety and Health (NIOSH). The sample methods are detailed in US Environmental Protection Agency (EPA) Technical Order 10A (TO 10A) (EPA 2011).

### 1.2.2 Public Exposure Monitoring

Monitoring of public[1] exposure follows the guideline established by the rules and guidelines set forth by the Hawai'i Clean Air Branch (HCAB). The sampling method is detailed in EPA Technical Order 4A (TO 4A) (EPA 2011)

The following HCAB air quality regulations are applicable to the Site development and air monitoring conducted under RO #2, and thus were referenced to help guide the preparation of this air monitoring for the Site (HCAB 2011).

- HCAB Title 11 Chapter 60.1 Section 33 [§11-60.1-33] Fugitive Dust

The purpose of Rule §11-60.1-33 is to reduce the amount of dust entrained in the ambient air as a result of man-made fugitive dust sources by requiring actions to prevent, reduce, or mitigate fugitive dust emissions. No person shall cause or permit visible fugitive dust to become airborne without taking reasonable precautions. Examples of reasonable precautions are: use of water or chemical to suppress dust, covering stockpile, etc.

- HCAB Title 11 Chapter 59 Section 4 [§11-59-4] Ambient Air Standards.

The purpose of Rule §11-59-4 is to establish ambient air standards. It prohibits fine dust ($PM_{10}$) levels exceeding the following levels in ambient air: (1) An arithmetic mean of fifty micrograms per cubic meter of air during a calendar year; and (2) An average value of one hundred fifty micrograms per cubic meter of air during any twenty-four-hour period.

- HCAB Title 11 Chapter 60.1 Section 179 [§11-60.1-179] Ambient Air Concentration of Hazardous Air Pollutant

The purpose of Rule §11-60.1-179 is to reduce the amount of hazardous air pollutant in the ambient air. No person shall emit hazardous air pollutant in quantities that result in an excess individual lifetime cancer risk of more than 10 in one million assuming continuous exposure for 70 years.

## 1.3 ENVIRONMENTAL SCREENING LEVELS

Analytical results for the air monitoring conducted during the RO #2 were compared to specific environmental screening levels which are presented below.

[1] For the air monitoring conducted at HC during RO #2 implementation, the "public" is defined as HC residents and guests.

- **HC Workers – PELs and TLVs.** For workers within the excavation area, the Occupational Safety and Health Administration (OSHA) Permissible Exposure Levels (PELs) (for aldrin, dieldrin, and chlordane) (OSHA 2011) and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) (for heptachlor) are applied (ACGIH 2011). These screening levels are 8-hour time-weighted average concentrations

- **HC Residents and Guests – REGs.** The Residential Exposure Goals (REGs) were developed for ambient air monitoring in residential neighborhoods (Tetra Tech 2011a). The REGs are site-specific thresholds which were determined using the standard US Environmental Protection Agency (EPA) approach for calculating acceptable airborne chemical concentrations, a target risk of $1 \times 10^{-5}$, and site-specific exposure parameters. For the Site, it was assumed that residents could potentially be exposed to airborne pesticides (via inhalation) for 8-hours per day (i.e., during excavation activities) for 6 years (i.e., the residency period for military housing [U.S. AFRL, 1998]).

- **Airborne Dust – $PM_{10}$.** The environmental screening level for dust is based on the National Ambient Air Quality Standard (NAAQS) for 10 micrometer (μm) particulate matter ($PM_{10}$) (EPA 2010).

The screening levels used to evaluate the analytical results for the air monitoring conducted under the Removal Actions (ROs) at the Site are presented in Table 1b.

# SECTION 2
# HC WORKER HEALTH & SAFETY MONITORING

This section presents the HC worker health and safety monitoring procedures and results. The air monitoring for HC workers was conducted using personal air monitors place on two HC workers, one laborer and one equipment operator while they were working with PI soil within the excavation area. The goal of the monitoring was to obtain an average exposure based on a typical workday with a typical workload.

## 2.1 PERSONAL AIR MONITORS

For HC worker exposure evaluation, breathing zone monitoring was conducted. The sample collection apparatus used to monitor the breathing zone consists of a pump attached to the belt of a worker using a belt clip. A nylon tube connected the pump to a filter cassette and cartridge is situated at about the worker's neck height. The pump draws air through the filter and cartridge at a specific flow rate. The flow rate, types of filters, cartridge, and sampling times are specified in the NIOSH Guideline, Table 2, which presents these data for each chemical (NIOSH 2005). For the air monitoring conducted under the RO #2, the filter and cartridge were subsequently analyzed for organochlorine pesticides.

### 2.1.1 Pump Calibration

The air sampling pumps are standard equipment used in industrial hygiene exposure sampling. Prior to air monitoring, the sampling pumps are calibrated using a drycal calibrator. The pumps are also calibrated after the air monitoring event to detect any drift in the pump rate during the sampling period. The pre- and post-pump rates were averaged to obtain the average flow rate for data analysis.

### 2.1.2 Filter and Cartridge Preparation

Before starting the air monitoring event, the filter and cartridge samples were marked and numbered for identification.

## 2.2 FIELD METHODS – PERSONAL AIR MONITORS

For the breathing zone air monitoring, the personal air samplers were attached to HC workers within the excavation area at the Site. The HC workers included one laborer (LAB)

and one equipment operator (OP). Specific directions were given to each HC worker to notify Tetra Tech personnel if any problems occurred during sampling, such as pump failure or filter to pump disconnection. Tetra Tech personnel checked with the workers on an hourly basis to ensure proper air sampling was in progress.

For the air monitoring at the Site, a field blank sample was also collected. Since the field blank is installed, removed and handled in the same manner as the air samples, the procedure of taking a field blank provides the level of mass loading that may occur from the sample handling process alone. As a result, any mass found on the field blank is considered an artifact of the sampling process, and the amounts are subtracted from the sample mass loading for each air sample collected. Tetra Tech conducted the monitoring on three consecutive days, and did not detect significant problems in air sample collection over the 3-day event. There was no mass loading found in the blank samples.

After the air sampling was completed, the air samplers were shut off, the shut down time recorded. The filter and cartridge samples were removed from the pumps. The inlet and outlet of the filter cassettes and cartridge were immediately capped to prevent any increase or decrease in the mass loading of the filters and cartridge samples. The filter and cartridge samples were bagged and placed in ice boxes and sent to the laboratory with chain of custody. A copy of the Field Records is provided in Appendix A.

## 2.3 ANALYTICAL METHODS AND RESULTS – PERSONAL MONITORS

A total of seven air samples were received by Torrent Laboratory, Inc., Milpitas, California, on February 19, 2011. The laboratory provided the mass loading on each sample. A calculation is required to convert the mass loading to concentration so that comparisons to OSHA exposure limit can be made. The sampling results are presented in mass concentration ($\mu g/m^3$). Laboratory analyses of the collected media provide the mass loading. This calculation is shown in Equation (1):

$$\text{Conc.} = \text{Mass} / (Q \times t) \qquad (1)$$

*Where*:

| | | |
|---|---|---|
| Conc. | = | Concentration, micrograms per cubic meters ($\mu g/m^3$) |
| Mass | = | Filter and PUF cartridge mass loading, micrograms ($\mu g$) |
| Q | = | Sampling flow rate, cubic meter per minute ($m^3$/min) (converted from liter per minute [L/min]) |
| t | = | Sampling time, minutes (min) or liters per minute (L/min) |

Following is a sample calculation used in the data analyses from an air sampled collected at the Site.

The air sample collected on February 15, 2011 (LAB-2.15.2011) had detected a mass of 0.289 $\mu g$ for aldrin. The average pump rate was 1.01 L/minute. Sampling time was 318 minutes. The aldrin concentration [aldrin] is calculated using Equation (1):

$$[\text{aldrin}] = 0.289\ \mu g/(1.01\ L/min \times 318\ min \times 0.001\ m^3/L)$$
$$= \underline{0.9\ \mu g/m^3}$$

Aldrin and dieldrin were detected in the personal air monitoring samples. The analytical results are provided in Table 2, and a copy of the analytical report is provided in Appendix B.

## 2.4 DISCUSSION – HC WORKER EXPOSURE

In order to evaluate the level of worker exposure and establish if a mitigation action is required during Site work under the RO #2, the analytical results were compared to the standards for OSHA PELs were used (OSHA 2011), and the ACGIH TLVs (over an 8-hour day).

The concentrations for the organochlorine pesticides aldrin and dieldrin detected by the personal air monitors worn by HC workers are below the respective PEL and TLV values (Table 2).

# SECTION 3
# HC RESIDENTIAL EXPOSURE MONITORING

This section presents the air monitoring procedures and results for residential air monitoring at the Site. The sampling protocol was developed based on the actual site operational and physical characteristics, including site activities, receptor locations, and wind direction. The following sections provide sampling and analytical methods employed in this project.

## 3.1 RESIDENTIAL AIR MONITORS

A polyurethane foam (PUF) sampler was used for collection of airborne pesticides. The PUF sampler is designed to simultaneously collect suspended airborne particulates and trap airborne vapors at flow rates up to 0.28 $m^3$/min. Ambient air is forced through a dual chambered module, which contains both a particulate and vapor filtering system. The upper chamber supports the airborne particulate filter media in a circular filter holder, while the lower chamber encapsulates a glass cartridge that contains the PUF for vapor entrainment. The sampling method allows simultaneous collection of both airborne volatile and dust-entrapped contaminants. The filter and foam are removed and sent to an analytical laboratory for analysis to provide the concentrations of chemicals.

### 3.1.1 Sampler Pump Calibration

Prior to beginning the air monitoring event, the air sampling pumps were calibrated using a manometer and calibration kit supplied by the equipment vendor. The calibration curves are shown in Tables 3 and 4.

## 3.2 RESIDENTIAL AIR MONITORING STATIONS

The air sampling stations were placed upwind and downwind of key activity areas at the Site. To minimize other sources of fugitive emissions between the sampler and the excavation area, the air sampling stations were placed as close to the excavation area as feasible. For this air monitoring event, the air sampling stations were periodically moved so that the air samplers would be nearest to the activities generating dust emissions. This placement was done in order to capture any upwind and downwind airborne pesticides. Any pesticides detected in upwind samples are considered background, while the difference in the collected

pesticide concentrations between upwind and downwind samples is considered the net offsite airborne pesticide concentration resulting from onsite excavation activities.

## 3.3 METEOROLOGICAL MEASUREMENT SYSTEM

To establish the locations for the upwind and downwind air sampler stations, Tetra Tech consulted the meteorological data collected at Honolulu International Airport (HNL), which is immediately to the west of JBPHH (HNL 2011). Figure 1 shows the Wind Rose Graph indicating the prevailing wind is from the northeast with an average wind speed of 9.11 knots.

## 3.4 FIELD METHODS – RESIDENTIAL MONITORS

Field operations to prepare for sampling included the installation of temporary electrical power. A small gasoline generator was used to power the sampler. Monitoring activities included calibrating the sampling equipment, verifying initial and final sampler flow rates, replacing the exposed filter cassettes and PUF modules with new ones, and setting timers for the sampling duration. The samplers were operated during excavation activities for up to 8 hours each day over 3-day period. The collected samples (dated February 17, 2011) are thus composite samples for the residential air monitoring conducted from February 15 through 17, 2011.

The upwind air sample (EAR-AMB-UP) was collected over a period of 1,126 minutes (18.8 hours), and the downwind air sample (EAR-AMB-DOWN) was collected over a period of 1,062 minutes (17.7 hours). Table 5 shows the field log for the PUF samplers.

The collected air samples were processed, stored in a cooler with ice for sample preservation, and transported under a chain-of-custody form to a certified analytical laboratory for analyses. A copy of the Field Records is provided in Appendix A.

## 3.5 ANALYTICAL METHODS AND RESULTS – RESIDENTIAL AIR MONITORS

A total of two air samples were received by Torrent Laboratory, Inc., Milpitas, California, on February 19, 2011.The laboratory provided the mass loading on each sample. A calculation is required to convert the mass loading to concentration so that comparisons to OSHA exposure limit can be made. The sampling results are presented in mass concentration ($\mu g/m^3$). Laboratory analyses of the collected media provide the mass loading. Mass concentration is calculated as follows using Equation (1), shown in Section 2.3.

Following is a sample calculation used in the data analyses from an air sample collected at the Site.

The air sample collected on February 17, 2011 (EAR-AMB DOWN) had a detected mass of 1.01 μg for aldrin. The average pump rate was 0.198 $m^3$/minute. The total sampling time was 1,062 minutes. The aldrin concentration [aldrin] is calculated using Equation (1):

$$[\text{aldrin}] = 1.01\ \mu g/(0.198\ m^3/\text{min} \times 1{,}062\ \text{min})$$
$$= \underline{0.0046\ \mu g/m^3}$$

Aldrin and dieldrin were detected in the upwind and downwind air samples. The technical chlordane constituents alpha- and gamma-chlordane were detected in the downwind air sample. The analytical results are provided in Table 6, and a copy of the analytical report is provided in Appendix B.

## 3.6 DISCUSSION – RESIDENTIAL EXPOSURE TO AIRBORNE PESTICIDES

In order to evaluate the level of exposure to HC residents and guests, and to establish if a mitigation action is required during Site work under the RO #2, the analytical results were compared to the standard REGs developed for HC (Section 1.3, Tetra Tech 2011). For the downwind sample (EAR-AMB-DOWN), the detections for the technical chlordane constituents alpha- and gamma-chlordane were added, and the sum compared to the REG for chlordane.

The concentrations for the organochlorine pesticides aldrin, dieldrin, and chlordane constituents detected by the residential air monitors located at upwind and downwind air monitoring stations are below the respective REG values (Table 6).

## 3.7 RESIDENTIAL DUST MONITORING

Residential dust monitoring was conducted during excavation activities at the Site from February 15 through 17, 2011. The dust monitoring samples were collected from one upwind and one downwind air monitoring station that coincided with the residential air monitors. Dust data was collected at a rate of one reading per minute during excavation activities over an 8-hour work day.

As presented in Table 1b, the environmental screening level for dust is based on the National Ambient Air Quality Standard (NAAQS) for 10 micrometer (μm) particulate matter ($PM_{10}$).

### 3.7.1 Dust Monitoring Results

The dust monitoring results from February 2011 were compared to the NAAQS $PM_{10}$ screening level for airborne dust. The results were reported as average, minimum, and maximum values for each 8-hour monitoring period, where the dust readings were collected at a rate on one reading per minute. These results are summarized below and presented in Table 7.

- The average dust concentrations recorded by the upwind monitor ranged from 10 to 29 $\mu g/m^3$, and 10 to 30 $\mu g/m^3$ in the downwind dust monitors. All of which are below the NAAQS $PM_{10}$ standard (150 $\mu g/m^3$).

- The minimum dust concentrations recorded by the upwind monitor ranged from 0 to 15 $\mu g/m^3$, and 0 to 17 $\mu g/m^3$ in the downwind dust monitors. All of which are below the NAAQS $PM_{10}$ standard.

- The maximum dust concentrations recorded by the upwind monitor ranged from 235 to 719 $\mu g/m^3$, and 313 to 813 $\mu g/m^3$ in the downwind dust monitors. All of the upwind and downwind dust samples had detections exceeding the NAAQS PM10 standard.

### 3.7.2 Discussion – Dust Monitoring

The average and minimum dust levels for excavation activities conducted under the RO #2 are below the NAAQS $PM_{10}$ threshold for particulate dust. The maximum dust detections exceeded the $PM_{10}$ threshold in all of the upwind and downwind samples; however since the average daily readings being below the $PM_{10}$ threshold, and the dust samples were collected at a rate of one reading per minute during excavation activities over an 8-hour day, the exceedances in the maximum detections are likely due short dust emission bursts and not the result of prolonged dust emissions.

# SECTION 4
# CONCLUSIONS

Tetra Tech has conducted air monitoring at the Site during the implementation of RO #2 to evaluate HC worker health and safety and potential exposure to HC residents and guests from pesticides in airborne dust generated during excavation of PI soil at the Site. Air monitoring using personal air samplers and air samplers placed at air monitoring stations upwind and downwind of the excavation area was conducted during the period between February 15 through 17, 2011. There were no sampling or analytical related problems or issues encountered during the air monitoring event at the Site. Tetra Tech's conclusions are presented below:

- **HC Workers – Personal Air Monitoring.** For HC worker health and safety monitoring, the organochlorine pesticides aldrin and dieldrin were detected in the air monitoring samples collected from the personal air monitors. The detected pesticide concentrations are below the respective OSHA PELs and ACGIH TLVs. The health risk screening concludes that the potential for health effects to HC workers due to exposure of pesticides is low.
- **HC Residents and Guests – Air Monitoring Station.** The organochlorine pesticides aldrin, dieldrin and chlordane were detected in the air samples collected at residential air monitoring stations located upwind and downwind from excavation activities at the Site. The detected concentrations are below the respective REGs established for HC (Tetra Tech 2011). The health risk screening concludes that the potential for health effects to HC residents and guests due to exposure of pesticides is low.

- **Residential Dust Monitoring.** The average and minimum dust levels for excavation activities conducted under the RO #2 are below the NAAQS $PM_{10}$ threshold for particulate dust. The maximum dust detections exceeded the $PM_{10}$ threshold in all of the upwind and downwind samples; however since the average daily readings being below the $PM_{10}$ threshold, and the dust samples were collected at a rate of one reading per minute during excavation activities over an 8-hour day,

the exceedances in the maximum detections are likely due short dust emission bursts and not the result of prolonged dust emissions.

# SECTION 5
# REFERENCES


ACGIH (American Conference of Governmental Industrial Hygienists) 2011. *ACGIH Threshold Limit Values,*. Accessed at Internet URL: http://www.acgih.org/home.htm. April 2011.

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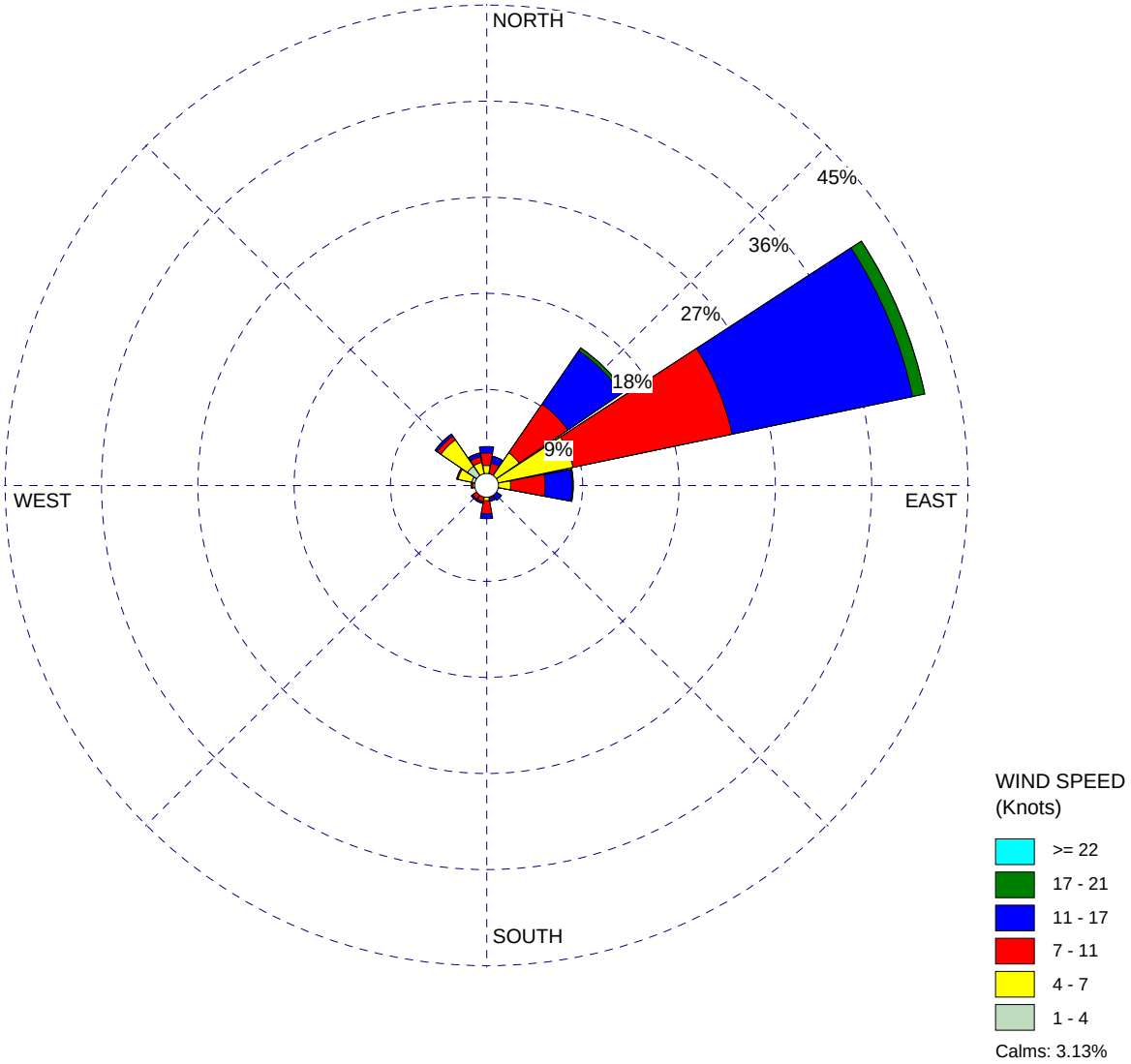
# FIGURES

WIND ROSE PLOT:

**Figure 1. Windrose - Honolulu Airport Meteorological Station**

DISPLAY:

**Wind Speed**
**Direction (blowing from)**




| | | | |
|---|---|---|---|
| COMMENTS: | DATA PERIOD:<br>**1989**<br>**Jan 1 - Dec 31**<br>**00:00 - 23:00** | COMPANY NAME:<br>**Tetra Tech, Inc.** | |
| | CALM WINDS:<br>**3.13%** | TOTAL COUNT:<br>**8747 hrs.** | |
| | AVG. WIND SPEED:<br>**9.11 Knots** | | PROJECT NO.: |

# TABLES

**Table 1a**
**Air Sampling Protocol**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

| Target Chemical[2] | Analytical Method [1] | Type of Monitoring Equipment | Type of Medium | Sampling Rate |
|---|---|---|---|---|
| Pesticides | TO-4A | PUF[3] Sampler | Filter/ PUF | Up to 0.28 $m^3$/minute |
| Pesticides | TO-10A | Personal Sampling Pump | Filter/ Cartridge | 1 to 5 L/minute |

*Notes*

1 US Environmental Protection Agency Technical Order
2 Pesticides: aldrin, dieldrin, chlordane, heptachlor
3 polyurethane foam

**Table 1b**
**Environmental Screening Levels for Airborne Dust and Pesticides**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

| Constituent[1] | Screening Level [2, 3] ($\mu g/m^3$) | Basis for Screening Level |
|---|---|---|
| ***Dust*** | | |
| Dust, as Particulate Matter ($PM_{10}$) | 150 | 24-hour National Ambient Air Quality Standard |
| ***Airborne Pesticides*** [1] | | |
| Aldrin | 0.075 | REG-Site-specific, risk-based concentration |
| | 250 | OSHA PEL –8-hour average |
| Chlordane | 3.6 | REG-Site-specific, risk-based concentration |
| | 500 | OSHA PEL –8-hour average |
| Dieldrin | 0.0795 | REG-Site-specific, risk-based concentration |
| | 250 | OSHA PEL –8-hour average |
| Heptachlor | 0.285 | REG-Site-specific, risk-based concentration |
| | 50 | ACGIH TLV –8-hour average |

*Notes*

$\mu g/m^3$ = micrograms per cubic meter.
$PM_{10}$ = Ambient Air Quality Standard for 10 micrometer particulate matter.
OSHA = Occupational Health and Safety Administration
ACGIH = American Conference of Governmental Industrial Hygienists
REG = Residential Exposure Goal
PEL = Permissible Exposure Limit
TLV = Threshold Limit Value

[1] Aldrin, chlordane, dieldrin, and heptachlor are organochlorine pesticide compounds.

[2] The pesticide screening levels are the site specific residential exposure goals (REG) developed for residential areas outside the excavation area. The OSHA PELs are applied to worker exposure within the excavation area only.

[3]There is no OSHA PEL established for heptachlor. The ACGIH TLV is referenced instead.

**Table 2**
**HC Workers - Personal Air Monitoring Results for Pesticides**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

| Sample | Date | Sampler Flow Rate | Sample Time | Mass | | Concentration | | Flow Rate Start | Flow Rate End |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Aldrin | Dieldrin | Aldrin | Dieldrin | | |
| | | [$m^3$/minute] | [minutes] | [µg] | [µg] | [µg/$m^3$] | [µg/$m^3$] | [$m^3$/minute] | [$m^3$/minute] |
| OP-2.15.2011 | 15-Feb-11 | 1.02 | 323 | 0.222 | 0.029 | 0.000674 | 0.000674 | 1.008 | 1.032 |
| LAB-2.15.2011 | 15-Feb-11 | 1.01405 | 318 | 0.289 | 0.076 | 0.000896 | 0.000896 | 1.029 | 0.9991 |
| OP-2.16.2011 | 16-Feb-11 | 0.9856 | 372 | 0.059 | 0.014 | 0.000161 | 0.000161 | 0.9933 | 0.9779 |
| LAB-2.16.2011 | 16-Feb-11 | 1.008 | 369 | 0.017 | <0.0023 | 0.000046 | 0.000046 | 1.009 | 1.007 |
| LAB-2.17.2011 | 17-Feb-11 | 0.9986 | 309 | 0.03 | 0.0105 | 0.000097 | 0.000097 | 1.004 | 0.9932 |
| ***OSHA PEL (Worker Exposure)*** | | | | | | ***250*** | ***250*** | | |
| ***ACGIH TLV (Worker Exposure)*** | | | | | | ***250*** | ***250*** | | |

*Notes*

Only detected analytes are shown in this table.

| | |
|---|---|
| LAB | laborer |
| OP | equipment operator |
| µg/$m^3$ | microgram per cubic meter |
| < | less than the laboratory reporting limit/minimum |
| REG | Residential Exposure Goal |
| OSHA | Occupational Safety and Health Administration |
| PEL | permissible exposure limit; over an 8-hour day |
| ACGIH | American Conference of Governmental Industrial Hygienists |
| TLV | threshold limit value; over an 8-hour day |

**Table 3**
**PUF Sampler - Upwind Calibration Curve**
**Februrary 15, 2011**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

**CET Engineering, Inc.**
**PUF Sampler Calibration**

**SITE**

| | | | |
|---|---|---|---|
| Location: | Hickam Air Force Base | Date: | 15-Feb-11 |
| Sampler: | UPWIND | Tech: | Jon Mollison |

**CONDITIONS**

| | | | |
|---|---|---|---|
| Sampler Elevation (feet): | 5 | | |
| Sea Level Pressure (in Hg): | 30.04 | Corrected Pressure (mm Hg): | 763 |
| Temperature (deg F): | 80 | Temperature (deg K): | 300 |
| Seasonal SL Press. (in Hg): | 30.04 | Corrected Seasonal (mm Hg): | 763 |
| Seasonal Temp. (deg F): | 80 | Seasonal Temp. (deg K): | 300 |

**CALIBRATION ORIFICE**

| | | | |
|---|---|---|---|
| Make: | Tisch | Qstd Slope: | 10.23860 |
| Model: | TE-5040A | Qstd Intercept: | -0.06645 |
| Serial#: | | Date Certified: | |

**CALIBRATION**

| Plate or Test # | H2O (in) | Qstd (m3/min) | FLOW (magn) | FLOW (corrected) | LINEAR REGRESSION | |
|---|---|---|---|---|---|---|
| 1 | 7.10 | 0.267 | 70.0 | 8.36 | Slope = | 29.4688 |
| 2 | 6.20 | 0.249 | 60.0 | 7.74 | Intercept = | 0.4893 |
| 3 | 4.80 | 0.220 | 50.0 | 7.06 | Corr. coeff.= | 0.9961 |
| 4 | 3.70 | 0.194 | 40.0 | 6.32 | | |
| 5 | 2.90 | 0.173 | 30.0 | 5.47 | # of Observations | 5 |

**Table 3**
**PUF Sampler - Upwind Calibration Curve**
**Februrary 15, 2011**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

*Notes*
Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
Flow (corrected)=Sqrt((magn)(Pa/Pstd)(Tstd/Ta))

Qstd = standard flow rate
Flow (magn)= reading off of magnehelic gauge
Flow (corrected)= corrected flow rate
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
1/m([Sqrt(magn)(Pav/760)(298/Tav)]-b)

m = sampler slope
b = sampler intercept
(magn)= magnehelic reading
Tav = daily average temperature
Pav = daily average pressure

| | | |
|---|---|---|
| Actual flowrate | 0.198013821 | m^3/min |
| Actual flowrate | 198.0138215 | liters/min |
| | | 24 hours |

**Table 3**
**PUF Sampler - Upwind Calibration Curve**
**Februrary 15, 2011**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

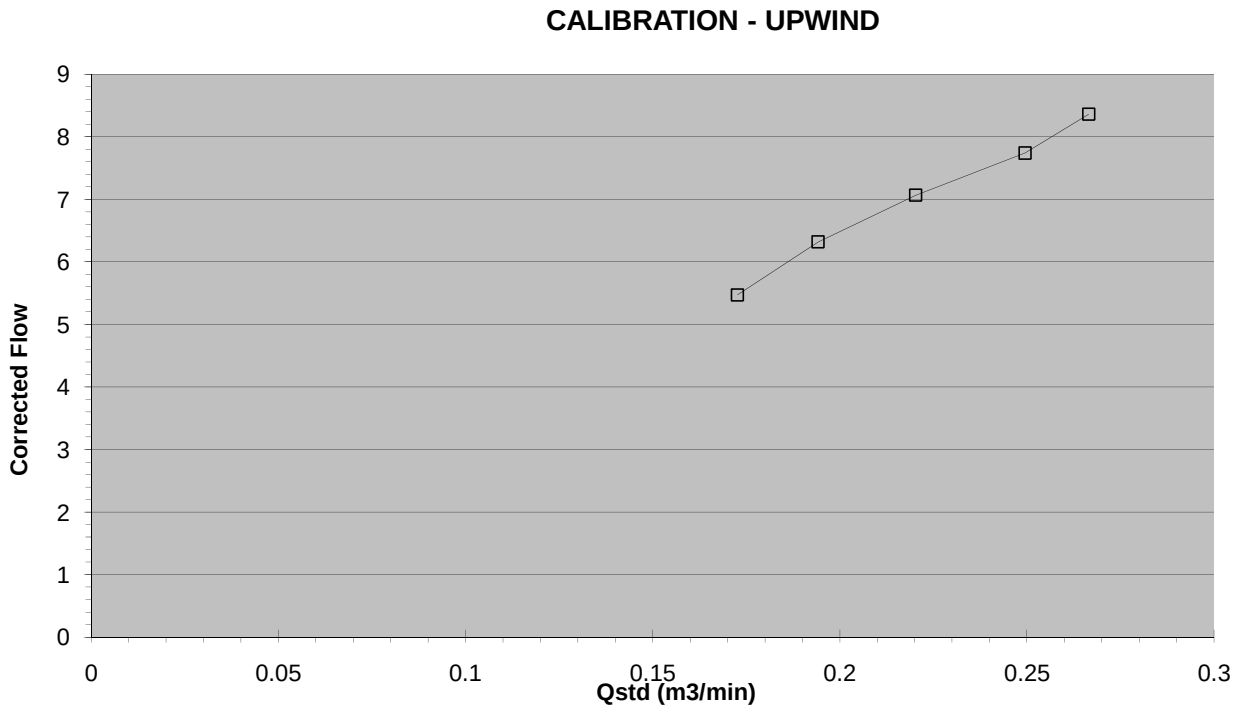


**Table 4**
**PUF Sampler - Downwind Calibrations Curve**
**Februrary 15, 2011**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

**CET Engineering, Inc.**
**PUF Sampler Calibration**

**SITE**

| | | | |
|---|---|---|---|
| Location: | Hickam Air Force Base | Date: | 15-Feb-11 |
| Sampler: | UPWIND | Tech: | Jon Mollison |

**CONDITIONS**

| | | | |
|---|---|---|---|
| Sampler Elevation (feet): | 5 | | |
| Sea Level Pressure (in Hg): | 30.04 | Corrected Pressure (mm Hg): | 763 |
| Temperature (deg F): | 80 | Temperature (deg K): | 300 |
| Seasonal SL Press. (in Hg): | 30.04 | Corrected Seasonal (mm Hg): | 763 |
| Seasonal Temp. (deg F): | 80 | Seasonal Temp. (deg K): | 300 |

**CALIBRATION ORIFICE**

| | | | |
|---|---|---|---|
| Make: | Tisch | Qstd Slope: | 10.23860 |
| Model: | TE-5040A | Qstd Intercept: | -0.06645 |
| Serial#: | | Date Certified: | |

**CALIBRATION**

| Plate or Test # | H2O (in) | Qstd (m3/min) | FLOW (magn) | FLOW (corrected) | LINEAR REGRESSION | |
|---|---|---|---|---|---|---|
| 1 | 7.30 | 0.270 | 70.0 | 8.36 | Slope = | 32.2188 |
| 2 | 6.00 | 0.246 | 60.0 | 7.74 | Intercept = | -0.2732 |
| 3 | 5.10 | 0.227 | 50.0 | 7.06 | Corr. coeff.= | 0.9981 |
| 4 | 4.20 | 0.206 | 40.0 | 6.32 | | |
| 5 | 3.10 | 0.178 | 30.0 | 5.47 | # of Observations | 5 |

**Table 4**
**PUF Sampler - Downwind Calibrations Curve**
**Februrary 15, 2011**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

*Notes*

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
Flow (corrected)=Sqrt((magn)(Pa/Pstd)(Tstd/Ta))

Qstd = standard flow rate
Flow (magn)= reading off of magnehelic gauge
Flow (corrected)= corrected flow rate
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
1/m([Sqrt(magn)(Pav/760)(298/Tav)]-b)

m = sampler slope
b = sampler intercept
(magn)= magnehelic reading
Tav = daily average temperature
Pav = daily average pressure

| | | |
|---|---|---|
| Actual flowrate | 0.204779933 | m^3/min |
| Actual flowrate | 204.7799332 | liters/min |
| | | 24 hours |

**Table 4**
**PUF Sampler - Downwind Calibrations Curve**
**Februrary 15, 2011**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

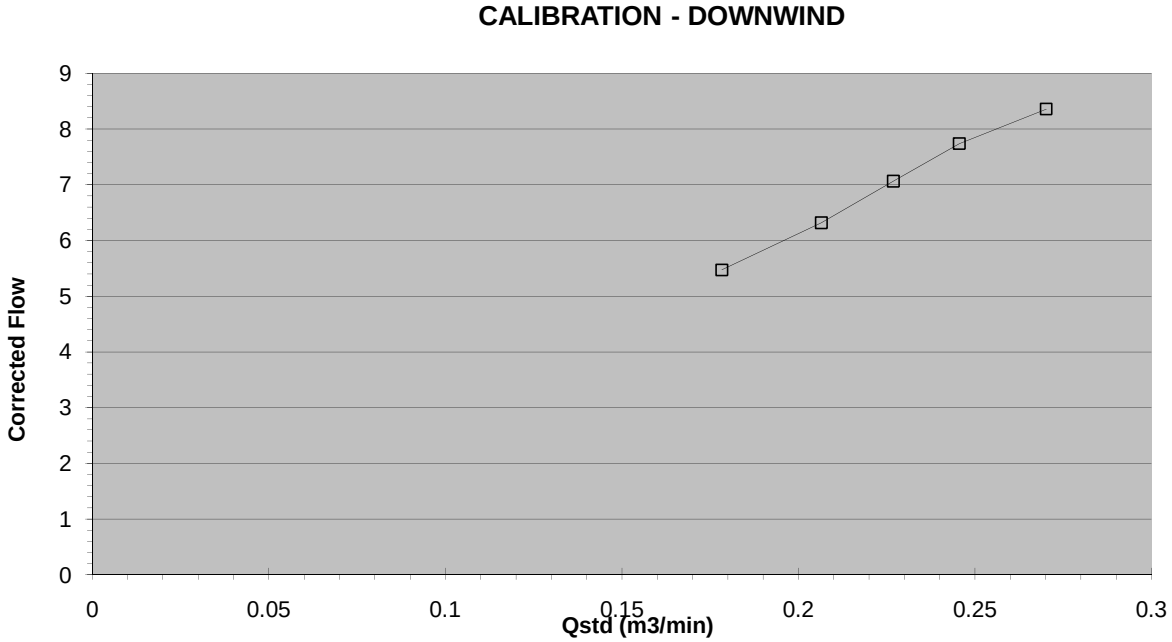


**Table 5**
**Field Sampling Records for PUF Samplers - Pesticides**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

| Station | Sample ID | Target Chemical[1] | Sample Date | Meter Start | Meter End | Elasped Time (hr) | Total Elasped Time per sample (min) | Pressure Start (in. water) | Pressure End (in. water) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | EAR-AMB-UP | Pesticides | 2/15/2011 | 993.18 | 999.61 | 6.43 | 1126 | 60 | 60 |
| | | | 2/16/2011 | 999.61 | 1006.31 | 6.7 | | 70 | 73 |
| | | | 2/17/2011 | 1006.31 | 1011.95 | 5.64 | | 70 | 73 |
| 2 | EAR-AMB-DOWN | Pesticides | 2/15/2011 | 4584.27 | 4590.63 | 6.36 | 1062 | 76 | 76 |
| | | | 2/16/2011 | 4590.63 | 4596.3 | 5.67 | | 70 | 79 |
| | | | 2/17/2011 | 4596.3 | 4601.97 | 5.67 | | 70 | 79 |

*Notes*

EAR-AMB-UP = Upwind Air Sampling Station
EAR-AMB-DOWN = Downwind Air Sampling Station
1 Pesticides: aldrin, dieldrin, chlordane, heptachlor

**Table 6**
**Residential Air Monitoring Station Results for Pesticides**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

| Sample ID → | EAR-AMB-UP[1] | | | | EAR-AMB-DOWN[1] | | | | Site-Specific REG[2] |
|---|---|---|---|---|---|---|---|---|---|
| Sample Date→ | 17-Feb-11 | | | | 17-Feb-11 | | | | |
| Parameters→ | Measured Mass | Sampler Flow Rate | Sample Time | Measured Concentration | Measured Mass | Sampler Flow Rate | Sample Time | Measured Concentration | |
| Units→ | [µg] | [$m^3$/minute] | [minutes] | [µg/$m^3$] | [µg] | [$m^3$/minute] | [minutes] | [µg/$m^3$] | [µg/$m^3$] |
| ***Sample Date***→ | | | | | | | | | |
| Aldrin | 0.484 | 0.1980 | 1126 | 0.0022 | 1.01 | 0.2048 | 1062 | 0.0046 | 0.075 |
| Dieldrin | 0.148 | 0.1980 | 1126 | 0.0007 | 0.625 | 0.2048 | 1062 | 0.0029 | 0.0795 |
| Chlordane[3] | | | | < ND | | | | 0.0005 | 3.6 |
| *gamma-Chlordane* | *< 0.088* | *0.1980* | *1126* | *<0.00034* | *0.0635* | *0.2048* | *1062* | *0.0003* | NE |
| *alpha-Chlordane* | *< 0.003* | *0.1980* | *1126* | *<0.00001* | *0.039* | *0.2048* | *1062* | *0.0002* | NE |

*Notes*

Only detected analytes are shown in this table.

µg/$m^3$ microgram per cubic meter
< less than the laboratory reporting limit/minimum
REG Residential Exposure Goal
ND not detected
NE not established

1 The samplers were operated during excavation activities for up to 8 hours each day over 3-day period. The collected samples (dated February 17, 2011) are thus composite samples for the residential monitoring conducted from February 15 through 17, 2011.

2 The site-specific REGs were developed for monitoring of airborne pesticides in the residential neighborhoods outside of the excavation area during RO implementation .

3 The technical chlordane value reported here is the sum of alpha- and gamma-chlordane concentrations. Alpha- and gamma-chlordane are technical chlordane constituents.

**Table 7**
**Analytical Results for Airborne Dust**
**Removal Action No. 2, Hickam Communities**
**Joint Base Pearl Harbor-Hickam , Hawai'i**

| Dust Monitor Location | Sample Date | Dust Concentration[1] | | | Duration | | |
|---|---|---|---|---|---|---|---|
| | | Average ($\mu g/m^3$) | Minimum ($\mu g/m^3$) | Maximum ($\mu g/m^3$) | Approximate start time | Approximate end time | Actual run time (hrs) |
| **Upwind Monitor** | 2/15/2011 | 15 | 0 | **235** | 10:00 | 15:00 | 5:41 |
| | 2/16/2011 | 29 | 15 | **719** | 8:20 | 14:55 | 6:29 |
| | 2/17/2011 | 10 | 9 | **423** | 8:00 | 13:45 | 5:45 |
| **Downwind Monitor** | 2/15/2011 | 10 | 0 | **313** | 10:00 | 15:00 | 5:46 |
| | 2/16/2011 | 30 | 10 | **813** | 8:20 | 14:55 | 6:32 |
| | 2/17/2011 | 23 | 17 | **621** | 8:00 | 13:45 | 5:46 |
| ***NAAQS $PM_{10}$*** | | ***150*** | | | | | |
| ***OSHA PEL*** | | ***15,000*** | | | | | |
| ***HDOH Monitoring Station[2]*** | | ***2 to 10 (monthy 24 hour average) 18 to 34 (24 hour average)*** | | | | | |

***Notes:***

**Bolded** values are detections exceeding the $PM_{10}$ standard

| | |
|---|---|
| $\mu g/m^3$ | microgram per cubic meter |
| NA | not available |
| $PM_{10}$ | National Ambient Air Quality Standard (NAAQS) for 10 millimeter (mm) particulate matter |
| OSHA | Occupational Safety and Health Adminstration |
| PEL | permissible exposure limit; over an 8-hour day |
| HDOH | Hawai'I Department of Health |
| 1 | Dust readings collected from two separate monitors at a rate of one per minute over an 8-hour work day. |
| 2 | Kinau Hale HDOH Monitoring Station: Range of 2 to 10 $\mu g/m^3$ (monthly 24-hour average $PM_{10}$ concentration) for 2009; the maximum average 24-hour average $PM_{10}$ concentration ranges form approximately 18 to 34 $\mu g/m^3$ |

# APPENDIX A
# FIELD RECORDS

TETRA TECH

# FIELD NOTES

**Project Title:** Earhart RAP #2
**Project #:** ~~000~~ 100-SFO-T26535
**Date:** 2/15/2010 **Time:**
**Location:** Earhart 1-2, Hickam
**Client:** Hickam Communities
**Tt Personnel:** J Mollison, A. Unserleider conducting oversight of plenter area remediation
**Misc. Personnel:**

**Statement of Work:** Oversight of Bldg 6363 excavation and air monitoring
**Equipment Used:**

**Weather:**

| Time | Project Activity |
|---|---|
| ~~8~~45 | Tt arrived on site |
| | Health & Safety Meeting |
| | Calibrate & Install DustTrak air monitors, one in upgradient (east) corner, one downgradient of work area north of driveway for unit # |
| 930 | Calibrate and begin personal air monitoring program using SKC Personal air pumps and ORBO-1500 PUF Sandwich Samplewave - glass sleeves for TO-10A |

| Unit | $Q_{START}$* | $Q_{END}$* | Time (min) | Placement | Sample |
|---|---|---|---|---|---|
| 13496 | 1.008 | 1.032 | 323 | Operator | OP-02.15.2011 |
| 13775 | 1.029 | 0.9991 | 318 | Laborer | LAB-02.15.2011 |

*Average over 10 readings

1000 Install ambient air sampler
1015 Jeff Edmonson on-site for work update for ~20 minutes
1030 AN arrives with 2 generators

| Setup | Unit | $H_{START}$ | $H_{END}$ | $H_2O$ inches | Sample |
|---|---|---|---|---|---|
| Upgradient | | ~~993.18~~ | ~~996.61~~ | 60 | AMBIENT-UP |
| Downgradient | | 4584.27 | 4590.63 | 76 | AMBIENT-DOWN |

1100 off-site for lunch
1130 Return to site to observe soil load out

1200 Follow up with planter work Building 6340, Unit 835 skipped due to containers in way

1230 Talk to landscapers - they are under instruction not to remove plants that owners installed. They will only work where they see Lanai as T.I. plants. Currently working on bldg 6353

1300 Fifth truck of soil loaded out

1330 Conduct quick survey of planter areas to determine where work won't be done until clients have been notified

1410 Jeff Edmonson on-site to discuss landscape issue - He has contacted Mel, who is discussing with Louis

Refuel generators for ambient air samplers

J.E. confirms that all plants & P.I. soil must be removed from planters regardless of who installed them

1430 Talk to Jacobsen crew about removing homeowner plants and what to do if the homeowner removes plants. Nothing you can do if they do it before you arrive. Otherwise, contact Actus

1500 Remove Dust Trak monitors

| | | | | |
|---|---|---|---|---|
| Upwind | Avg: 0.015 | Min: 0.0 | Max: 0.235 | Time: 5:41 |
| Downwind | Avg: 0.010 | Min: 0.0 | Max: 0.313 | Time: 5:46 |

1515 - Delta decons and removes excavator, breakdown & remove ambient air samplers

- 11 Truckloads hauled out
- Approximately 200 ft$^2$ remains for removal along Olena Nui circle, Actus Delta has geotextile laid out on all excavated areas

1530 off-site

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart Removal Action #2
**Project #:** 190-SFO-T26535-04
**Date:** 2/16/2011 **Time:**
**Location:** Hickam AFB
**Client:** Hickam Communities
**Tt Personnel:** S. Mollison

**Misc. Personnel:**

**Statement of Work:** Air Monitoring, Landscaping Removal, Excavation of 6363
**Equipment Used:** N

**Weather:**

| Time | Project Activity |
|---|---|
| 720 | Tt arrived on site |
| | Health & Safety Meeting |
| | Begin setting up air monitors |
| 730 | Delta drops off excavator |
| 820 | Delta on site, begin excavation @ 6363 |

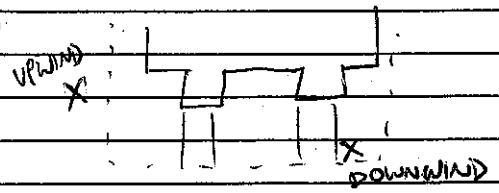
Ambient Monitors

| TSTART | TEND | PRESSURE: START | END | LOCATION |
|---|---|---|---|---|
| 999.61 | 1006.31 | 70 | 73 | UPWIND |
| 4590.63 | 4569.34 | 70 | 79 | DOWNWIND |

Personal Monitors

| Unit | QSTART | QEND | Time | Placement | Sample |
|---|---|---|---|---|---|
| 13496 | 0.9933 | 0.9779 | 372 | Operator | OP-2.16.2011 |
| 13775 | 1.009 | 1.007 | 369 | Laborer | LAB-2.16.2011 |

Set Up Dust Traks with Ambient Monitors




1450 Downwind monitor falls over, main busted, off-site for replacement

915 Return to site, repair downwind ambient sampler
930 Meet with Jacobsen crew to review all landscape areas

1630 Delta completes excavating unit 832 yard, lays out geotextile. laid out. Excavator moved over to unit 834

1130 3 Truckloads moved out so far, Delta break for lunch
1200 Refuel generators, return to work

Verify landscape work

Remove DustTrak Monitors

| | | Average | Min | Max | Time |
|---|---|---|---|---|---|
| 1455 | Upwind: | 0.029 | 0.015 | 0.719 | 6:29 |
| | Downwind: | 0.030 | 0.010 | 0.813 | 6:32 |

1500 Remove Personal Air Monitor
1510 Delta excavator removed from site, crew lays out geotextile
- Front yard sections fully excavated

TETRA TECH



# FIELD NOTES

**Project Title:** Earhart Removal Action #2
**Project #:** 100-SFO-T26535-04
**Date:** 2/17/2011 **Time:**
**Location:** Hickam A FB
**Client:** Hickam Communities
**Tt Personnel:** J Mellisa

**Misc. Personnel:**

**Statement of Work:** Air monitoring, landscaping removal, excavation of 6363

**Equipment Used:**

**Weather:**

| Time | Project Activity |
|---|---|
| 745 | Tt arrived on site, drop off PtP form Health & Safety Meeting |

Set up Ambient air monitors

| T START | T END | P START | P END | LOCATION |
|---|---|---|---|---|
| 1006.31 | 1011.95 | 70 | 70 | UPWIND |
| 4569.34 | 4601.97 | 70 | 73 | DOWNWIND |

Set Up Personal Air Monitors

| UNIT | Q START | Q END | Time (min) | Placement | Sample |
|---|---|---|---|---|---|
| 13496 | 1.050 | 1.003 | 307 | Operator | OP-2.17.2011 |
| 13775 | 1.004 | 0.9932 | 309 | Laborer | LAB-2.17.2011 |
| Also prep field blank | | | | | FB-2.17.2011 |

Set up Dust Trak air monitors

- Delta working on excavating front yard of unit 838, single truck hauling to ~~stor~~ soil storage area

- Check in with landscape work - guys working on Building 6380, Unit 548

1000 Fuel truck on site for excavator maintenance and fueling

1030 Jacobsen PM on-site to co-ordinate installation of water irrigation lines today and tomorrow
Call YKP to update her on schedule of excavation

1130-1200 Delta breaks for lunch

1200 Jacobsen crew stops work on landscape areas and begins installation of irrigation lines in 6363 DU-39a

1315 Excavation complete. Delta cleans excavator treads and moves it off area, begins laying out geotextile fabric at unit 838

Irrigation lines complete at north and central portions of DU-39a

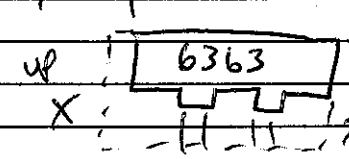
1345 Remove Dust TRAK Monitors (mg/m$^3$)

| Unit | Avg | Min | Max | Time |
|---|---|---|---|---|
| Upwind | 0.10 | 0.009 | 0.423 | ~~5:46~~ |
| Downwind | 0.023 | 0.017 | 0.621 | 5:45 |

Break down personal air monitors

Break down ambient air monitors
Samples collected
~~AMB-A~~ ~~SMAR~~-AMB-AIR
EAR-AMB~~UP~~ ~~2.17.2011~~
EAR-AMBDOWN ~~2.17.2011~~

Today's placement

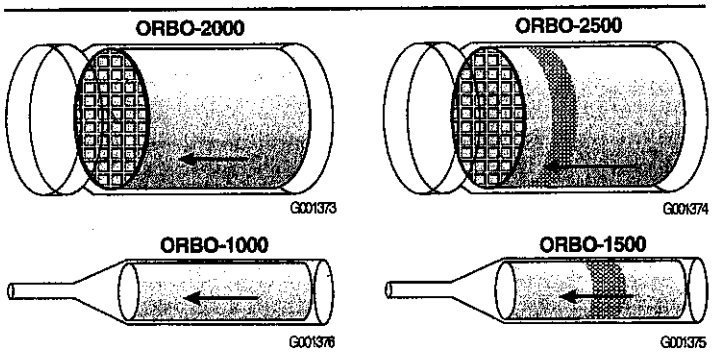



1430 Off-site

**This Data Sheet Contains Important Information About The Product.**

# POLYURETHANE FOAM (PUF) CARTRIDGES

| Cartridges | Cat. No. | Replacement Plug Cat. No. |
|---|---|---|
| ORBO-1000 Small PUF, pk 3 | 20557 | 20600-U |
| ORBO-1500 Small PUF/XAD/PUF, pk 3 | 21233-U | Inquire |
| ORBO-2000 Large PUF | 20037 | 20038 |
| ORBO-2500 Large PUF/XAD/PUF | 21235-U | 20009-U |




Several US EPA and ASTM methods require a polyurethane foam (PUF) adsorbent cartridge for monitoring semivolatiles in stack, ambient, indoor, and workplace atmospheres. PUF plugs are frequently combined with an additional adsorbent, such as XAD®-2 resin, to collect more volatile contaminants, and may also be preceded by a quartz filter to trap particulate matter. All our PUF products are meticulously cleaned and packaged to ensure the lowest blank levels.

**Note:** Discoloration of the PUF has not been shown to affect performance.

**Features**
- Method applications for pesticides, PCBs, PAHs, dioxins
- Extensively precleaned for low level analysis
- Certificate of analysis provided for each lot
- Low pressure drop facilitates high volume sampling

## SPECIFICATIONS OF PUF CARTRIDGES

**Small PUF (Low Volume)**

| | ORBO-1000 Small PUF | ORBO-1500 PUF/XAD-2/PUF |
|---|---|---|
| **Dimensions** | 2.2 cm O.D. x 7.6 cm length | PUF: 2.2 cm O.D. x 3.0 cm length<br>XAD-2: 1.5 g<br>PUF: 2.2 cm O.D. x 3.0 cm length |
| **Sampling Rate** | 1-5 L/min. | 1-5 L/min. |
| **PUF Density** | 0.022 g/cm³ | 0.022 g/cm³ |
| **Applications** | ASTM D4861 – Pesticides/PCBs<br>ASTM D4947 – Chlordane/Heptachlor<br>EPA IP-8 – Pesticides/PCBs<br>EPA TO-10A – Pesticides/PCBs | Pesticides/PCBs |

**Large PUF (High Volume)**

| | ORBO-2000 Large PUF | ORBO-2500 PUF/XAD-2/PUF |
|---|---|---|
| **Dimensions** | 6 cm O.D. x 7.6 cm length | PUF: 6 cm O.D. x 5.1 cm length<br>XAD-2: 10 g<br>PUF: 6 cm O.D. x 2.5 cm length |
| **Sampling Rate** | 20-225 L/min. | 20-225 L/min. |
| **PUF Density** | 0.022 g/cm³ | 0.022 g/cm³ |
| **Applications** | ASTM D6209 – PAHs<br>EPA IP-7 – PAHs<br>EPA TO-4A – Pesticides/PCBs<br>EPA TO-9A – Dioxins<br>EPA TO-13A – PAHs | Pesticides/PCBs<br>PAHs<br>Dioxins |

### Sample Collection and Analysis

All Supelco PUFs are precleaned and ready to use. Meticulous handling during sampling and analysis is required to maintain sample integrity. The tapered design and low pressure drop of the small PUF allows collection with a personal sampling pump. The large PUF is compatible with a sampling head used in a high-volume sampler, such as the PS-1 semi-volatile sampler.

1. Following proper pump calibration, collect air sample at 1-5 L/min. for small PUFs and 20-225 L/min. for large PUFs, as recommended in the method used. Store collected sample at -10 °C.
2. Soxhlet extract PUF sample within one week of collection using hexane/ether as described in methodology. Concentrate extract to desired volume and store at -10 °C.
3. Analyze sample within two weeks using GC or HPLC as appropriate for the compounds being tested.

### PUF Cleanup

PUF plugs are reuseable when properly cleaned:

1. Soxhlet extract in 5% diethyl ether in n-hexane for 16 hours.
2. Vacuum dry at room temperature for 2 to 4 hours.
3. Handle with gloves and store in a clean air-tight glass container protected from light.
4. Verify cleanliness by analyzing at least one blank PUF for each batch.

### Cartridge Assembly

1. Using gloves, gently insert the PUF plug into a *clean* glass holder by gently twisting until the plug rests at the bottom of the holder, or the XAD-2 in the case of the combination cartridge. Slight compression is necessary to ensure the snug fit required for proper sample flow.
2. Quickly cap each end of the cartridge with polypropylene caps or place in a sealed glass jar with teflon-lined cap. Protect from light to prevent discoloration.

| Description | Quantity | Cat. No. |
|---|---|---|
| **Small PUF Cartridges and Components** | | |
| ORBO-1000 Assembled Cartridge<br>Glass holder with cleaned PUF plug | 3 | **20557** |
| Replacement Cleaned PUF Plugs (7.6 cm length) | 3 | **20600-U** |
| ORBO-1500 Assembled Cartridge<br>Glass holder with cleaned XAD-2 resin and PUF plugs | 3 | **21233-U** |
| Cleaned XAD-2 Resin (Supelpak-2) | 100 g | **20279** |
| Glass holder for Small PUFs | 1 | **20556** |
| Filter Cartridge Assembly with 3.2 cm replaceable quartz filter | 1 | **21031** |
| **Large PUF Cartridges and Components** | | |
| ORBO-2000 Assembled Cartridge<br>Glass holder, screen, and cleaned PUF plug | 1 | **20037** |
| Replacement Cleaned PUF Plug (7.6 cm length) | 1 | **20038** |
| ORBO-2500 Assembled Cartridge<br>Glass holder with cleaned XAD-2 resin and PUF plugs | 1 | **21235-U** |
| Replacement Cleaned 2 pc. PUF Plugs (5.1 cm and 2.5 cm lengths) | 1 set | **20009-U** |
| Cleaned XAD-2 Resin (Supelpak-2) | 100 g | **20279** |
| Glass holder and screen for Large PUFs | 1 | **20563** |
| Stainless Steel Screens (55 mm diam.) | 2 | **21008-U** |

T710098E
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**SUPELCO**
**Bellefonte, PA**

# APPENDIX B
# LABORATORY ANALYTICAL REPORT

Yvonne Parry
Tetra Tech Inc (HI)
737 Bishop St, Suite 3020
Honolulu, Hawaii 96813
Tel: 808-533-3366
Fax: 808-533-3306
Email: Yvonne.parry@Tetratech.com

RE: Earhart Air Monitoring

Work Order No.: 1102143

Dear Jon Mollison:

Torrent Laboratory, Inc. received 9 sample(s) on February 19, 2011 for the analyses presented in the following Report.

All data for associated QC met EPA or laboratory specification(s) except where noted in the case narrative.

Torrent Laboratory, Inc. is certified by the State of California, ELAP #1991. If you have any questions regarding these test results, please feel free to contact the Project Management Team at (408)263-5258; ext 204.

Patti Sandrock

March 01, 2011
Date

Torrent LABORATORY, INC.

**Date:** 3/1/2011

**Client:** Tetra Tech Inc (HI)

**Project:** Earhart Air Monitoring

**Work Order:** 1102143

## CASE NARRATIVE

No issues encountered with the receiving, preparation, analysis or reporting of the results associated with this work order.

Results are reported as ug found on column. Per client request, no sample volume corrections have been applied.

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

**LAB-2.15.2011** 1102143-001A

| Parameters: | Analysis Method | DF | MDL | PQL | Results ug |
|---|---|---|---|---|---|
| Dieldrin | TO10A | 1 | 0.002300 | 0.0100 | 0.0760 |
| Aldrin | TO10A | 2 | 0.004600 | 0.0200 | 0.289 |

**OP-2.15.2011** 1102143-002A

| Parameters: | Analysis Method | DF | MDL | PQL | Results ug |
|---|---|---|---|---|---|
| Aldrin | TO10A | 1 | 0.002300 | 0.0100 | 0.222 |
| Dieldrin | TO10A | 1 | 0.002300 | 0.0100 | 0.0290 |

**LAB-2.16.2011** 1102143-003A

| Parameters: | Analysis Method | DF | MDL | PQL | Results ug |
|---|---|---|---|---|---|
| Aldrin | TO10A | 1 | 0.002300 | 0.0100 | 0.0170 |

**OP-2.16.2011** 1102143-004A

| Parameters: | Analysis Method | DF | MDL | PQL | Results ug |
|---|---|---|---|---|---|
| Aldrin | TO10A | 1 | 0.002300 | 0.0100 | 0.0590 |
| Dieldrin | TO10A | 1 | 0.002300 | 0.0100 | 0.0140 |

**EAR-AMB-DOWN** 1102143-005A

| Parameters: | Analysis Method | DF | MDL | PQL | Results ug |
|---|---|---|---|---|---|
| Aldrin | TO4A | 10 | 0.02300 | 0.100 | 1.01 |
| Dieldrin | TO4A | 10 | 0.02300 | 0.100 | 0.625 |
| gamma-Chlordane | TO4A | 1 | 0.008830 | 0.0100 | 0.0635 |
| alpha-Chlordane | TO4A | 1 | 0.002550 | 0.0100 | 0.0390 |

Torrent LABORATORY, INC.

## Sample Result Summary

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

**EAR-AMB-UP** 1102143-006A

| Parameters: | Analysis Method | DF | MDL | PQL | Results ug |
|---|---|---|---|---|---|
| Dieldrin | TO4A | 1 | 0.002300 | 0.0100 | 0.148 |
| Aldrin | TO4A | 4 | 0.009200 | 0.0400 | 0.484 |

**FB-2.17.2011** 1102143-007A

| Parameters: | Analysis Method | DF | MDL | PQL | Results ug |
|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**LAB-2.17.2011** 1102143-008A

| Parameters: | Analysis Method | DF | MDL | PQL | Results ug |
|---|---|---|---|---|---|

**All compounds were non-detectable for this sample.**

**OP-2.17.2011** 1102143-009A

| Parameters: | Analysis Method | DF | MDL | PQL | Results ug |
|---|---|---|---|---|---|
| Aldrin | TO10A | 1 | 0.002300 | 0.0100 | 0.0300 |
| Dieldrin | TO10A | 1 | 0.002300 | 0.0100 | 0.0105 |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

| | | | |
|---|---|---|---|
| **Client Sample ID:** | LAB-2.15.2011 | **Lab Sample ID:** | 1102143-001A |
| **Project Name/Location:** | Earhart Air Monitoring | **Sample Matrix:** | Air |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 02/15/11 / | **Certified Clean WO # :** | |
| **Canister/Tube ID:** | | **Received PSI :** | 0.0 |
| **Collection Volume (L):** | 0.00 | **Corrected PSI :** | 0.0 |
| **Tag Number:** | Earhart Air Monitoring | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL ug | PQL ug | Results ug | Results ug/m3 | Lab Qualifier | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| gamma-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| beta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003750 | 0.0100 | ND | | | 404094 | NA |
| delta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003350 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor | TO10A | NA | 02/28/11 | 1 | 0.004550 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor epoxide | TO10A | NA | 02/28/11 | 1 | 0.002700 | 0.0100 | ND | | | 404094 | NA |
| gamma-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.008830 | 0.0100 | ND | | | 404094 | NA |
| alpha-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan I | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDE | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Dieldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | 0.0760 | | | 404094 | NA |
| Endrin | TO10A | NA | 02/28/11 | 1 | 0.002630 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDD | TO10A | NA | 02/28/11 | 1 | 0.002500 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan II | TO10A | NA | 02/28/11 | 1 | 0.002350 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDT | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin aldehyde | TO10A | NA | 02/28/11 | 1 | 0.007000 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan sulfate | TO10A | NA | 02/28/11 | 1 | 0.002100 | 0.0100 | ND | | | 404094 | NA |
| Methoxychlor | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endrin Ketone | TO10A | NA | 02/28/11 | 1 | 0.002750 | 0.0100 | ND | | | 404094 | NA |
| TCMX (S) | TO10A | NA | 02/28/11 | 1 | 40.3 | 118 | 93.6 % | | | 404094 | NA |
| DCBP (S) | TO10A | NA | 02/28/11 | 1 | 52 | 116 | 93.8 % | | | 404094 | NA |
| Aldrin | TO10A | NA | 02/28/11 | 2 | 0.004600 | 0.0200 | 0.289 | | | 404094 | NA |

Torrent LABORATORY, INC.

## SAMPLE RESULTS

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

| | | | |
|---|---|---|---|
| **Client Sample ID:** | OP-2.15.2011 | **Lab Sample ID:** | 1102143-002A |
| **Project Name/Location:** | Earhart Air Monitoring | **Sample Matrix:** | Air |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 02/15/11 / | **Certified Clean WO # :** | |
| **Canister/Tube ID:** | | **Received PSI :** | 0.0 |
| **Collection Volume (L):** | 0.00 | **Corrected PSI :** | 0.0 |
| **Tag Number:** | Earhart Air Monitoring | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL ug | PQL ug | Results ug | Results ug/m3 | Lab Qualifier | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| gamma-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| beta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003750 | 0.0100 | ND | | | 404094 | NA |
| delta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003350 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor | TO10A | NA | 02/28/11 | 1 | 0.004550 | 0.0100 | ND | | | 404094 | NA |
| Aldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | 0.222 | | | 404094 | NA |
| Heptachlor epoxide | TO10A | NA | 02/28/11 | 1 | 0.002700 | 0.0100 | ND | | | 404094 | NA |
| gamma-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.008830 | 0.0100 | ND | | | 404094 | NA |
| alpha-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan I | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDE | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Dieldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | 0.0290 | | | 404094 | NA |
| Endrin | TO10A | NA | 02/28/11 | 1 | 0.002630 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDD | TO10A | NA | 02/28/11 | 1 | 0.002500 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan II | TO10A | NA | 02/28/11 | 1 | 0.002350 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDT | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin aldehyde | TO10A | NA | 02/28/11 | 1 | 0.007000 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan sulfate | TO10A | NA | 02/28/11 | 1 | 0.002100 | 0.0100 | ND | | | 404094 | NA |
| Methoxychlor | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endrin Ketone | TO10A | NA | 02/28/11 | 1 | 0.002750 | 0.0100 | ND | | | 404094 | NA |
| TCMX (S) | TO10A | NA | 02/28/11 | 1 | 40.3 | 118 | 88.0 % | | | 404094 | NA |
| DCBP (S) | TO10A | NA | 02/28/11 | 1 | 52 | 116 | 91.2 % | | | 404094 | NA |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

| | | | |
|---|---|---|---|
| **Client Sample ID:** | LAB-2.16.2011 | **Lab Sample ID:** | 1102143-003A |
| **Project Name/Location:** | Earhart Air Monitoring | **Sample Matrix:** | Air |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 02/16/11 / | **Certified Clean WO # :** | |
| **Canister/Tube ID:** | | **Received PSI :** | 0.0 |
| **Collection Volume (L):** | 0.00 | **Corrected PSI :** | 0.0 |
| **Tag Number:** | Earhart Air Monitoring | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL ug | PQL ug | Results ug | Results ug/m3 | Lab Qualifier | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| gamma-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| beta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003750 | 0.0100 | ND | | | 404094 | NA |
| delta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003350 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor | TO10A | NA | 02/28/11 | 1 | 0.004550 | 0.0100 | ND | | | 404094 | NA |
| Aldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | 0.0170 | | | 404094 | NA |
| Heptachlor epoxide | TO10A | NA | 02/28/11 | 1 | 0.002700 | 0.0100 | ND | | | 404094 | NA |
| gamma-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.008830 | 0.0100 | ND | | | 404094 | NA |
| alpha-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan I | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDE | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Dieldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | ND | | | 404094 | NA |
| Endrin | TO10A | NA | 02/28/11 | 1 | 0.002630 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDD | TO10A | NA | 02/28/11 | 1 | 0.002500 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan II | TO10A | NA | 02/28/11 | 1 | 0.002350 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDT | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin aldehyde | TO10A | NA | 02/28/11 | 1 | 0.007000 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan sulfate | TO10A | NA | 02/28/11 | 1 | 0.002100 | 0.0100 | ND | | | 404094 | NA |
| Methoxychlor | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endrin Ketone | TO10A | NA | 02/28/11 | 1 | 0.002750 | 0.0100 | ND | | | 404094 | NA |
| TCMX (S) | TO10A | NA | 02/28/11 | 1 | 40.3 | 118 | 84.4 % | | | 404094 | NA |
| DCBP (S) | TO10A | NA | 02/28/11 | 1 | 52 | 116 | 86.8 % | | | 404094 | NA |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

| | | | |
|---|---|---|---|
| **Client Sample ID:** | OP-2.16.2011 | **Lab Sample ID:** | 1102143-004A |
| **Project Name/Location:** | Earhart Air Monitoring | **Sample Matrix:** | Air |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 02/16/11 / | **Certified Clean WO # :** | |
| **Canister/Tube ID:** | | **Received PSI :** | 0.0 |
| **Collection Volume (L):** | 0.00 | **Corrected PSI :** | 0.0 |
| **Tag Number:** | Earhart Air Monitoring | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL ug | PQL ug | Results ug | Results ug/m3 | Lab Qualifier | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| gamma-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| beta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003750 | 0.0100 | ND | | | 404094 | NA |
| delta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003350 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor | TO10A | NA | 02/28/11 | 1 | 0.004550 | 0.0100 | ND | | | 404094 | NA |
| Aldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | 0.0590 | | | 404094 | NA |
| Heptachlor epoxide | TO10A | NA | 02/28/11 | 1 | 0.002700 | 0.0100 | ND | | | 404094 | NA |
| gamma-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.008830 | 0.0100 | ND | | | 404094 | NA |
| alpha-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan I | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDE | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Dieldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | 0.0140 | | | 404094 | NA |
| Endrin | TO10A | NA | 02/28/11 | 1 | 0.002630 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDD | TO10A | NA | 02/28/11 | 1 | 0.002500 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan II | TO10A | NA | 02/28/11 | 1 | 0.002350 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDT | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin aldehyde | TO10A | NA | 02/28/11 | 1 | 0.007000 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan sulfate | TO10A | NA | 02/28/11 | 1 | 0.002100 | 0.0100 | ND | | | 404094 | NA |
| Methoxychlor | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endrin Ketone | TO10A | NA | 02/28/11 | 1 | 0.002750 | 0.0100 | ND | | | 404094 | NA |
| TCMX (S) | TO10A | NA | 02/28/11 | 1 | 40.3 | 118 | 82.2 % | | | 404094 | NA |
| DCBP (S) | TO10A | NA | 02/28/11 | 1 | 52 | 116 | 84.2 % | | | 404094 | NA |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

| | | | |
|---|---|---|---|
| **Client Sample ID:** | EAR-AMB-DOWN | **Lab Sample ID:** | 1102143-005A |
| **Project Name/Location:** | Earhart Air Monitoring | **Sample Matrix:** | Air |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 02/17/11 / | **Certified Clean WO # :** | |
| **Canister/Tube ID:** | | **Received PSI :** | 0.0 |
| **Collection Volume (L):** | 0.00 | **Corrected PSI :** | 0.0 |
| **Tag Number:** | Earhart Air Monitoring | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL ug | PQL ug | Results ug | Results ug/m3 | Lab Qualifier | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aldrin | TO4A | NA | 02/28/11 | 10 | 0.02300 | 0.100 | 1.01 | | | 404094 | NA |
| Dieldrin | TO4A | NA | 02/28/11 | 10 | 0.02300 | 0.100 | 0.625 | | | 404094 | NA |
| alpha-BHC | TO4A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| gamma-BHC | TO4A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| beta-BHC | TO4A | NA | 02/28/11 | 1 | 0.003750 | 0.0100 | ND | | | 404094 | NA |
| delta-BHC | TO4A | NA | 02/28/11 | 1 | 0.003350 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor | TO4A | NA | 02/28/11 | 1 | 0.004550 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor epoxide | TO4A | NA | 02/28/11 | 1 | 0.002700 | 0.0100 | ND | | | 404094 | NA |
| gamma-Chlordane | TO4A | NA | 02/28/11 | 1 | 0.008830 | 0.0100 | 0.0635 | | | 404094 | NA |
| alpha-Chlordane | TO4A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | 0.0390 | | | 404094 | NA |
| Endosulfan I | TO4A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDE | TO4A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin | TO4A | NA | 02/28/11 | 1 | 0.002630 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDD | TO4A | NA | 02/28/11 | 1 | 0.002500 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan II | TO4A | NA | 02/28/11 | 1 | 0.002350 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDT | TO4A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin aldehyde | TO4A | NA | 02/28/11 | 1 | 0.007000 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan sulfate | TO4A | NA | 02/28/11 | 1 | 0.002100 | 0.0100 | ND | | | 404094 | NA |
| Methoxychlor | TO4A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endrin Ketone | TO4A | NA | 02/28/11 | 1 | 0.002750 | 0.0100 | ND | | | 404094 | NA |
| TCMX (S) | TO4A | NA | 02/28/11 | 1 | 40.3 | 118 | 81.6 % | | | 404094 | NA |
| DCBP (S) | TO4A | NA | 02/28/11 | 1 | 52 | 116 | 85.6 % | | | 404094 | NA |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

| | | | |
|---|---|---|---|
| **Client Sample ID:** | EAR-AMB-UP | **Lab Sample ID:** | 1102143-006A |
| **Project Name/Location:** | Earhart Air Monitoring | **Sample Matrix:** | Air |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 02/17/11 / | **Certified Clean WO # :** | |
| **Canister/Tube ID:** | | **Received PSI :** | 0.0 |
| **Collection Volume (L):** | 0.00 | **Corrected PSI :** | 0.0 |
| **Tag Number:** | Earhart Air Monitoring | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL ug | PQL ug | Results ug | Results ug/m3 | Lab Qualifier | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | TO4A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| gamma-BHC | TO4A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| beta-BHC | TO4A | NA | 02/28/11 | 1 | 0.003750 | 0.0100 | ND | | | 404094 | NA |
| delta-BHC | TO4A | NA | 02/28/11 | 1 | 0.003350 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor | TO4A | NA | 02/28/11 | 1 | 0.004550 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor epoxide | TO4A | NA | 02/28/11 | 1 | 0.002700 | 0.0100 | ND | | | 404094 | NA |
| gamma-Chlordane | TO4A | NA | 02/28/11 | 1 | 0.008830 | 0.0100 | ND | | | 404094 | NA |
| alpha-Chlordane | TO4A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan I | TO4A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDE | TO4A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Dieldrin | TO4A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | 0.148 | | | 404094 | NA |
| Endrin | TO4A | NA | 02/28/11 | 1 | 0.002630 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDD | TO4A | NA | 02/28/11 | 1 | 0.002500 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan II | TO4A | NA | 02/28/11 | 1 | 0.002350 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDT | TO4A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin aldehyde | TO4A | NA | 02/28/11 | 1 | 0.007000 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan sulfate | TO4A | NA | 02/28/11 | 1 | 0.002100 | 0.0100 | ND | | | 404094 | NA |
| Methoxychlor | TO4A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endrin Ketone | TO4A | NA | 02/28/11 | 1 | 0.002750 | 0.0100 | ND | | | 404094 | NA |
| TCMX (S) | TO4A | NA | 02/28/11 | 1 | 40.3 | 118 | 73.6 % | | | 404094 | NA |
| DCBP (S) | TO4A | NA | 02/28/11 | 1 | 52 | 116 | 76.6 % | | | 404094 | NA |
| Aldrin | TO4A | NA | 02/28/11 | 4 | 0.009200 | 0.0400 | 0.484 | | | 404094 | NA |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

| | | | |
|---|---|---|---|
| **Client Sample ID:** | FB-2.17.2011 | **Lab Sample ID:** | 1102143-007A |
| **Project Name/Location:** | Earhart Air Monitoring | **Sample Matrix:** | Air |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 02/17/11 / | **Certified Clean WO # :** | |
| **Canister/Tube ID:** | | **Received PSI :** | 0.0 |
| **Collection Volume (L):** | 0.00 | **Corrected PSI :** | 0.0 |
| **Tag Number:** | Earhart Air Monitoring | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL ug | PQL ug | Results ug | Results ug/m3 | Lab Qualifier | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| gamma-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| beta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003750 | 0.0100 | ND | | | 404094 | NA |
| delta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003350 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor | TO10A | NA | 02/28/11 | 1 | 0.004550 | 0.0100 | ND | | | 404094 | NA |
| Aldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor epoxide | TO10A | NA | 02/28/11 | 1 | 0.002700 | 0.0100 | ND | | | 404094 | NA |
| gamma-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.008830 | 0.0100 | ND | | | 404094 | NA |
| alpha-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan I | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDE | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Dieldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | ND | | | 404094 | NA |
| Endrin | TO10A | NA | 02/28/11 | 1 | 0.002630 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDD | TO10A | NA | 02/28/11 | 1 | 0.002500 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan II | TO10A | NA | 02/28/11 | 1 | 0.002350 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDT | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin aldehyde | TO10A | NA | 02/28/11 | 1 | 0.007000 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan sulfate | TO10A | NA | 02/28/11 | 1 | 0.002100 | 0.0100 | ND | | | 404094 | NA |
| Methoxychlor | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endrin Ketone | TO10A | NA | 02/28/11 | 1 | 0.002750 | 0.0100 | ND | | | 404094 | NA |
| TCMX (S) | TO10A | NA | 02/28/11 | 1 | 40.3 | 118 | 78.6 % | | | 404094 | NA |
| DCBP (S) | TO10A | NA | 02/28/11 | 1 | 52 | 116 | 80.0 % | | | 404094 | NA |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

| | | | |
|---|---|---|---|
| **Client Sample ID:** | LAB-2.17.2011 | **Lab Sample ID:** | 1102143-008A |
| **Project Name/Location:** | Earhart Air Monitoring | **Sample Matrix:** | Air |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 02/17/11 / | **Certified Clean WO # :** | |
| **Canister/Tube ID:** | | **Received PSI :** | 0.0 |
| **Collection Volume (L):** | 0.00 | **Corrected PSI :** | 0.0 |
| **Tag Number:** | Earhart Air Monitoring | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL ug | PQL ug | Results ug | Results ug/m3 | Lab Qualifier | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| gamma-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| beta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003750 | 0.0100 | ND | | | 404094 | NA |
| delta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003350 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor | TO10A | NA | 02/28/11 | 1 | 0.004550 | 0.0100 | ND | | | 404094 | NA |
| Aldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor epoxide | TO10A | NA | 02/28/11 | 1 | 0.002700 | 0.0100 | ND | | | 404094 | NA |
| gamma-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.008830 | 0.0100 | ND | | | 404094 | NA |
| alpha-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan I | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDE | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Dieldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | ND | | | 404094 | NA |
| Endrin | TO10A | NA | 02/28/11 | 1 | 0.002630 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDD | TO10A | NA | 02/28/11 | 1 | 0.002500 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan II | TO10A | NA | 02/28/11 | 1 | 0.002350 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDT | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin aldehyde | TO10A | NA | 02/28/11 | 1 | 0.007000 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan sulfate | TO10A | NA | 02/28/11 | 1 | 0.002100 | 0.0100 | ND | | | 404094 | NA |
| Methoxychlor | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endrin Ketone | TO10A | NA | 02/28/11 | 1 | 0.002750 | 0.0100 | ND | | | 404094 | NA |
| TCMX (S) | TO10A | NA | 02/28/11 | 1 | 40.3 | 118 | 92.6 % | | | 404094 | NA |
| DCBP (S) | TO10A | NA | 02/28/11 | 1 | 52 | 116 | 92.8 % | | | 404094 | NA |

Torrent LABORATORY, INC.

# SAMPLE RESULTS

**Report prepared for:** Jon Mollison
Tetra Tech Inc (HI)

**Date Received:** 02/19/11
**Date Reported:** 03/01/11

| | | | |
|---|---|---|---|
| **Client Sample ID:** | OP-2.17.2011 | **Lab Sample ID:** | 1102143-009A |
| **Project Name/Location:** | Earhart Air Monitoring | **Sample Matrix:** | Air |
| **Project Number:** | 100-SFO-T26535-04 | | |
| **Date/Time Sampled:** | 02/17/11 / | **Certified Clean WO # :** | |
| **Canister/Tube ID:** | | **Received PSI :** | 0.0 |
| **Collection Volume (L):** | 0.00 | **Corrected PSI :** | 0.0 |
| **Tag Number:** | Earhart Air Monitoring | | |

| Parameters: | Analysis Method | Prep Date | Date Analyzed | DF | MDL ug | PQL ug | Results ug | Results ug/m3 | Lab Qualifier | Analytical Batch | Prep Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| alpha-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| gamma-BHC | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| beta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003750 | 0.0100 | ND | | | 404094 | NA |
| delta-BHC | TO10A | NA | 02/28/11 | 1 | 0.003350 | 0.0100 | ND | | | 404094 | NA |
| Heptachlor | TO10A | NA | 02/28/11 | 1 | 0.004550 | 0.0100 | ND | | | 404094 | NA |
| Aldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | 0.0300 | | | 404094 | NA |
| Heptachlor epoxide | TO10A | NA | 02/28/11 | 1 | 0.002700 | 0.0100 | ND | | | 404094 | NA |
| gamma-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.008830 | 0.0100 | ND | | | 404094 | NA |
| alpha-Chlordane | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan I | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDE | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Dieldrin | TO10A | NA | 02/28/11 | 1 | 0.002300 | 0.0100 | 0.0105 | | | 404094 | NA |
| Endrin | TO10A | NA | 02/28/11 | 1 | 0.002630 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDD | TO10A | NA | 02/28/11 | 1 | 0.002500 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan II | TO10A | NA | 02/28/11 | 1 | 0.002350 | 0.0100 | ND | | | 404094 | NA |
| 4,4'-DDT | TO10A | NA | 02/28/11 | 1 | 0.002200 | 0.0100 | ND | | | 404094 | NA |
| Endrin aldehyde | TO10A | NA | 02/28/11 | 1 | 0.007000 | 0.0100 | ND | | | 404094 | NA |
| Endosulfan sulfate | TO10A | NA | 02/28/11 | 1 | 0.002100 | 0.0100 | ND | | | 404094 | NA |
| Methoxychlor | TO10A | NA | 02/28/11 | 1 | 0.002550 | 0.0100 | ND | | | 404094 | NA |
| Endrin Ketone | TO10A | NA | 02/28/11 | 1 | 0.002750 | 0.0100 | ND | | | 404094 | NA |
| TCMX (S) | TO10A | NA | 02/28/11 | 1 | 40.3 | 118 | 89.4 % | | | 404094 | NA |
| DCBP (S) | TO10A | NA | 02/28/11 | 1 | 52 | 116 | 92.4 % | | | 404094 | NA |

Torrent LABORATORY, INC.

# MB Summary Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1102143 | **Prep Method:** | NA | **Prep Date:** | NA | **Prep Batch:** | NA |
| **Matrix:** | Air | **Analytical Method:** | TO10A | **Analyzed Date:** | 02/28/11 | **Analytical Batch:** | 404094 |
| **Units:** | ug | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Lab Qualifier |
|---|---|---|---|---|
| alpha-BHC | 0.002550 | 0.0100 | ND | |
| gamma-BHC | 0.002550 | 0.0100 | ND | |
| beta-BHC | 0.003750 | 0.0100 | ND | |
| delta-BHC | 0.003350 | 0.0100 | ND | |
| Heptachlor | 0.004550 | 0.0100 | ND | |
| Aldrin | 0.002300 | 0.0100 | ND | |
| Heptachlor epoxide | 0.002700 | 0.0100 | ND | |
| gamma-Chlordane | 0.008830 | 0.0100 | ND | |
| alpha-Chlordane | 0.002550 | 0.0100 | ND | |
| Endosulfan I | 0.002200 | 0.0100 | ND | |
| 4,4'-DDE | 0.002200 | 0.0100 | ND | |
| Dieldrin | 0.002300 | 0.0100 | ND | |
| Endrin | 0.002630 | 0.0100 | ND | |
| 4,4'-DDD | 0.002500 | 0.0100 | ND | |
| Endosulfan II | 0.002350 | 0.0100 | ND | |
| 4,4'-DDT | 0.002200 | 0.0100 | ND | |
| Endrin aldehyde | 0.007000 | 0.0100 | ND | |
| Endosulfan sulfate | 0.002100 | 0.0100 | ND | |
| Methoxychlor | 0.002550 | 0.0100 | ND | |
| Endrin Ketone | 0.002750 | 0.0100 | ND | |
| TCMX (S) | | | 98.2 | |
| DCBP (S) | | | 90.6 | |

Torrent LABORATORY, INC.

# LCS/LCSD Summary Report

*Raw values are used in quality control assessment.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Work Order:** | 1102143 | **Prep Method:** | NA | **Prep Date:** | NA | **Prep Batch:** | NA |
| **Matrix:** | Air | **Analytical Method:** | TO10A | **Analyzed Date:** | 02/28/11 | **Analytical Batch:** | 404094 |
| **Units:** | ug | | | | | | |

| Parameters | MDL | PQL | Method Blank Conc. | Spike Conc. | LCS % Recovery | LCSD % Recovery | LCS/LCSD % RPD | % Recovery Limits | % RPD Limits | Lab Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| gamma-BHC 87.5 | 0.002550 | 0.0100 | ND | 0.1 | | 84.5 | 3.49 | 61.6 - 135 | 30 | |
| Heptachlor | 0.004550 | 0.0100 | ND | 0.1 | 91.5 | 89.0 | 2.77 | 60 - 97.8 | 30 | |
| Aldrin | 0.002300 | 0.0100 | ND | 0.1 | 91.5 | 88.0 | 3.90 | 55.3 - 101 | 30 | |
| Dieldrin | 0.002300 | 0.0100 | ND | 0.1 | 91.0 | 88.5 | 2.79 | 60.3 - 116 | 30 | |
| Endrin | 0.002630 | 0.0100 | ND | 0.1 | 93.5 | 91.0 | 2.71 | 60.4 - 134 | 30 | |
| 4,4'-DDT | 0.002200 | 0.0100 | ND | 0.1 | 103 | 101 | 2.46 | 58.4 - 126 | 30 | |
| TCMX (S) | | | ND | 0.35 | 96.7 | 90.4 | | 40.3 - 118 | | |
| DCBP (S) | | | ND | 0.35 | 90.1 | 86.9 | | 52 - 116 | | |

# Laboratory Qualifiers and Definitions

## DEFINITIONS:

| |
|---|
| **Accuracy/Bias (% Recovery)** - The closeness of agreement between an observed value and an accepted reference value. |
| **Blank (Method/Preparation Blank)** -MB/PB - An analyte-free matrix to which all reagents are added in the same volumes/proportions as used in sample processing. The method blank is used to document contamination resulting from the analytical process. |
| **Duplicate** - a field sample and/or laboratory QC sample prepared in duplicate following all of the same processes and procedures used on the original sample (sample duplicate, LCSD, MSD) |
| **Laboratory Control Sample (LCS ad LCSD)** - A known matrix spiked with compounds representative of the target analyte(s). This is used to document laboratory performance. |
| **Matrix** - the component or substrate that contains the analyte of interest (e.g., - groundwater, sediment, soil, waste water, etc) |
| **Matrix Spike (MS/MSD)** - Client sample spiked with identical concentrations of target analyte (s). The spiking occurs prior to the sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. |
| **Method Detection Limit (MDL)** - the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero |
| **Practical Quantitation Limit (PQL)** - a laboratory determined value at 2 to 5 times above the MDL that can be reproduced in a manner that results in a 99% confidence level that the result is both accurate and precise. PQLs reflect all preparation factors and/or dilution factors that have been applied to the sample during the preparation and/or analytical processes. |
| **Precision (%RPD)** - The agreement among a set of replicate/duplicate measurements without regard to known value of the replicates |
| **Surrogate (S) or (Surr)** - An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are used in most organic analysis to demonstrate matrix compatibility with the chosen method of analysis |
| **Tentatively Identified Compound (TIC) -** A compound not contained within the analytical calibration standards but present in the GCMS library of defined compounds. When the library is searched for an unknown compound, it can frequently give a tentative identification to the compound based on retention time and primary and secondary ion match. TICs are reported as estimates and are candidates for further investigation. |
| **Units:** the unit of measure used to express the reported result - **mg/L** and ***mg/Kg*** (equivalent to PPM - parts per million in **liquid** and ***solid***), **ug/L** and ***ug/Kg*** (equivalent to PPB - parts per billion in **liquid** and ***solid***), **ug/m3**, ***mg.m3***, **ppbv** and ***ppmv*** (all units of measure for reporting concentrations in air), **%** ( equivalent to 10000 ppm or 1,000,000 ppb), **ug/Wipe** ( concentration found on the surface of a single Wipe usually taken over a 100cm2 surface) |

## LABORATORY QUALIFIERS:

**B** - Indicates when the anlayte is found in the associated method or preparation blank
**D** - Surrogate is not recoverable due to the necessary dilution of the sample
**E** - Indicates the reportable value is outside of the calibration range of the instrument but within the linear range of the instrument (unless otherwise noted) Values reported with an E qualifier should be considered as estimated.
**H**- Indicates that the recommended holding time for the analyte or compound has been exceeded
**J**- Indicates a value between the method MDL and PQL and that the reported concentration should be considered as estimated rather the quantitative
**NA** - Not Analyzed
**N/A** - Not Applicable
**NR** - Not recoverable - a matrix spike concentration is not recoverable due to a concentration within the original sample that is greater than four times the spike concentration added
**R**- The % RPD between a duplicate set of samples is outside of the absolute values established by laboratory control charts
**S**- Spike recovery is outside of established method and/or laboratory control limits. Further explanation of the use of this qualifier should be included within a case narrative
**X** -Used to indicate that a value based on pattern identification is within the pattern range but not typical of the pattern found in standards. Further explanation may or may not be provided within the sample footnote and/or the case narrative.

# Sample Receipt Checklist

Client Name: Tetra Tech Inc (HI)

Project Name: Earhart Air Monitoring

Work Order No.: 1102143

Date and Time Received: 2/19/2011 11:15

Received By: NG

Physically Logged By: NG

Checklist Completed By: NG

Carrier Name: FedEx

**Chain of Custody (COC) Information**

| | |
|---|---|
| Chain of custody present? | Yes |
| Chain of custody signed when relinquished and received? | Yes |
| Chain of custody agrees with sample labels? | Yes |
| Custody seals intact on sample bottles? | Not Present |

**Sample Receipt Information**

| | |
|---|---|
| Custody seals intact on shipping container/cooler? | Not Present |
| Shipping Container/Cooler In Good Condition? | Yes |
| Samples in proper container/bottle? | Yes |
| Samples containers intact? | Yes |
| Sufficient sample volume for indicated test? | Yes |

**Sample Preservation and Hold Time (HT) Information**

| | | | | |
|---|---|---|---|---|
| All samples received within holding time? | Yes | | | |
| Container/Temp Blank temperature in compliance? | Yes | Temperature: | 3 | °C |
| Water-VOA vials have zero headspace? | No VOA vials submitted | | | |
| Water-pH acceptable upon receipt? | | | | |

pH Checked by:

pH Adjusted by:

# Login Summary Report

**Client ID:** TL5162 Tetra Tech Inc (HI)
**Project Name:** Earhart Air Monitoring
**Project # :** 100-SFO-T26535-04
**Report Due Date:** 2/28/2011

**QC Level:**
**TAT Requested:** 5+ day:0
**Date Received:** 2/19/2011
**Time Received:** 11:15

**Comments:** 5 day TAT! Received 7 samples for TO-10A and 2 samples for TO-4A.

**Work Order # :** ***1102143***

| WO Sample ID | Client Sample ID | Collection Date/Time | Matrix | Scheduled Disposal | Sample On Hold | Test On Hold | Requested Tests | Subbed |
|---|---|---|---|---|---|---|---|---|
| 1102143-001A | LAB-2.15.2011 | 02/15/11 | Air | | | | A_TO10AOCP | |
| 1102143-002A | OP-2.15.2011 | 02/15/11 | Air | | | | A_TO10AOCP | |
| 1102143-003A | LAB-2.16.2011 | 02/16/11 | Air | | | | A_TO10AOCP | |
| 1102143-004A | OP-2.16.2011 | 02/16/11 | Air | | | | A_TO10AOCP | |
| 1102143-005A | EAR-AMB-DOWN | 02/17/11 | Air | | | | A_TO4AOCP | |
| 1102143-006A | EAR-AMB-UP | 02/17/11 | Air | | | | A_TO4AOCP | |
| 1102143-007A | FB-2.17.2011 | 02/17/11 | Air | | | | A_TO10AOCP | |
| 1102143-008A | LAB-2.17.2011 | 02/17/11 | Air | | | | A_TO10AOCP | |
| 1102143-009A | OP-2.17.2011 | 02/17/11 | Air | | | | A_TO10AOCP | |

**Sample Note:** SAMPLES ARE -LARGE SIZE SORBENT TUBES.

Torrent LABORATORY, INC.

# CHAIN-OF-CUSTODY RECORD

TETRA TECH

1102143

Client Name/Account #: TetraTech, Inc.
Address: 737 Bishop St., Suite 3020
City/State/Zip: Honolulu, HI 96813
Project Manager: Y. Parry
Telephone Number: (808)533-3366 Fax No.: (808)533-3306
Sampler Name: (Print) J. Mollison
Sampler Signature: J M Mths

Report To: Y. Parry, G. Eaton, T. Whitehead, J. Mollison
Invoice To: Y. Parry
Project ID: Earhart Air Monitoring
Project #: 100-SFO-T26535-04

| | Sample ID / Description | Date Sampled | Time Sampled | No. of Containers Shipped | Grab | Composite | Multi-incremental Sample | Preservative: Ice | $HNO_3$ (Red Label) | HCl (Blue Label) | NaOH (Orange Label) | $H_2SO_4$ Plastic (Yellow Label) | $H_2SO_4$ Glass(Yellow Label) | None (Black Label) | Other (one MeOH VOA) | Matrix: Groundwater | Wastewater | Drinking Water | Sludge | Soil | Other (specify): Air Monitoring | Analyze For: TO-10A (Lo volume Pesticides) | TO-4A (High volume Pesticides) | RUSH TAT (Pre-Schedule) | Standard TAT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001A | LAB-2.15.2011 | 2/15/11 | | 1 | | | | X | | | | | | | | | | | | X | X | | | X | |
| 002A | OP-2.15.2011 | 2/15/11 | | 1 | | | | X | | | | | | | | | | | | X | X | | | X | |
| 003A | LAB-2.16.2011 | 2/16/11 | | 1 | | | | X | | | | | | | | | | | | X | X | | | X | |
| 004A | OP-2.16.2011 | 2/16/11 | | 1 | | | | X | | | | | | | | | | | | X | X | | | X | |
| 005A | EAR-AMB-DOWN | 2/17/11 | | 1 | | | | X | | | | | | | | | | | | X | | X | | X | |
| 006A | EAR-AMB-UP | 2/17/11 | | 1 | | | | X | | | | | | | | | | | | X | | X | | X | |
| 007A | FB-2.17.2011 | 2/17/11 | | 1 | | | | X | | | | | | | | | | | | X | X | | | X | |
| 008A | LAB-2.17.2011 | 2/17/11 | | 1 | | | | X | | | | | | | | | | | | X | X | | | X | |
| 009A | OP-2.17.2011 | 2/17/11 | | 1 | | | | X | | | | | | | | | | | | X | X | | | X | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |

Special Instructions: ~~Samples need to be air-dried, then please proceed with sieving and subsampling as per HDOH guidance~~ TB

Method of Shipment: FEDEX

Laboratory Comments:
Temperature Upon Receipt: 3 °C
VOCs Free of Headspace? Y N

| Relinquished by: | Date | Time | Received by: | Date | Time |
|---|---|---|---|---|---|
| J M Mths Jon Mollison | 2/18/11 | 0900 | James Barlow | 2/18/11 | 1800 |
| James Barlow | 2/18/11 | 1200 | FEDEX | 2/12/11 | 1210 |
| FedEx | 2/19/11 | 11:15 Am. | Navin G. Khodasara | 2/19/11 | 11:15 Am |

Page 1 of 1

TETRA TECH

**DRAFT**

# Air Monitoring Report

## Removal Action Report
## Actions Implemented Under
## Removal Actions No. 1, No. 2, and No. 3
## Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods
## Joint Base Pearl Harbor-Hickam
## Oʻahu, Hawaiʻi

**August 2011**

complex world | CLEAR SOLUTIONS™

**DRAFT**

# Air Monitoring Report

**Removal Action Report**
**Actions Implemented Under**
**Removal Actions No. 1, No. 2, and No. 3**
**Earhart I-2, Earhart I-3, and Onizuka II-1 Neighborhoods**
**Joint Base Pearl Harbor-Hickam**
**Oʻahu, Hawaiʻi**

*Prepared for:*

**Hickam Communities, LLC**

*211 Mercury Street*
*Honolulu, HI 96818*

*Prepared by:*

**Tetra Tech**

*737 Bishop Street, Suite 3020*
*Honolulu, HI 96813*
*(808) 533-3366*
*Fax (808) 533-3306*
Tetra Tech Project No. T26535.04

DCN: 2653504.021.D01
August 2011

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Appendix A. Field Records
Appendix B. Laboratory Analytical Report

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