# LAKE RIVER 2017 SEDIMENT MONITORING REPORT

## FORMER PACIFIC WOOD TREATING CO. SITE
## FACILITY ID 1019, CLEANUP SITE ID 3020

*Prepared for*
**PORT OF RIDGEFIELD**
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*The material and data in this report were prepared under the supervision and direction of the undersigned.*

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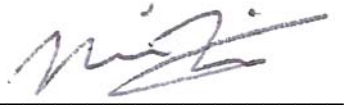

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| Apex | Apex Laboratories |
| bml | below mudline |
| CAP | cleanup action plan |
| cm | centimeter(s) |
| COC | chain of custody |
| CUL | cleanup level |
| dioxins | polychlorinated dibenzo-p-dioxins and furans |
| DU | decision unit |
| Ecology | Washington State Department of Ecology |
| ENR | enhanced natural recovery |
| ISM | incremental sampling methodology |
| MFA | Maul Foster & Alongi, Inc. |
| ng/kg | nanograms per kilogram |
| the Port | Port of Ridgefield |
| PWT | Pacific Wood Treating Co. |
| QA/QC | quality assurance and quality control |
| REL | remediation level |
| SAP | sampling and analysis plan |
| TEQ | toxicity equivalent |
| TOC | total organic carbon |
| USEPA | U.S. Environmental Protection Agency |

# 1 INTRODUCTION

On behalf of the Port of Ridgefield (the Port), Maul Foster & Alongi, Inc. (MFA) has prepared this report to summarize Year 2 (2017) Lake River post-remedy sediment monitoring results. Lake River is offshore of the former Pacific Wood Treating Co. (PWT) site in Ridgefield, Washington (see Figure 1-1). PWT operated a wood-treating facility from 1964 to 1993 at the Port's Lake River Industrial Site, now known as Miller's Landing.

On November 5, 2013, the Port entered into a Consent Decree with the State of Washington requiring remedial action to address contamination at the former PWT site. The selected cleanup action for the Lake River portion of the former PWT site consisted of mechanical dredging and placement of an enhanced natural recovery (ENR) sand layer, and is described in the cleanup action plan (CAP) (Washington State Department of Ecology [Ecology], 2013). The remedy includes sediment chemical monitoring to assess cleanup efficacy in years 0, 2, 5, and 10 after substantive completion of the remedy.

Year 0 monitoring was completed in 2015 (MFA, 2015b). This report provides the results of the Year 2 (2017) monitoring, including sampling methodology and analysis, quality assurance protocols, and laboratory analytical results and interpretation. Sampling and reporting were conducted in accordance with the Ecology-approved sampling and analysis plan (SAP) (MFA, 2015a), with any exceptions noted in this report.

## 1.1 Background

The CAP identifies a remediation level (REL; 30 nanograms per kilogram [ng/kg] dioxin toxicity equivalent [TEQ]) and a cleanup level (CUL; 5 ng/kg dioxin TEQ) for polychlorinated dibenzo-p-dioxins and furans (collectively referred to as dioxins) in Lake River sediments. These numeric criteria guided the remedial action substantively completed in 2015. Areas exceeding the REL were dredged and treated with a clean ENR sand layer, whereas areas above the CUL but below the REL, were only treated with clean sand (see Figure 1-2). After remedy completion, Year 0 (baseline) monitoring was conducted in July 2015 to assesses cleanup effectiveness. The 2015 results showed that sediment concentrations were below the CUL and that a significant reduction in dioxin concentrations had been attained (MFA, 2015b). The Year 2 (2017) monitoring described in this report was conducted to quantify any concentration changes relative to 2015. Monitoring efforts will also be conducted in Years 5 (2020) and 10 (2025) to further quantify concentration trends over time, and to confirm that natural recovery is effective in meeting the CUL in the long term, as is anticipated.

# 2 SITE CONDITIONS

Lake River is a slow, flat slough of the Columbia River. Lake River is hydraulically connected through a tide gate/flushing structure along the western shoreline of Vancouver Lake and at the mouth of Lake River on the Columbia River, 11 miles downstream of the Vancouver Lake tide gate. Overall river flow is from Vancouver Lake to the mouth of Lake River and flow direction in Lake River reverses as a result of tidal influences from the Columbia River. Low water velocity, bathymetric analysis, and grain size distribution all indicate that Lake River is a predominantly depositional fluvial environment, and that natural attenuation of sediment concentrations should be expected to occur over time (MFA, 2013b).

An approximately 1-foot-thick clean sand layer was placed over the entire remedy area as part of the sediment remedy (see Figure 1-2). Based on visual observations of riverbed exposed during low tide in 2017, fines have deposited on much of the placed sand layer. No evidence of significant sand scour (e.g., exposed native sandy silt) was observed. Surface (0 to 10 centimeters [cm] below mudline [bml]) sediment samples retrieved during the 2017 event were generally fine to coarse sands and in some areas transitioned to sandy silt at less than 10 cm bml. The fine to coarse sands represent the clean sand layer placed as part of the remedy.

The subsurface (deeper than 10 cm bml) sediment characteristics in Lake River vary with depth. In the remedy area, the current depth to native sediment below the placed clean sand layer likely varies (e.g., due to propwash and mixing processes). Generally, in the nearshore slope areas, the native subsurface sediment is characterized as a fine sandy silt to a depth of approximately 5 feet bml that then transitions to a fine to medium sand. Subsurface sediment in the channel areas of Lake River is generally very fine sandy silt up to 11 feet bml, with the exception of some fine to medium sand encountered in two cores in the Lake River channel area at approximately 6 to 7 feet bml (MFA, 2013a). See Appendix A for photographs of site conditions.

# 3 SAMPLING PROGRAM

The incremental sampling methodology (ISM) was used to characterize dioxins in sediments. ISM characterizes the average concentration of contaminants in a predefined area termed a decision unit (DU). Samples (called increments) were collected from multiple locations in a DU under evaluation. The increments were combined into one sample (called an ISM sample) and analyzed to obtain a representative average contaminant concentration for the entire DU. Three ISM samples, called replicates, were collected to define variability resulting from sampling error or spatial heterogeneity. ISM provides data that are more representative of average concentrations than area-wide concentrations derived from discrete or traditional composite samples (HDOH, 2009; ITRC, 2012).

## 3.1 Incremental Sampling Methodology Design

The sampling objective was to characterize the average concentration of dioxins in surface sediments in the remedy area. The DU sampled extends from the surface to 10 cm bml across the entire remedy area (as described in section 1.1) and is shown in Figure 3-1. Three replicate samples (ISM samples "A," "B," and "C") consisting of 30 increments each were collected to assess sample variability. The increment locations are consistent with those sampled in 2015 and were selected based on a stratified random approach using a triangular grid (using ArcGIS 10 and Visual Sample Plan 6). Using a systematic random grid, as opposed to a simple random sampling approach, reduces the probability of missing areas with significantly elevated concentrations.

## 3.2 Sampling Methods

MFA conducted sediment sampling on September 25 through 27, 2017. Water levels were low, and the nearshore sediment bed was exposed during periods of low tide. Figure 3-1 and Table 3-1 show and summarize sampling stations, respectively.

Sediment increments were typically collected by a 1-inch-diameter, thin-walled, stainless steel sampling tube. The sampling tube was manually advanced to below 10 cm. The sampling tube was withdrawn and the increment extruded, using a plunger, onto a clean work surface. The increment was measured and trimmed to 10 cm, and placed in the laboratory-supplied sampling container. If increment recovery was poor at certain locations, the increment was discarded and resampled within a few feet of the original location. At some locations, the sampling tube did not retain sediments and a handheld Van Veen (clamshell) sampler was deployed instead. A 10-cm-long, 1-inch-diameter core was cut from the Van Veen sample to maintain consistency with increments collected using the sampling tube. Some locations could not be accessed via boat because water levels were too low. These locations were accessed by foot from shore, and a 10-cm-long, 1-inch-diameter core was retrieved using a small stainless-steel knife and spoon. Approximately 100 grams per increment, for a total of approximately 3 kilograms per ISM sample, was collected to provide the overall mass required by the analytical laboratory. The ISM sample was analyzed for dioxins and total organic carbon (TOC).

A differential global positioning system was used to navigate to the locations shown on Figure 3-1. Locations were determined to an accuracy of ±3 meters. Horizontal coordinates were referenced to the Washington South State Plane HARN (NAD83). See Appendix A for photographs of sampling procedures and representative samples collected.

All equipment was decontaminated in accordance with the SAP. All sample containers were kept on ice before submittal, with chain-of-custody (COC) documentation, to the laboratory for analysis. Use of dedicated (nondisposable) sampling equipment significantly reduced the amount of decontamination fluids generated. Nondisposable incremental sampling equipment was decontaminated only between replicates (i.e., not decontaminated between increments within the unit). Decontamination of nondisposable sampling equipment (i.e., incremental sampling equipment) used disposable, single-use paper towels that were containerized, along with used personal protective equipment, and disposed of in a sanitary landfill.

## 3.3 Quality Assurance and Quality Control Samples

The following quality assurance and quality control (QA/QC) sampling was conducted.

Three replicate ISM samples were collected across the DU. Replicates were processed and analyzed (consistent with the methods used for the primary sample) to assess sample variability.

An equipment rinsate blank collected in 2015 from decontaminated reusable equipment coming into direct contact with sediment samples (e.g., bowls and spoons) showed that no sediment sample results required qualification. As determined in coordination with Ecology, an equipment rinsate blank was not submitted for analysis during the 2017 monitoring event (Mercuri, 2017).

## 3.4 Sample Transport

Samples for ISM processing and TOC analysis were submitted to the Ecology-approved Apex Laboratories (Apex) of Tigard, Oregon. Following ISM processing, Apex submitted sample aliquots to the Ecology-approved Cape Fear Laboratory LLC for dioxin analysis. COC documentation was maintained throughout the sample handling and testing process and is included in the laboratory analytical reports (see Appendix B).

## 3.5 Laboratory Chemical Sample Processing and Analysis

Prior to analysis, Apex used SAP-identified ISM procedures to process the ISM samples. As discussed above, the approximately equal mass collected from each increment was field consolidated to generate a sample of approximately 3 kilograms (wet weight). The laboratory air dried each decision unit sample at room temperature. The entire volume of each sample was chopped and sieved to facilitate obtaining a representative subsample and improving analyte extraction efficiency. The sample was sieved using an American Society for Testing and Materials No. 10 (2-millimeter) sieve. Once the sample was dried and sieved, the laboratory performed the "1-dimensional slabcake" subsampling procedure to sub-aliquot sample volume to be used for analysis. The slabcake procedure involves spreading the sample at a consistent depth in a line, using 20 or more passes and using a square scoop to cut across the line as needed to create an aliquot for each analysis. Samples for TOC were ground prior to analysis. Precise volumes (as identified in the SAP) of samples were collected as aliquots for each individual laboratory analysis and for QA/QC requirements. The following analyses of ISM aliquots by the methods indicated were conducted:

- TOC by Puget Sound Estuary Program/SM 5310B Modified
- Dioxins by U.S. Environmental Protection Agency (USEPA) Method 1613B

Laboratory QA/QC requirements were maintained through the use of standard USEPA methods, based on USEPA test methods for evaluating solid waste, physical/chemical methods (also known as SW-846) requirements, as amended (USEPA, 1986).

## 3.6 Data Reduction, Validation, and Reporting

The laboratory data produced were independently reviewed by MFA for data quality (see Appendix C). Analytical results were evaluated according to applicable sections of USEPA procedures (USEPA, 2010, 2014) and appropriate laboratory and method-specific guidelines (Apex, 2013; USEPA, 1986), and are reported consistent with recent dioxin data treatment guidance (Ecology, 2015). ISM sample replicates were assessed as part of the data validation. Sample results were qualified appropriately to reflect any criteria not satisfied during the aforementioned assessments. All data are considered acceptable for use, with associated qualifiers. Consistent with Washington Administrative Code 173-340-840(5) and Ecology Toxics Cleanup Program Policy 840 (Data Submittal Requirements), data will be submitted in both written (this report) and electronic (the Ecology Environmental Information Management system) formats.

# 4 RESULTS

The 2015 and 2017 sediment monitoring results are provided in Table 4-1. For the 2017 monitoring event, most dioxin congener results are at or near the estimated detection limits. Samples A (1.38 ng/kg dioxin TEQ) and C (2.19 ng/kg) are below the CUL and are marginally lower than Sample B results (7.01 ng/kg). The 2017 average ISM sample concentration (3.53 ng/kg) is below the CUL of 5 ng/kg.

Dioxin concentrations increased slightly from 2015 (average ISM concentration of 1.16 ng/kg). TOC also increased from an average of 0.87 percent in 2015 to 4.97 percent in 2017. The increases likely reflect (1) bioturbation and propwash resulting in some mixing of the sands with underlying sandy silt, (2) some sand and organics movement due to anthropogenic activities such as propwash, and (3) deposition of fines on top of the placed sand layer. Thinner sand layers, and therefore proportionally more sandy silt, were observed in some sample increments collected along the riverward extent (mid-channel) of the DU, particularly in Sample B increments. The mid-channel area is relatively shallow and sees heavy recreational boat traffic and propwash, and therefore some erosion and mixing of the clean sand layer has likely occurred. This was anticipated and therefore a 1-foot sand layer (as opposed to six inches or less) was specified in the remedy design (MFA, 2014). The higher amounts of silty sand in Sample B are reflected in the higher TOC observed, and may explain the minor spatial heterogeneity in dioxin concentrations. Depositional fines from upstream areas may have also contributed to the slight increases of dioxin concentrations and TOC observed in 2017. Regional sediment background dioxin concentrations (approximately 2 ng/kg TEQ) (MFA, 2013b) are higher than those observed during the Year 0 (2015) sediment monitoring event.

Before the remedial action, dioxin TEQ concentrations in Lake River were as high as 910 ng/kg, and it was estimated that post-remedy concentrations would range up to 23 ng/kg (MFA, 2015a), with an area-wide average concentration of approximately 4.4 ng/kg, following natural recovery and mixing of placed clean sand with native sediment (MFA, 2013a). The 2017 average ISM concentration is consistent with the area-wide projection and is below the CUL of 5 ng/kg. Placed sand is expected to continue to mix with the underlying sandy silt over time via bioturbation and anthropogenic events, and upstream sediments will continue to deposit in the remedy area. Future

monitoring events will assess whether and how these processes continue to affect dioxin concentrations in the remedy area over time.

# LIMITATIONS

The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

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# TABLES

# Table 3-1
# Sediment Sample Descriptions
# Former PWT Site
# Ridgefield, Washington

| Increment Number | Group | Date Collected | Comments |
|---|---|---|---|
| 0 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 1 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 2 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 3 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, trace woody/organic debris. |
| 4 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, trace woody/organic debris. |
| 5 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 6 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 7 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 8 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 9 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 10 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 11 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 12 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 13 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 14 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 15 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, trace woody/organic debris. |
| 16 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 17 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 18 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 19 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 20 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 21 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected from shore. |
| 22 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected from shore. |
| 23 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected from shore. |
| 24 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected from shore. |
| 25 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 26 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 27 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 28 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |

# Table 3-1
# Sediment Sample Descriptions
# Former PWT Site
# Ridgefield, Washington

| Increment Number | Group | Date Collected | Comments |
|---|---|---|---|
| 29 | A | 09/25/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 30 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 31 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 32 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 33 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 34 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 35 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 36 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 37 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 38 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 39 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 40 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 41 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, trace woody/organic debris. Collected with Van Veen. |
| 42 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 43 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 44 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 45 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 46 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 47 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, trace organic debris (bivalve shells). |
| 48 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 49 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 50 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 51 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 52 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. |
| 53 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, trace woody/organic debris. |
| 54 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 55 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected with Van Veen. |
| 56 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected from shore. |
| 57 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected from shore. |

# Table 3-1
# Sediment Sample Descriptions
# Former PWT Site
# Ridgefield, Washington

| Increment Number | Group | Date Collected | Comments |
|---|---|---|---|
| 58 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected from shore. |
| 59 | C | 09/27/2017 | Dark brownish-gray sand, fine to coarse, no debris. Collected from shore. |
| 60 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 61 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 62 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 63 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, and dark brown silt, no debris. |
| 64 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 65 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 66 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 67 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 68 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 69 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 70 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 71 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 72 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 73 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 74 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 75 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 76 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 77 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, and dark brown silt, no debris. |
| 78 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, and dark brown silt, no debris. |
| 79 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, and dark brown silt, no debris. |
| 80 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, and dark brown silt, no debris. |
| 81 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, and dark brown silt, no debris. |
| 82 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 83 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 84 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 85 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |
| 86 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, no debris. |

# Table 3-1
# Sediment Sample Descriptions
# Former PWT Site
# Ridgefield, Washington

| Increment Number | Group | Date Collected | Comments |
|---|---|---|---|
| 87 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, and dark brown silt, no debris. |
| 88 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, and dark brown silt, no debris. |
| 89 | B | 09/26/2015 | Dark brownish-gray sand, fine to coarse, and dark brown silt, no debris. |

NOTE:
PWT = Pacific Wood Treating Co.

# Table 4-1
# Sediment Sample Results
# Former PWT Site
# Ridgefield, Washington

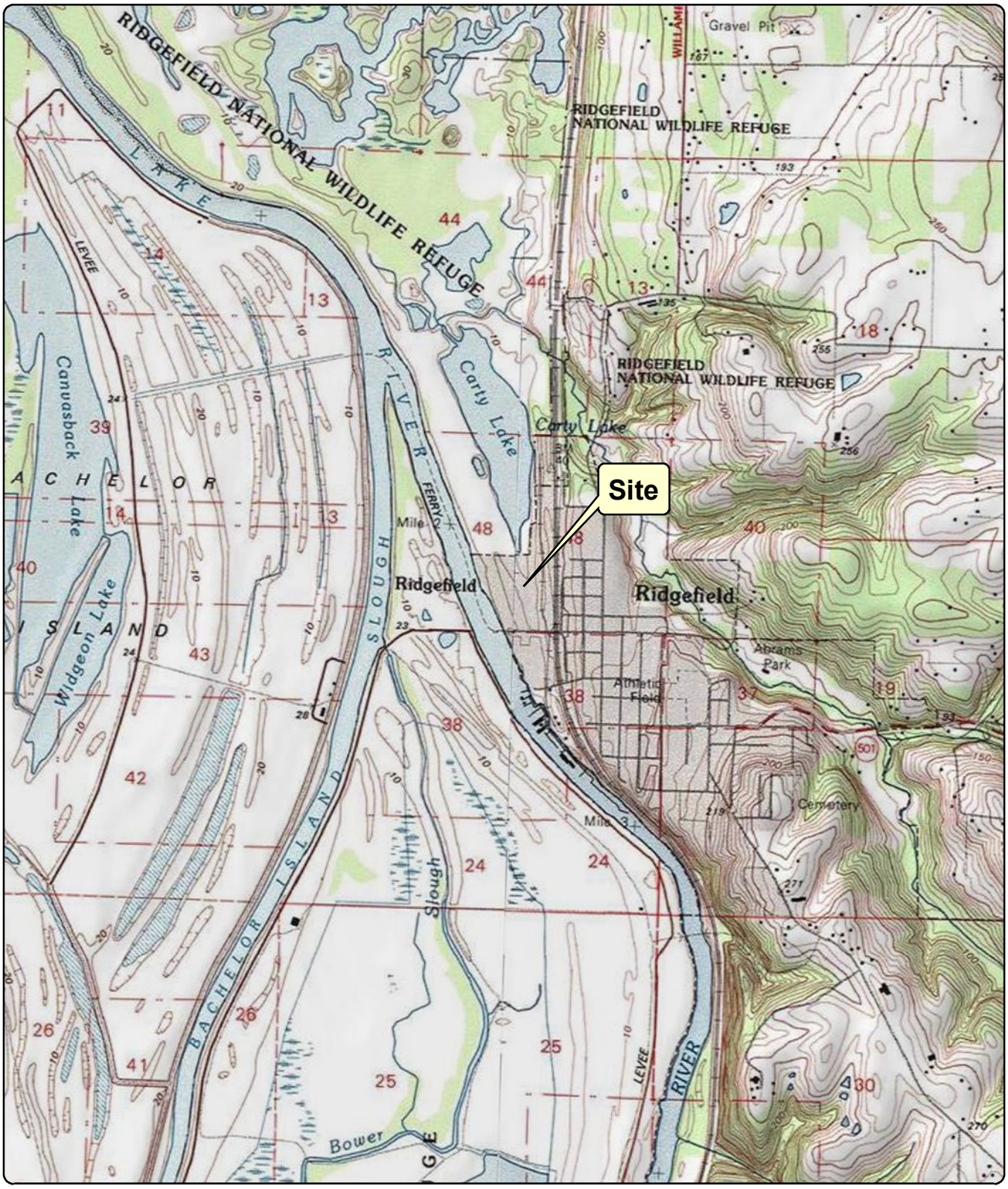
| Location | | ISM Sample A | ISM Sample B | ISM Sample C | ISM Sample A | ISM Sample B | ISM Sample C |
|---|---|---|---|---|---|---|---|
| Sample ID | | ISM-A-150240 | ISM-B-150421 | ISM-C-150422 | ISM-A-170925 | ISM-B-170926 | ISM-C-170927 |
| Date Collected | | 04/20/2015 | 04/21/2015 | 04/22/2015 | 09/25/2017 | 09/26/2017 | 09/27/2017 |
| Sample Type | | ISM | ISM | ISM | ISM | ISM | ISM |
| Start Depth (cm bml) | | 0 | 0 | 0 | 0 | 0 | 0 |
| End Depth (cm bml) | | 10 | 10 | 10 | 10 | 10 | 10 |
| | **Cleanup Level** | **YEAR 0 (2015)** | | | **YEAR 2 (2017)** | | |
| **Dioxins and Furans (ng/kg)** | | | | | | | |
| 1,2,3,4,6,7,8-HpCDD | -- | 30.3 | 9.9 | 6.23 | 30.7 J | 248 J | 77.5 J |
| 1,2,3,4,6,7,8-HpCDF | -- | 4.03 | 1.65 | 0.969 U | 4.89 J | 32 J | 9.38 J |
| 1,2,3,4,7,8,9-HpCDF | -- | 0.806 J | 0.276 J | 0.291 J | 1.22 U | 2.25 J | 0.819 J |
| 1,2,3,4,7,8-HxCDD | -- | 0.77 J | 0.216 J | 0.282 J | 0.746 U | 1.33 J | 0.506 J |
| 1,2,3,4,7,8-HxCDF | -- | 1.15 | 0.278 U | 0.345 J | 1.07 J | 4.82 J | 1.37 J |
| 1,2,3,6,7,8-HxCDD | -- | 2.08 | 0.546 J | 0.527 J | 1.45 J | 7.26 J | 2.95 J |
| 1,2,3,6,7,8-HxCDF | -- | 0.884 J | 0.251 J | 0.267 J | 0.541 U | 1.71 J | 0.62 UJ |
| 1,2,3,7,8,9-HxCDD | -- | 1.2 | 0.316 J | 0.331 J | 0.676 U | 2.33 J | 0.899 UJ |
| 1,2,3,7,8,9-HxCDF | -- | 0.675 J | 0.238 UJ | 0.233 J | 0.963 U | 1.33 J | 0.53 U |
| 1,2,3,7,8-PeCDD | -- | 0.607 J | 0.281 U | 0.208 J | 0.284 U | 0.404 J | 0.244 U |
| 1,2,3,7,8-PeCDF | -- | 0.666 J | 0.229 U | 0.255 J | 0.42 U | 0.428 UJ | 0.425 J |
| 2,3,4,6,7,8-HxCDF | -- | 0.76 J | 0.21 UJ | 0.2 J | 0.586 U | 1.95 J | 0.759 UJ |
| 2,3,4,7,8-PeCDF | -- | 0.585 J | 0.222 U | 0.241 J | 0.414 UJ | 2.04 J | 0.672 UJ |
| 2,3,7,8-TCDD | -- | 0.218 J | 0.117 U | 0.166 U | 0.523 U | 0.566 U | 0.33 U |
| 2,3,7,8-TCDF | -- | 0.216 J | 0.169 U | 0.143 U | 0.502 U | 0.532 U | 0.365 U |
| OCDD | -- | 264 | 76 | 53.1 | 298 J | 2570 J | 864 J |
| OCDF | -- | 7.36 | 2.11 | 1.81 J | 8.34 J | 52.9 J | 27.1 J |
| Total HpCDDs | -- | 54.3 | 18.1 | 11.9 | 61.9 J | 466 J | 150 J |
| Total HpCDFs | -- | 11.3 | 4.48 | 1.84 | 15 J | 105 J | 30.5 J |
| Total HxCDDs | -- | 7.75 | 2.29 | 2.05 | 5.85 | 62.6 U | 17 U |
| Total HxCDFs | -- | 9.57 | 2.54 | 2.44 | 9.93 U | 75 | 18.9 U |

# Table 4-1
# Sediment Sample Results
# Former PWT Site
# Ridgefield, Washington

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Location | | ISM Sample A | ISM Sample B | ISM Sample C | ISM Sample A | ISM Sample B | ISM Sample C |
| Sample ID | | ISM-A-150240 | ISM-B-150421 | ISM-C-150422 | ISM-A-170925 | ISM-B-170926 | ISM-C-170927 |
| Date Collected | | 04/20/2015 | 04/21/2015 | 04/22/2015 | 09/25/2017 | 09/26/2017 | 09/27/2017 |
| Sample Type | | ISM | ISM | ISM | ISM | ISM | ISM |
| Start Depth (cm bml) | | 0 | 0 | 0 | 0 | 0 | 0 |
| End Depth (cm bml) | | 10 | 10 | 10 | 10 | 10 | 10 |
| | **Cleanup Level** | **YEAR 0 (2015)** | | | **YEAR 2 (2017)** | | |
| Total PeCDDs | -- | 0.607 J | 0.281 U | 0.208 J | 0.284 U | 14.7 U | 2.07 UJ |
| Total PeCDFs | -- | 1.74 | 0.225 U | 0.668 J | 2.65 UJ | 28.9 U | 6.38 U |
| Total TCDDs | -- | 0.218 | 0.117 U | 0.166 U | 0.523 U | 9.24 | 0.33 U |
| Total TCDFs | -- | 0.216 | 0.169 U | 0.143 U | 0.502 U | 17 U | 0.365 U |
| Total TEQ Mammals (U = 1/2 EDL) | 5 | 2.23 | 0.555 | 0.683 | 1.38 | 7.01 | 2.19 |
| Average ISM Sample TEQ (U = 1/2 EDL) | | **1.16** | | | **3.53** | | |
| **Conventionals (%)** | | | | | | | |
| Total Organic Carbon | -- | 1.2 | 0.74 | 0.66 | 3.8 | 6.2 | 4.9 |
| Average Total Organic Carbon | -- | 0.87 | | | 4.97 | | |

NOTES:
Average results are in **bold** font.
-- = no value.
% = percent.
cm bml = centimeters below mudline.
EDL = estimated detection limit.
ISM = incremental sampling methodology.
J = Associated result is an estimated quantity.
ng/kg = nanograms per kilogram.
PWT = Pacific Wood Treating Co.
TEQ = toxicity equivalent.
U = Associated result is less than listed detection limit.

# FIGURES




Source: Topographic Quadrangle obtained from ArcGIS Online Services/NGS-USGS TOPO! US Geological Survey (1999)
7.5-minute topographic quadrangle: Ridgefield
Address: Lake River Industrial Site
111 W. Division Street, Ridgefield, WA 98642
Section: 24 Township: 4N Range: 1W Of Willamette Meridian

PWT = Pacific Wood Treating Co.

# Figure 1-1
## Site Location

Former PWT Site
Ridgefield, Washington

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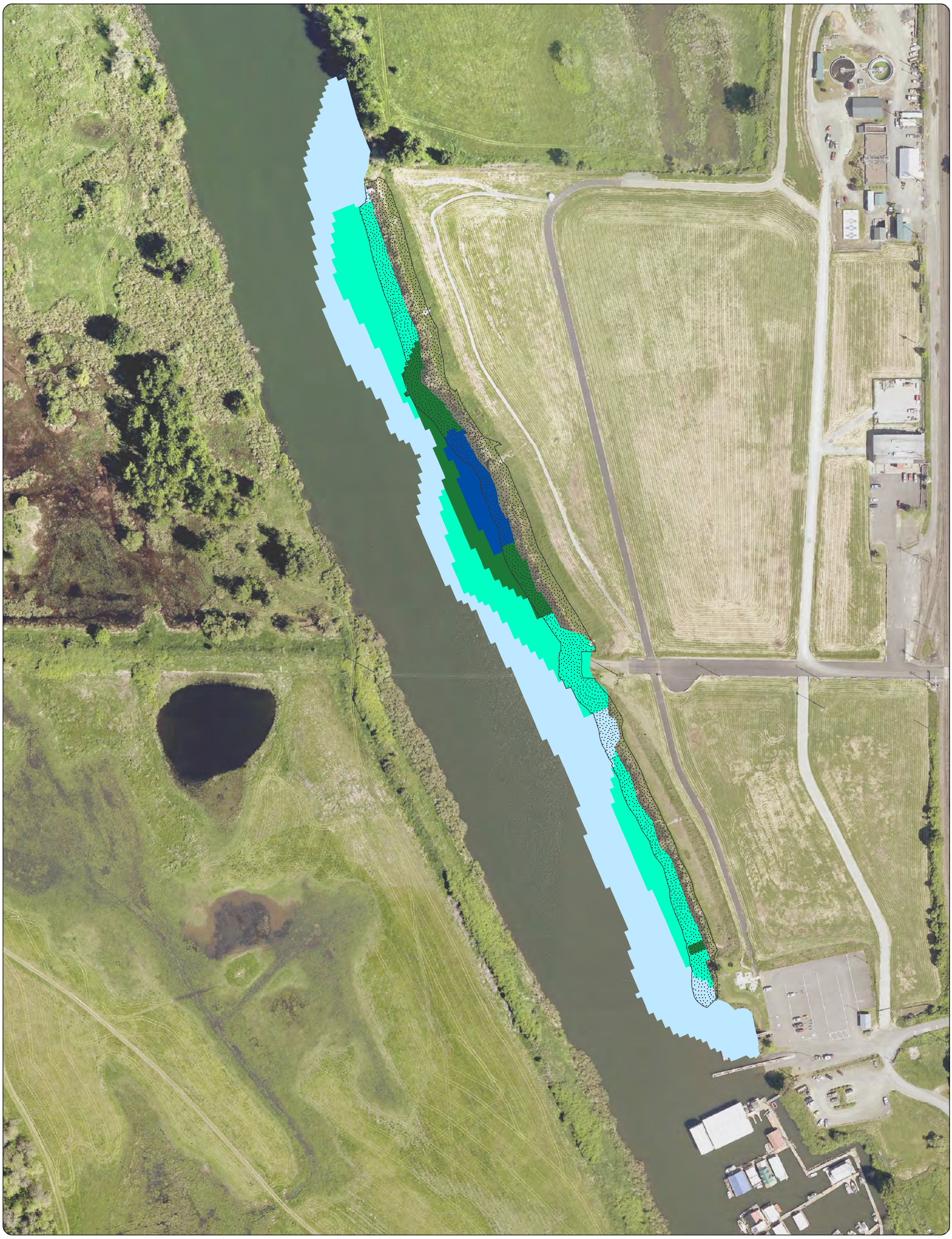
0 1,000 2,000
Feet

Path: X:\9003.01 Port of Ridgefield\40\Projects\06\Lake River SAP\Fig1_Site Location.mxd
Approved By: P. Wiescher Print Date: 6/29/2015
Produced By: R. Callihan
Project: 9003.01.40



Source: Aerial photograph (2014) obtained from Clark County GIS.

Notes:
1. PWT = Pacific Wood Treating Co.
2. ENR = Enhanced Natural Recovery.
3. Dredge depths denote neatline.
4. Dredged areas will also receive 1 foot of ENR treatment.
5. Analysis extent has been clipped to the bank-sediment interface. Dredge boundaries near the shore were generally determined by projection of a 3:1 horizontal to vertical slope down from the shoreline inflection point to the required dredge depth. ENR boundaries near the shore were determined by the point where the shore slope transitions to less than a 5:1 horizontal to vertical slope.

**Legend**

Fish Mix

Remedial Action Areas

ENR Only | 1-ft Dredge | 2-ft Dredge | 3-ft Dredge

# Figure 1-2
# Lake River Remedy Area

Former PWT Site
Ridgefield, Washington

0 100 200
Feet

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Path: X:\9003.01 Port of Ridgefield\40\Projects\06\Lake River SAP\Fig2_Lake River Remedy Area.mxd
Print Date: 11/10/2017
Approved By: mnovak
Produced By: rroberts
Project: 9003.01.40/06

Source: Aerial photograph (2014) obtained from Clark County GIS.

Notes:
1. PWT = Pacifc Wood Treating Co.
2. ISM = incremental sampling methodology.
3. Bankward sample locations extent was clipped to the extent of fish mix plus 5 feet riverward.

## Legend

- ISM Sample Location (A)
- ISM Sample Location (B)
- ISM Sample Location (C)
- ISM Sample Boundary
- Fish Mix

# Figure 3-1
# Sample Locations

Former PWT Site
Ridgefield, Washington

0 100 200
Feet

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Path: X:\9003.01 Port of Ridgefield\0\40\Projects\06\Lake River SAP\Fig3_Sample Results.mxd
Print Date: 6/29/2015
Approved By: mnovak
Produced By: rroberts
Project: 9003.01.40/06

# APPENDIX A

PHOTO ARRAY

# APPENDIX A—PHOTO ARRAY

Project Number: 9003.01.40
Location: 111 West Division Street
Ridgefield, Washington

**Photo No.** 1

**Description**
Representative core from ISM sample A. Fines present at top of core, transitioning to fine/coarse sand, and to sandy silt at lower depths. Top of mudline on right side of sample. September 25, 2017.

**Photo No.** 2

**Description**
Exposed sediment bed during low tide—middle remedy area near shore. Depositional fines on fine/coarse sand or fine/coarse sand observed. September 25, 2017.

# APPENDIX A—PHOTO ARRAY

Project Number: 9003.01.40
Location: 111 West Division Street
Ridgefield, Washington

**Photo No.** 3

**Description**
Exposed sediment bed during low tide—south remedy area near shore. Depositional fines on fine/coarse sand observed. September 25, 2017.

**Photo No.** 4

**Description**
Representative Van Veen sample. Depositional fines present at top, transitioning to fine/coarse sand. September 25, 2017.

# APPENDIX A—PHOTO ARRAY

Project Number: 9003.01.40
Location: 111 West Division Street
Ridgefield, Washington

**Photo No.** 5

**Description**
Lake River bank, looking north. September 27, 2017.

**Photo No.** 6

**Description**
Representative core from ISM sample C. Fine/coarse sand transitioning to sandy silt at lower depths. Top of mudline on right side of sample. September 27, 2017.

# APPENDIX B

## ANALYTICAL REPORTS

# Apex Labs

**12232 S.W. Garden Place**
**Tigard, OR 97223**
**503-718-2323 Phone**
**503-718-0333 Fax**

Friday, November 3, 2017

Phil Wiescher
Maul Foster & Alongi, INC.
2001 NW 19th Ave, STE 200
Portland, OR 97209

RE: Port of Ridgefield ISM / Lake River/9003.01.40

Enclosed are the results of analyses for work order A7J0037, which was received by the laboratory on 9/29/2017 at 11:01:00AM.

Thank you for using Apex Labs. We appreciate your business and strive to provide the highest quality services to the environmental industry.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: pnerenberg@apex-labs.com, or by phone at 503-718-2323.

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

Apex Labs

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Tigard, OR 97223
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503-718-0333 Fax

| | | |
|---|---|---|
| **Maul Foster & Alongi, INC.** | Project: **Port of Ridgefield ISM** | |
| 2001 NW 19th Ave, STE 200 | Project Number: Lake River/9003.01.40 | **Reported:** |
| Portland, OR 97209 | Project Manager: Phil Wiescher | 11/03/17 12:28 |

## ANALYTICAL REPORT FOR SAMPLES

### SAMPLE INFORMATION

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| **ISM-A-170925-After Processing** | A7J0037-02 | Sediment | 09/25/17 16:15 | 09/29/17 11:01 |
| **ISM-B-170926-After Processing** | A7J0037-04 | Sediment | 09/26/17 15:30 | 09/29/17 11:01 |
| **ISM-C-170927-After Processing** | A7J0037-06 | Sediment | 09/27/17 15:00 | 09/29/17 11:01 |

Apex Laboratories

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

Philip Nerenberg

Philip Nerenberg, Lab Director

Apex Labs

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| | | |
|---|---|---|
| **Maul Foster & Alongi, INC.** | Project: **Port of Ridgefield ISM** | |
| 2001 NW 19th Ave, STE 200 | Project Number: Lake River/9003.01.40 | **Reported:** |
| Portland, OR 97209 | Project Manager: Phil Wiescher | 11/03/17 12:28 |

## ANALYTICAL SAMPLE RESULTS

### Conventional Chemistry Parameters

| Analyte | Result | MDL | Reporting Limit | Units | Dilution | Date Analyzed | Method | Notes |
|---|---|---|---|---|---|---|---|---|
| **ISM-A-170925-After Processing (A7J0037-02)** | | | **Matrix: Sediment** | | | | | |
| Batch: 7100505 | | | | | | | | |
| **Total Organic Carbon** | **3800** | --- | 200 | mg/kg | 1 | 10/06/17 15:15 | PSEP/SM 5310B MOD | |
| **ISM-B-170926-After Processing (A7J0037-04)** | | | **Matrix: Sediment** | | | | | |
| Batch: 7100505 | | | | | | | | |
| **Total Organic Carbon** | **6200** | --- | 200 | mg/kg | 1 | 10/06/17 15:15 | PSEP/SM 5310B MOD | |
| **ISM-C-170927-After Processing (A7J0037-06)** | | | **Matrix: Sediment** | | | | | |
| Batch: 7100505 | | | | | | | | |
| **Total Organic Carbon** | **4900** | --- | 200 | mg/kg | 1 | 10/06/17 15:15 | PSEP/SM 5310B MOD | |

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| | | |
|---|---|---|
| **Maul Foster & Alongi, INC.** | Project: **Port of Ridgefield ISM** | |
| 2001 NW 19th Ave, STE 200 | Project Number: Lake River/9003.01.40 | **Reported:** |
| Portland, OR 97209 | Project Manager: Phil Wiescher | 11/03/17 12:28 |

## ANALYTICAL SAMPLE RESULTS

### Percent Dry Weight

| Analyte | Result | MDL | Reporting Limit | Units | Dilution | Date Analyzed | Method | Notes |
|---|---|---|---|---|---|---|---|---|
| **ISM-A-170925-After Processing (A7J0037-02)** | | | **Matrix: Sediment** | | **Batch: 7100504** | | | |
| **% Solids** | **99.2** | --- | 1.00 | % by Weight | 1 | 10/06/17 07:35 | EPA 8000C | |
| **ISM-B-170926-After Processing (A7J0037-04)** | | | **Matrix: Sediment** | | **Batch: 7100504** | | | |
| **% Solids** | **98.8** | --- | 1.00 | % by Weight | 1 | 10/06/17 07:35 | EPA 8000C | |
| **ISM-C-170927-After Processing (A7J0037-06)** | | | **Matrix: Sediment** | | **Batch: 7100504** | | | |
| **% Solids** | **98.7** | --- | 1.00 | % by Weight | 1 | 10/06/17 07:35 | EPA 8000C | |

Apex Laboratories

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| | | |
|---|---|---|
| **Maul Foster & Alongi, INC.** | Project: **Port of Ridgefield ISM** | |
| 2001 NW 19th Ave, STE 200 | Project Number: Lake River/9003.01.40 | **Reported:** |
| Portland, OR 97209 | Project Manager: Phil Wiescher | 11/03/17 12:28 |

## QUALITY CONTROL (QC) SAMPLE RESULTS

### Conventional Chemistry Parameters

| Analyte | Result | MDL | Reporting Limit | Units | Dil. | Spike Amount | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Batch 7100505 - PSEP TOC** | | | | | | | Soil | | | | | |
| **Blank (7100505-BLK1)** | | | | | Prepared: 10/05/17 16:00 | | Analyzed: 10/06/17 15:15 | | | | | |
| **PSEP/SM 5310B MOD** | | | | | | | | | | | | |
| Total Organic Carbon | ND | --- | 200 | mg/kg | 1 | --- | --- | --- | --- | --- | --- | |
| **Blank (7100505-BLK2)** | | | | | Prepared: 10/05/17 16:00 | | Analyzed: 10/06/17 15:15 | | | | | |
| **PSEP/SM 5310B MOD** | | | | | | | | | | | | |
| Total Organic Carbon | ND | --- | 200 | mg/kg | 1 | --- | --- | --- | --- | --- | --- | A-01 |
| **LCS (7100505-BS1)** | | | | | Prepared: 10/05/17 16:00 | | Analyzed: 10/06/17 15:15 | | | | | |
| **PSEP/SM 5310B MOD** | | | | | | | | | | | | |
| Total Organic Carbon | 9700 | --- | | mg/kg | 1 | 10000 | --- | 97 | 85-115 | --- | --- | |
| **Duplicate (7100505-DUP1)** | | | | | Prepared: 10/05/17 16:00 | | Analyzed: 10/06/17 15:15 | | | | | |
| **QC Source Sample: ISM-A-170925-After Processing (A7J0037-02)** | | | | | | | | | | | | |
| **PSEP/SM 5310B MOD** | | | | | | | | | | | | |
| Total Organic Carbon | **3800** | --- | 200 | mg/kg | 1 | --- | 3800 | --- | --- | 2 | 20% | |

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| | | |
|---|---|---|
| **Maul Foster & Alongi, INC.** | Project: **Port of Ridgefield ISM** | |
| 2001 NW 19th Ave, STE 200 | Project Number: Lake River/9003.01.40 | **Reported:** |
| Portland, OR 97209 | Project Manager: Phil Wiescher | 11/03/17 12:28 |

## QUALITY CONTROL (QC) SAMPLE RESULTS

### Percent Dry Weight

| Analyte | Result | MDL | Reporting Limit | Units | Dil. | Spike Amount | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Batch 7100504 - Total Solids (Dry Weight)** | | | | | | | | | **Soil** | | | |
| **Duplicate (7100504-DUP1)** | | | | | Prepared: 10/05/17 15:44 | | Analyzed: 10/06/17 07:35 | | | | | |
| **QC Source Sample: Other (A7J0020-01)** | | | | | | | | | | | | |
| **EPA 8000C** | | | | | | | | | | | | |
| % Solids | **81.6** | --- | 1.00 | % by Weight | 1 | --- | 81.8 | --- | --- | 0.3 | 10% | |
| **Duplicate (7100504-DUP2)** | | | | | Prepared: 10/05/17 17:40 | | Analyzed: 10/06/17 07:35 | | | | | |
| **QC Source Sample: Other (A7J0142-06)** | | | | | | | | | | | | |
| **EPA 8000C** | | | | | | | | | | | | |
| % Solids | **73.0** | --- | 1.00 | % by Weight | 1 | --- | 73.7 | --- | --- | 0.9 | 10% | |
| **Duplicate (7100504-DUP3)** | | | | | Prepared: 10/05/17 18:55 | | Analyzed: 10/06/17 07:35 | | | | | |
| **QC Source Sample: Other (A7J0147-01)** | | | | | | | | | | | | |
| **EPA 8000C** | | | | | | | | | | | | |
| % Solids | **80.8** | --- | 1.00 | % by Weight | 1 | --- | 81.1 | --- | --- | 0.5 | 10% | |

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Philip Nerenberg, Lab Director

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|---|---|---|
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| 2001 NW 19th Ave, STE 200 | Project Number: Lake River/9003.01.40 | **Reported:** |
| Portland, OR 97209 | Project Manager: Phil Wiescher | 11/03/17 12:28 |

## SAMPLE PREPARATION INFORMATION

### Conventional Chemistry Parameters

**Prep: PSEP TOC**

| Lab Number | Matrix | Method | Sampled | Prepared | Sample Initial/Final | Default Initial/Final | RL Prep Factor |
|---|---|---|---|---|---|---|---|
| Batch: 7100505 | | | | | | | |
| A7J0037-02 | Sediment | PSEP/SM 5310B MOD | 09/25/17 16:15 | 10/05/17 16:00 | 5g/5g | 5g/5g | NA |
| A7J0037-04 | Sediment | PSEP/SM 5310B MOD | 09/26/17 15:30 | 10/05/17 16:00 | 5g/5g | 5g/5g | NA |
| A7J0037-06 | Sediment | PSEP/SM 5310B MOD | 09/27/17 15:00 | 10/05/17 16:00 | 5g/5g | 5g/5g | NA |

### Percent Dry Weight

**Prep: Total Solids (Dry Weight)**

| Lab Number | Matrix | Method | Sampled | Prepared | Sample Initial/Final | Default Initial/Final | RL Prep Factor |
|---|---|---|---|---|---|---|---|
| Batch: 7100504 | | | | | | | |
| A7J0037-02 | Sediment | EPA 8000C | 09/25/17 16:15 | 10/05/17 15:44 | 1N/A/1N/A | 1N/A/1N/A | NA |
| A7J0037-04 | Sediment | EPA 8000C | 09/26/17 15:30 | 10/05/17 15:44 | 1N/A/1N/A | 1N/A/1N/A | NA |
| A7J0037-06 | Sediment | EPA 8000C | 09/27/17 15:00 | 10/05/17 15:44 | 1N/A/1N/A | 1N/A/1N/A | NA |

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|---|---|---|
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| 2001 NW 19th Ave, STE 200 | Project Number: Lake River/9003.01.40 | **Reported:** |
| Portland, OR 97209 | Project Manager: Phil Wiescher | 11/03/17 12:28 |

## Notes and Definitions

Qualifiers:

| | |
|---|---|
| A-01 | Puck mill grind blank |

Notes and Conventions:

| | |
|---|---|
| DET | Analyte DETECTED |
| ND | Analyte NOT DETECTED at or above the reporting limit |
| NR | Not Reported |
| dry | Sample results reported on a dry weight basis. Results listed as 'wet' or without 'dry'designation are not dry weight corrected. |
| RPD | Relative Percent Difference |
| MDL | If MDL is not listed, data has been evaluated to the Method Reporting Limit only. |
| WMSC | Water Miscible Solvent Correction has been applied to Results and MRLs for volatiles soil samples per EPA 8000C. |
| Batch QC | In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis. |
| Blank Policy | Apex assesses blank data for potential high bias down to a level equal to ½ the method reporting limit (MRL), except for conventional chemistry and HCID analyses which are assessed only to the MRL. Sample results flagged with a B or B-02 qualifier are potentially biased high if they are less than ten times the level found in the blank for inorganic analyses or less than five times the level found in the blank for organic analyses.<br>For accurate comparison of volatile results to the level found in the blank; water sample results should be divided by the dilution factor, and soil sample results should be divided by 1/50 of the sample dilution to account for the sample prep factor.<br>Results qualified as reported below the MRL may include a potential high bias if associated with a B or B-02 qualified blank. B and B-02 qualifications are not applied to J qualified results reported below the MRL. |
| --- | QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc. |
| *** | Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND). |

# Apex Labs

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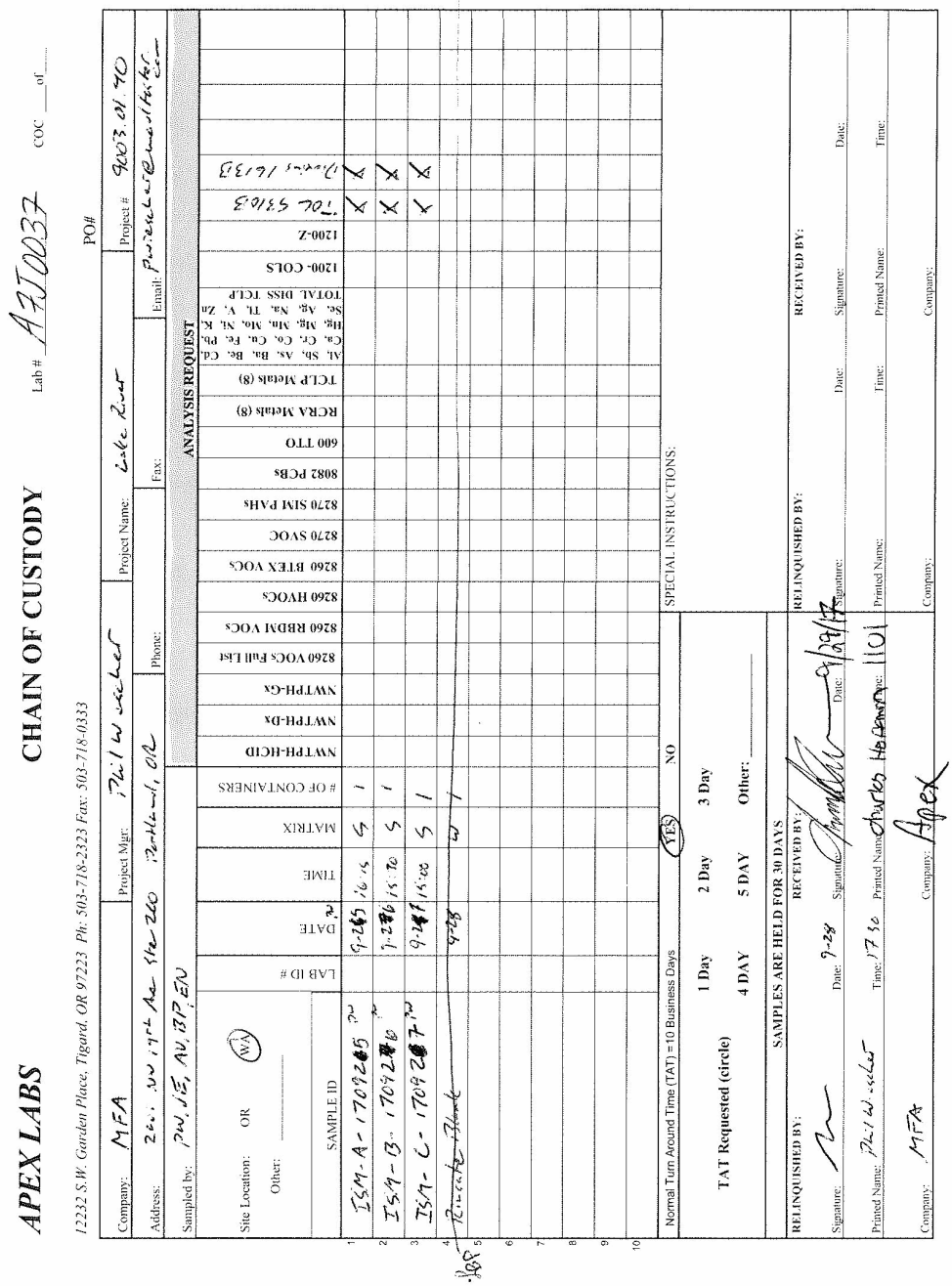
|---|---|---|
| **Maul Foster & Alongi, INC.** | Project: **Port of Ridgefield ISM** | |
| 2001 NW 19th Ave, STE 200 | Project Number: Lake River/9003.01.40 | **Reported:** |
| Portland, OR 97209 | Project Manager: Phil Wiescher | 11/03/17 12:28 |

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| **Maul Foster & Alongi, INC.** | Project: **Port of Ridgefield ISM** | |
| 2001 NW 19th Ave, STE 200 | Project Number: Lake River/9003.01.40 | **Reported:** |
| Portland, OR 97209 | Project Manager: Phil Wiescher | 11/03/17 12:28 |

**APEX LABS COOLER RECEIPT FORM**

Client: MFA Element WO#: A7 J0037

Project/Project #: Lake River 9003.01.40

**Delivery info:**

Date/Time Received: 9/29/17 @ 1101 By: CFH

Delivered by: Apex X Client ESS FedEx UPS Swift Senvoy SDS Other

**Cooler Inspection** Inspected by: CFH : 9/29/17 @ 1151

Chain of Custody Included? Yes X No Custody Seals? Yes No

Signed/Dated by Client? Yes X No

Signed/Dated by Apex? Yes X No

| | Cooler #1 | Cooler #2 | Cooler #3 | Cooler #4 | Cooler #5 | Cooler #6 | Cooler #7 |
|---|---|---|---|---|---|---|---|
| Temperature (deg. C) | | | | | | | |
| Received on Ice? (Y/N) | | | | | | | |
| Temp. Blanks? (Y/N) | 1.7 | | | | | | |
| Ice Type: (Gel/Real/Other) | | | | | | | |
| Condition: | Good | | | | | | |

Cooler out of temp? (Y/N) Possible reason why:

If some coolers are in temp and some out, were green dot applied to out of temperature samples? Yes/No/NA

**Samples Inspection:** Inspected by: MM 10/3 9X 10/3/17 @ 8.22

All Samples Intact? Yes X No Comments:

Bottle Labels/COCs agree? Yes X No Comments: No T on Lonts.

Containers/Volumes Received Appropriate for Analysis? Yes X No Comments:

Do VOA Vials have Visible Headspace? Yes No NA X

Comments

Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA X

Comments:

Additional Information:

Labeled by: MM Witness: DY Cooler Inspected by: N/A See Project Contact Form: Y

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

CFA | Cape Fear Analytical LLC
an affiliate of The GEL Group INC

3306 Kitty Hawk Road, Suite 120 Wilmington, NC 28405
P 910.795.0421
www.capefearanalytical.com

November 01, 2017

Mr. Philip Nerenberg
Apex Laboratories
12232 S.W. Garden Place
Portland, Oregon 97223

Re: POR DXN
Work Order: 11460
SDG: A7J0037

Dear Mr. Nerenberg:

Cape Fear Analytical LLC (CFA) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 11, 2017. This original data report has been prepared and reviewed in accordance with CFA's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at 910-795-0421.

Sincerely,

Cynde Larkins

Cynde Larkins
Project Manager

Enclosures

**SUBCONTRACT ORDER**

**Apex Laboratories**

**A7J0037**

CFA WO #114600

**SENDING LABORATORY:**

Apex Laboratories
12232 S.W. Garden Place
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 718-0333
Project Manager: Philip Nerenberg

**RECEIVING LABORATORY:**

Cape Fear Analytical, LLC
3306 Kitty Hawk Rd Suite 120
Wilmington, NC 28405
Phone :(910) 795-0421
Fax: -

**Sample Name: ISM-A-170925-After Processing** **Sedimen** **Sampled: 09/25/17 16:15** (A7J0037-02)

| Analysis | Due | Expires | Comments |
|---|---|---|---|
| **1613B Dioxins and Furans (SUB)** | 10/12/17 17:00 | 03/24/18 16:15 | Low Level Standard Required, Use Containers ~~A,~~ ~~B,~~ ~~C,~~ ~~D,~~ Use full volume G H I J |

*Containers Supplied:*

(A)40 mL VOA - Non Preserved
(B)40 mL VOA - Non Preserved
(C)40 mL VOA - Non Preserved
(D)40 mL VOA - Non Preserved
(G)40 mL VOA - Non Preserved
(H)40 mL VOA - Non Preserved
(I)40 mL VOA - Non Preserved
(J)40 mL VOA - Non Preserved

} Already Received

**Sample Name: ISM-B-170926-After Processing** **Sedimen** **Sampled: 09/26/17 15:30** (A7J0037-04)

| Analysis | Due | Expires | Comments |
|---|---|---|---|
| **1613B Dioxins and Furans (SUB)** | 10/12/17 17:00 | 03/25/18 15:30 | Low Level Standard Required, Use Containers ~~A,~~ ~~B,~~ ~~C,~~ ~~D,~~ Use full volume G H I J |

*Containers Supplied:*

(A)40 mL VOA - Non Preserved
(B)40 mL VOA - Non Preserved
(C)40 mL VOA - Non Preserved
(D)40 mL VOA - Non Preserved
(G)40 mL VOA - Non Preserved
(H)40 mL VOA - Non Preserved
(I)40 mL VOA - Non Preserved
(J)40 mL VOA - Non Preserved

} Already Received

Standard TAT

| Released By | Date | Received By | Date |
|---|---|---|---|
| | 10/10/17 | Fed Ex (Shipper) | |
| Fed Ex (Shipper) | 11OCT17 | Cynde Larkins | 11OCT17 @ 0945 |

temp. = 4.0°C

**SUBCONTRACT ORDER**

**Apex Laboratories**

**A7J0037**

CFA WO# 11460

**Sample Name: ISM-C-170927-After Processing** **Sedimen** **Sampled: 09/27/17 15:00** (A7J0037-06)

| Analysis | Due | Expires | Comments |
|---|---|---|---|
| **1613B Dioxins and Furans (SUB)** | 10/12/17 17:00 | 03/26/18 15:00 | Low Level Standard Required, Use Containers ~~A~~, ~~B~~, ~~C~~, ~~D~~, Use full volume H I J b |

*Containers Supplied:*

(A)40 mL VOA - Non Preserved
(B)40 mL VOA - Non Preserved
(C)40 mL VOA - Non Preserved
(D)40 mL VOA - Non Preserved
(G)40 mL VOA - Non Preserved
(H)40 mL VOA - Non Preserved
(I)40 mL VOA - Non Preserved
(J)40 mL VOA - Non Preserved

Already Received

| Released By | Date | Received By | Date |
|---|---|---|---|
| [signature] | 10/10/17 | Fed Ex (Shipper) | |
| Fed Ex (Shipper) | 11OCT17 | Cynde Larkins | 11OCT17 @ 0945 |

temp. = 4.0°C

## SAMPLE RECEIPT CHECKLIST

*Cape Fear Analytical*

| Client: APEX | Work Order: 11460 |
|---|---|
| Shipping Company: FedEx | Date/Time Received: 11OCT17 0945 |

| Suspected Hazard Information | Yes | NA | No |
|---|---|---|---|
| Shipped as DOT Hazardous? | | | ✓ |
| Samples identified as Foreign Soil? | | | ✓ |

| DOE Site Sample Packages | Yes | NA | No* |
|---|---|---|---|
| Screened <0.5 mR/hr? | | ✓ | |
| Samples < 2x background? | | ✓ | |

* Notify RSO of any responses in this column immediately.

| Air Sample Receipt Specifics | Yes | NA | No |
|---|---|---|---|
| Air sample in shipment? | | | ✓ |

Air Witness: _____

| | Sample Receipt Criteria | Yes | NA | No | Comments/Qualifiers (required for Non-Conforming Items) |
|---|---|---|---|---|---|
| 1 | Shipping containers received intact and sealed? | ✓ | | | Circle Applicable: seals broken damaged container leaking container other(describe) |
| 2 | Chain of Custody documents included with shipment? | ✓ | | | |
| 3 | Samples requiring cold preservation within 0-6°C? | ✓ | | | Preservation Method: (ice bags) blue ice dry ice none other (describe) 4.6° − 0.6 = 4.0°C |
| 4 | Aqueous samples found to have visible solids? | | ✓ | | Sample IDs, containers affected: |
| 5 | Samples requiring chemical preservation at proper pH? | | ✓ | | Sample IDs, containers affected and pH observed: If preservative added, Lot#: |
| 6 | Samples requiring preservation have no residual chlorine? | | ✓ | | Sample IDs, containers affected: If preservative added, Lot#: |
| 7 | Samples received within holding time? | ✓ | | | Sample IDs, tests affected: |
| 8 | Sample IDs on COC match IDs on containers? | ✓ | | | Sample IDs, containers affected: |
| 9 | Date & time of COC match date & time on containers? | ✓ | | | Sample IDs, containers affected: |
| 10 | Number of containers received match number indicated on COC? | ✓ | | | List type and number of containers / Sample IDs, containers affected: 4 - 4mL vials per sample |
| 11 | COC form is properly signed in relinquished/received sections? | ✓ | | | |

Comments:

Replacement samples for original shipment received out of temp.
Temp blank present (clear glass).

Checklist performed by: Initials: CY Date: 11OCT17

# High Resolution Dioxins and Furans Analysis

# Case Narrative

**HDOX Case Narrative**
**Apex Laboratories (APEX)**
**SDG A7J0037**
**Work Order 11460**

## Method/Analysis Information

| | |
|---|---|
| **Product:** | **Dioxins/Furans by EPA Method 1613B in Solids** |
| Analytical Method: | EPA Method 1613B |
| Extraction Method: | SW846 3540C |
| Analytical Batch Number: | 35994 |
| Clean Up Batch Number: | 35992 |
| Extraction Batch Number: | 35991 |

## Sample Analysis

The following samples were analyzed using the analytical protocol as established in Method 1613B:

| Sample ID | Client ID |
|---|---|
| 11460001 | ISM-A-170925-After Processing |
| 11460002 | ISM-B-170926-After Processing |
| 11460003 | ISM-C-170927-After Processing |
| 12019847 | Method Blank (MB) |
| 12019848 | Laboratory Control Sample (LCS) |
| 12019849 | Laboratory Control Sample Duplicate (LCSD) |

The samples in this SDG were analyzed on a "dry weight" basis.

### SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by Cape Fear Analytical LLC (CFA) as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with CF-OA-E-002 REV# 14.

Raw data reports are processed and reviewed by the analyst using the TargetLynx software package.

## Calibration Information

### Initial Calibration

All initial calibration requirements have been met for this sample delivery group (SDG).

**Continuing Calibration Verification (CCV) Requirements**
All associated calibration verification standard(s) (CCV) met the acceptance criteria.

## Quality Control (QC) Information

**Certification Statement**
The test results presented in this document are certified to meet all requirements of the 2009 TNI Standard.

**Method Blank (MB) Statement**
The MB(s) analyzed with this SDG met the acceptance criteria.

**Surrogate Recoveries**
All surrogate recoveries were within the established acceptance criteria for this SDG.

**Laboratory Control Sample (LCS) Recovery**
The LCS spike recoveries met the acceptance limits.

**Laboratory Control Sample Duplicate (LCSD) Recovery**
The LCSD spike recoveries met the acceptance limits.

**LCS/LCSD Relative Percent Difference (RPD) Statement**
The RPD(s) between the LCS and LCSD met the acceptance limits.

**QC Sample Designation**
A matrix spike and matrix spike duplicate analysis was not required for this SDG.

## Technical Information

**Holding Time Specifications**
CFA assigns holding times based on the associated methodology, which assigns the date and time from sample collection. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration. All samples in this SDG met the specified holding time.

**Preparation/Analytical Method Verification**
The EDLs for the tetra-dioxins and tetra-furans were slightly above the PQL based on the additional low calibration point. 11460001 (ISM-A-170925-After Processing) and 11460002 (ISM-B-170926-After Processing)- Batch 35994.

**Sample Dilutions**
The samples in this SDG did not require dilutions.

**Sample Re-extraction/Re-analysis**
Re-extractions or re-analyses were not required in this SDG.

## Miscellaneous Information

**Nonconformance (NCR) Documentation**
A NCR was not required for this SDG.

**Manual Integrations**
Certain standards and QC samples required manual integrations to correctly position the baseline as set in the calibration standard injections. Where manual integrations were performed, copies of all manual integration peak profiles are included in the raw data section of this fraction. Manual integrations were required for data files in this SDG.

**Sample preparation**
No difficulties were encountered during sample preparation.

## Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted: Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. An electronic signature page inserted after the case narrative will include the data validator's signature and title. The signature page also includes the data qualifiers used in the fractional package. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

# Sample Data Summary

# Cape Fear Analytical, LLC

3306 Kitty Hawk Road Suite 120, Wilmington, NC 28405 - (910) 795-0421 - www.capefearanalytical.com

## Qualifier Definition Report
## for

APEX001 Apex Laboratories

Client SDG: A7J0037 CFA Work Order: 11460

**The Qualifiers in this report are defined as follows:**

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a surrogate compound

J Value is estimated

K Estimated Maximum Possible Concentration

U Analyte was analyzed for, but not detected above the specified detection limit.

DL Indicates that sample is diluted.
RA Indicates that sample is re-analyzed without re-extraction.
RE Indicates that sample is re-extracted.

**Review/Validation**

Cape Fear Analytical requires all analytical data to be verified by a qualified data reviewer.

The following data validator verified the information presented in this case narrative:

**Signature:** Heather Patterson **Name: Heather Patterson**

**Date: 01 NOV 2017** **Title: Group Leader**

# Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **11460001** | **Date Collected:** | **09/25/2017 16:15** | **Matrix:** | **SOIL** |
| **Client Sample:** | **1613B Soil** | **Date Received:** | **10/11/2017 09:45** | **%Moisture:** | **.9** |
| **Client ID:** | **ISM-A-170925-After Processing** | | | **Prep Basis:** | **Dry Weight** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 20:15** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_4-4** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10.81 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|
| 1746-01-6 | 2,3,7,8-TCDD | U | 0.523 | pg/g | 0.523 | 0.467 |
| 40321-76-4 | 1,2,3,7,8-PeCDD | U | 0.284 | pg/g | 0.284 | 2.33 |
| 39227-28-6 | 1,2,3,4,7,8-HxCDD | U | 0.746 | pg/g | 0.746 | 2.33 |
| 57653-85-7 | 1,2,3,6,7,8-HxCDD | J | 1.45 | pg/g | 0.592 | 2.33 |
| 19408-74-3 | 1,2,3,7,8,9-HxCDD | U | 0.676 | pg/g | 0.676 | 2.33 |
| 35822-46-9 | 1,2,3,4,6,7,8-HpCDD | | 30.7 | pg/g | 1.64 | 2.33 |
| 3268-87-9 | 1,2,3,4,6,7,8,9-OCDD | | 298 | pg/g | 4.37 | 4.67 |
| 51207-31-9 | 2,3,7,8-TCDF | U | 0.502 | pg/g | 0.502 | 0.467 |
| 57117-41-6 | 1,2,3,7,8-PeCDF | U | 0.42 | pg/g | 0.420 | 2.33 |
| 57117-31-4 | 2,3,4,7,8-PeCDF | JK | 0.414 | pg/g | 0.364 | 2.33 |
| 70648-26-9 | 1,2,3,4,7,8-HxCDF | J | 1.07 | pg/g | 0.603 | 2.33 |
| 57117-44-9 | 1,2,3,6,7,8-HxCDF | U | 0.541 | pg/g | 0.541 | 2.33 |
| 60851-34-5 | 2,3,4,6,7,8-HxCDF | U | 0.586 | pg/g | 0.586 | 2.33 |
| 72918-21-9 | 1,2,3,7,8,9-HxCDF | U | 0.963 | pg/g | 0.963 | 2.33 |
| 67562-39-4 | 1,2,3,4,6,7,8-HpCDF | | 4.89 | pg/g | 0.720 | 2.33 |
| 55673-89-7 | 1,2,3,4,7,8,9-HpCDF | U | 1.22 | pg/g | 1.22 | 2.33 |
| 39001-02-0 | 1,2,3,4,6,7,8,9-OCDF | | 8.34 | pg/g | 1.58 | 4.67 |
| 41903-57-5 | Total TeCDD | U | 0.523 | pg/g | 0.523 | 0.933 |
| 36088-22-9 | Total PeCDD | U | 0.284 | pg/g | 0.284 | 4.67 |
| 34465-46-8 | Total HxCDD | | 5.85 | pg/g | 0.592 | 4.67 |
| 37871-00-4 | Total HpCDD | | 61.9 | pg/g | 1.64 | 4.67 |
| 30402-14-3 | Total TeCDF | U | 0.502 | pg/g | 0.502 | 0.933 |
| 30402-15-4 | Total PeCDF | JK | 2.65 | pg/g | 0.135 | 4.67 |
| 55684-94-1 | Total HxCDF | K | 9.93 | pg/g | 0.541 | 4.67 |
| 38998-75-3 | Total HpCDF | | 15.0 | pg/g | 0.720 | 4.67 |
| 3333-30-2 | TEQ WHO2005 ND=0 with EMPCs | | 0.825 | pg/g | | |
| 3333-30-3 | TEQ WHO2005 ND=0.5 with EMPCs | | 1.44 | pg/g | | |

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | | 139 | 187 | pg/g | 74.7 | (25%-164%) |
| 13C-1,2,3,7,8-PeCDD | | 165 | 187 | pg/g | 88.1 | (25%-181%) |
| 13C-1,2,3,4,7,8-HxCDD | | 141 | 187 | pg/g | 75.3 | (32%-141%) |
| 13C-1,2,3,6,7,8-HxCDD | | 166 | 187 | pg/g | 89.2 | (28%-130%) |
| 13C-1,2,3,4,6,7,8-HpCDD | | 138 | 187 | pg/g | 74.0 | (23%-140%) |
| 13C-OCDD | | 260 | 373 | pg/g | 69.6 | (17%-157%) |
| 13C-2,3,7,8-TCDF | | 130 | 187 | pg/g | 69.4 | (24%-169%) |
| 13C-1,2,3,7,8-PeCDF | | 159 | 187 | pg/g | 85.0 | (24%-185%) |
| 13C-2,3,4,7,8-PeCDF | | 165 | 187 | pg/g | 88.2 | (21%-178%) |
| 13C-1,2,3,4,7,8-HxCDF | | 136 | 187 | pg/g | 72.7 | (26%-152%) |
| 13C-1,2,3,6,7,8-HxCDF | | 155 | 187 | pg/g | 82.8 | (26%-123%) |
| 13C-2,3,4,6,7,8-HxCDF | | 146 | 187 | pg/g | 78.1 | (28%-136%) |
| 13C-1,2,3,7,8,9-HxCDF | | 134 | 187 | pg/g | 72.0 | (29%-147%) |

## Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **11460001** | **Date Collected:** | **09/25/2017 16:15** | **Matrix:** | **SOIL** |
| **Client Sample:** | **1613B Soil** | **Date Received:** | **10/11/2017 09:45** | **%Moisture:** | **.9** |
| **Client ID:** | **ISM-A-170925-After Processing** | | | **Prep Basis:** | **Dry Weight** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 20:15** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_4-4** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10.81 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-1,2,3,4,6,7,8-HpCDF | | 143 | 187 | pg/g | 76.5 | (28%-143%) |
| 13C-1,2,3,4,7,8,9-HpCDF | | 129 | 187 | pg/g | 69.0 | (26%-138%) |
| 37Cl-2,3,7,8-TCDD | | 13.8 | 18.7 | pg/g | 74.0 | (35%-197%) |

**Comments:**

**J Value is estimated**

**K Estimated Maximum Possible Concentration**

**U Analyte was analyzed for, but not detected above the specified detection limit.**

# Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **11460002** | **Date Collected:** | **09/26/2017 15:30** | **Matrix:** | **SOIL** |
| **Client Sample:** | **1613B Soil** | **Date Received:** | **10/11/2017 09:45** | **%Moisture:** | **1.1** |
| **Client ID:** | **ISM-B-170926-After Processing** | | | **Prep Basis:** | **Dry Weight** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 04:21** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_2-9** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10.72 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|
| 1746-01-6 | 2,3,7,8-TCDD | U | 0.566 | pg/g | 0.566 | 0.472 |
| 40321-76-4 | 1,2,3,7,8-PeCDD | J | 0.404 | pg/g | 0.175 | 2.36 |
| 39227-28-6 | 1,2,3,4,7,8-HxCDD | J | 1.33 | pg/g | 0.576 | 2.36 |
| 57653-85-7 | 1,2,3,6,7,8-HxCDD | | 7.26 | pg/g | 0.593 | 2.36 |
| 19408-74-3 | 1,2,3,7,8,9-HxCDD | J | 2.33 | pg/g | 0.598 | 2.36 |
| 35822-46-9 | 1,2,3,4,6,7,8-HpCDD | | 248 | pg/g | 1.87 | 2.36 |
| 3268-87-9 | 1,2,3,4,6,7,8,9-OCDD | | 2570 | pg/g | 2.94 | 4.72 |
| 51207-31-9 | 2,3,7,8-TCDF | U | 0.532 | pg/g | 0.532 | 0.472 |
| 57117-41-6 | 1,2,3,7,8-PeCDF | JK | 0.428 | pg/g | 0.186 | 2.36 |
| 57117-31-4 | 2,3,4,7,8-PeCDF | J | 2.04 | pg/g | 0.167 | 2.36 |
| 70648-26-9 | 1,2,3,4,7,8-HxCDF | | 4.82 | pg/g | 0.355 | 2.36 |
| 57117-44-9 | 1,2,3,6,7,8-HxCDF | J | 1.71 | pg/g | 0.366 | 2.36 |
| 60851-34-5 | 2,3,4,6,7,8-HxCDF | J | 1.95 | pg/g | 0.383 | 2.36 |
| 72918-21-9 | 1,2,3,7,8,9-HxCDF | J | 1.33 | pg/g | 0.519 | 2.36 |
| 67562-39-4 | 1,2,3,4,6,7,8-HpCDF | | 32.0 | pg/g | 0.485 | 2.36 |
| 55673-89-7 | 1,2,3,4,7,8,9-HpCDF | J | 2.25 | pg/g | 0.732 | 2.36 |
| 39001-02-0 | 1,2,3,4,6,7,8,9-OCDF | | 52.9 | pg/g | 0.827 | 4.72 |
| 41903-57-5 | Total TeCDD | | 9.24 | pg/g | 0.566 | 0.944 |
| 36088-22-9 | Total PeCDD | K | 14.7 | pg/g | 0.175 | 4.72 |
| 34465-46-8 | Total HxCDD | K | 62.6 | pg/g | 0.576 | 4.72 |
| 37871-00-4 | Total HpCDD | | 466 | pg/g | 1.87 | 4.72 |
| 30402-14-3 | Total TeCDF | K | 17.0 | pg/g | 0.532 | 0.944 |
| 30402-15-4 | Total PeCDF | K | 28.9 | pg/g | 0.0655 | 4.72 |
| 55684-94-1 | Total HxCDF | | 75.0 | pg/g | 0.355 | 4.72 |
| 38998-75-3 | Total HpCDF | | 105 | pg/g | 0.485 | 4.72 |
| 3333-30-2 | TEQ WHO2005 ND=0 with EMPCs | | 6.71 | pg/g | | |
| 3333-30-3 | TEQ WHO2005 ND=0.5 with EMPCs | | 7.02 | pg/g | | |

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | | 139 | 189 | pg/g | 73.6 | (25%-164%) |
| 13C-1,2,3,7,8-PeCDD | | 174 | 189 | pg/g | 92.1 | (25%-181%) |
| 13C-1,2,3,4,7,8-HxCDD | | 158 | 189 | pg/g | 83.5 | (32%-141%) |
| 13C-1,2,3,6,7,8-HxCDD | | 159 | 189 | pg/g | 84.0 | (28%-130%) |
| 13C-1,2,3,4,6,7,8-HpCDD | | 161 | 189 | pg/g | 85.4 | (23%-140%) |
| 13C-OCDD | | 331 | 377 | pg/g | 87.8 | (17%-157%) |
| 13C-2,3,7,8-TCDF | | 131 | 189 | pg/g | 69.2 | (24%-169%) |
| 13C-1,2,3,7,8-PeCDF | | 170 | 189 | pg/g | 90.0 | (24%-185%) |
| 13C-2,3,4,7,8-PeCDF | | 170 | 189 | pg/g | 90.2 | (21%-178%) |
| 13C-1,2,3,4,7,8-HxCDF | | 148 | 189 | pg/g | 78.4 | (26%-152%) |
| 13C-1,2,3,6,7,8-HxCDF | | 149 | 189 | pg/g | 79.2 | (26%-123%) |
| 13C-2,3,4,6,7,8-HxCDF | | 153 | 189 | pg/g | 80.9 | (28%-136%) |
| 13C-1,2,3,7,8,9-HxCDF | | 151 | 189 | pg/g | 80.1 | (29%-147%) |

## Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **11460002** | **Date Collected:** | **09/26/2017 15:30** | **Matrix:** | **SOIL** |
| **Client Sample:** | **1613B Soil** | **Date Received:** | **10/11/2017 09:45** | **%Moisture:** | **1.1** |
| **Client ID:** | **ISM-B-170926-After Processing** | | | **Prep Basis:** | **Dry Weight** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 04:21** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_2-9** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10.72 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-1,2,3,4,6,7,8-HpCDF | | 147 | 189 | pg/g | 77.8 | (28%-143%) |
| 13C-1,2,3,4,7,8,9-HpCDF | | 149 | 189 | pg/g | 78.8 | (26%-138%) |
| 37Cl-2,3,7,8-TCDD | | 14.4 | 18.9 | pg/g | 76.3 | (35%-197%) |

**Comments:**

**J Value is estimated**

**K Estimated Maximum Possible Concentration**

**U Analyte was analyzed for, but not detected above the specified detection limit.**

# Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **11460003** | **Date Collected:** | **09/27/2017 15:00** | **Matrix:** | **SOIL** |
| **Client Sample:** | **1613B Soil** | **Date Received:** | **10/11/2017 09:45** | **%Moisture:** | **1** |
| **Client ID:** | **ISM-C-170927-After Processing** | | | **Prep Basis:** | **Dry Weight** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 05:08** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_2-10** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10.79 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|
| 1746-01-6 | 2,3,7,8-TCDD | U | 0.33 | pg/g | 0.330 | 0.468 |
| 40321-76-4 | 1,2,3,7,8-PeCDD | U | 0.244 | pg/g | 0.244 | 2.34 |
| 39227-28-6 | 1,2,3,4,7,8-HxCDD | J | 0.506 | pg/g | 0.390 | 2.34 |
| 57653-85-7 | 1,2,3,6,7,8-HxCDD | | 2.95 | pg/g | 0.371 | 2.34 |
| 19408-74-3 | 1,2,3,7,8,9-HxCDD | JK | 0.899 | pg/g | 0.390 | 2.34 |
| 35822-46-9 | 1,2,3,4,6,7,8-HpCDD | | 77.5 | pg/g | 0.888 | 2.34 |
| 3268-87-9 | 1,2,3,4,6,7,8,9-OCDD | | 864 | pg/g | 2.88 | 4.68 |
| 51207-31-9 | 2,3,7,8-TCDF | U | 0.365 | pg/g | 0.365 | 0.468 |
| 57117-41-6 | 1,2,3,7,8-PeCDF | J | 0.425 | pg/g | 0.242 | 2.34 |
| 57117-31-4 | 2,3,4,7,8-PeCDF | JK | 0.672 | pg/g | 0.204 | 2.34 |
| 70648-26-9 | 1,2,3,4,7,8-HxCDF | J | 1.37 | pg/g | 0.341 | 2.34 |
| 57117-44-9 | 1,2,3,6,7,8-HxCDF | JK | 0.620 | pg/g | 0.360 | 2.34 |
| 60851-34-5 | 2,3,4,6,7,8-HxCDF | JK | 0.759 | pg/g | 0.380 | 2.34 |
| 72918-21-9 | 1,2,3,7,8,9-HxCDF | U | 0.53 | pg/g | 0.530 | 2.34 |
| 67562-39-4 | 1,2,3,4,6,7,8-HpCDF | | 9.38 | pg/g | 0.277 | 2.34 |
| 55673-89-7 | 1,2,3,4,7,8,9-HpCDF | J | 0.819 | pg/g | 0.423 | 2.34 |
| 39001-02-0 | 1,2,3,4,6,7,8,9-OCDF | | 27.1 | pg/g | 0.541 | 4.68 |
| 41903-57-5 | Total TeCDD | U | 0.33 | pg/g | 0.330 | 0.937 |
| 36088-22-9 | Total PeCDD | JK | 2.07 | pg/g | 0.244 | 4.68 |
| 34465-46-8 | Total HxCDD | K | 17.0 | pg/g | 0.371 | 4.68 |
| 37871-00-4 | Total HpCDD | | 150 | pg/g | 0.888 | 4.68 |
| 30402-14-3 | Total TeCDF | U | 0.365 | pg/g | 0.365 | 0.937 |
| 30402-15-4 | Total PeCDF | K | 6.38 | pg/g | 0.056 | 4.68 |
| 55684-94-1 | Total HxCDF | K | 18.9 | pg/g | 0.341 | 4.68 |
| 38998-75-3 | Total HpCDF | | 30.5 | pg/g | 0.277 | 4.68 |
| 3333-30-2 | TEQ WHO2005 ND=0 with EMPCs | | 2.07 | pg/g | | |
| 3333-30-3 | TEQ WHO2005 ND=0.5 with EMPCs | | 2.40 | pg/g | | |

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | | 134 | 187 | pg/g | 71.6 | (25%-164%) |
| 13C-1,2,3,7,8-PeCDD | | 156 | 187 | pg/g | 83.4 | (25%-181%) |
| 13C-1,2,3,4,7,8-HxCDD | | 138 | 187 | pg/g | 73.5 | (32%-141%) |
| 13C-1,2,3,6,7,8-HxCDD | | 152 | 187 | pg/g | 81.0 | (28%-130%) |
| 13C-1,2,3,4,6,7,8-HpCDD | | 151 | 187 | pg/g | 80.6 | (23%-140%) |
| 13C-OCDD | | 298 | 375 | pg/g | 79.5 | (17%-157%) |
| 13C-2,3,7,8-TCDF | | 124 | 187 | pg/g | 66.1 | (24%-169%) |
| 13C-1,2,3,7,8-PeCDF | | 154 | 187 | pg/g | 82.5 | (24%-185%) |
| 13C-2,3,4,7,8-PeCDF | | 159 | 187 | pg/g | 84.9 | (21%-178%) |
| 13C-1,2,3,4,7,8-HxCDF | | 137 | 187 | pg/g | 73.2 | (26%-152%) |
| 13C-1,2,3,6,7,8-HxCDF | | 136 | 187 | pg/g | 72.4 | (26%-123%) |
| 13C-2,3,4,6,7,8-HxCDF | | 137 | 187 | pg/g | 73.2 | (28%-136%) |
| 13C-1,2,3,7,8,9-HxCDF | | 138 | 187 | pg/g | 73.8 | (29%-147%) |

## Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **11460003** | **Date Collected:** | **09/27/2017 15:00** | **Matrix:** | **SOIL** |
| **Client Sample:** | **1613B Soil** | **Date Received:** | **10/11/2017 09:45** | **%Moisture:** | **1** |
| **Client ID:** | **ISM-C-170927-After Processing** | | | **Prep Basis:** | **Dry Weight** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 05:08** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_2-10** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10.79 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-1,2,3,4,6,7,8-HpCDF | | 143 | 187 | pg/g | 76.1 | (28%-143%) |
| 13C-1,2,3,4,7,8,9-HpCDF | | 143 | 187 | pg/g | 76.1 | (26%-138%) |
| 37Cl-2,3,7,8-TCDD | | 15.0 | 18.7 | pg/g | 79.9 | (35%-197%) |

**Comments:**

**J Value is estimated**

**K Estimated Maximum Possible Concentration**

**U Analyte was analyzed for, but not detected above the specified detection limit.**

# Quality Control Summary

## Hi-Res Dioxins/Furans
## Surrogate Recovery Report

**SDG Number: A7J0037**

**Matrix Type: SOLID**

| Sample ID | Client ID | Surrogate | QUAL | Recovery (%) | Acceptance Limits |
|---|---|---|---|---|---|
| 11460002 | ISM-B-170926-After Processing | 13C-2,3,7,8-TCDD | | 73.6 | (25%-164%) |
| | | 13C-1,2,3,7,8-PeCDD | | 92.1 | (25%-181%) |
| | | 13C-1,2,3,4,7,8-HxCDD | | 83.5 | (32%-141%) |
| | | 13C-1,2,3,6,7,8-HxCDD | | 84.0 | (28%-130%) |
| | | 13C-1,2,3,4,6,7,8-HpCDD | | 85.4 | (23%-140%) |
| | | 13C-OCDD | | 87.8 | (17%-157%) |
| | | 13C-2,3,7,8-TCDF | | 69.2 | (24%-169%) |
| | | 13C-1,2,3,7,8-PeCDF | | 90.0 | (24%-185%) |
| | | 13C-2,3,4,7,8-PeCDF | | 90.2 | (21%-178%) |
| | | 13C-1,2,3,4,7,8-HxCDF | | 78.4 | (26%-152%) |
| | | 13C-1,2,3,6,7,8-HxCDF | | 79.2 | (26%-123%) |
| | | 13C-2,3,4,6,7,8-HxCDF | | 80.9 | (28%-136%) |
| | | 13C-1,2,3,7,8,9-HxCDF | | 80.1 | (29%-147%) |
| | | 13C-1,2,3,4,6,7,8-HpCDF | | 77.8 | (28%-143%) |
| | | 13C-1,2,3,4,7,8,9-HpCDF | | 78.8 | (26%-138%) |
| | | 37Cl-2,3,7,8-TCDD | | 76.3 | (35%-197%) |
| 11460003 | ISM-C-170927-After Processing | 13C-2,3,7,8-TCDD | | 71.6 | (25%-164%) |
| | | 13C-1,2,3,7,8-PeCDD | | 83.4 | (25%-181%) |
| | | 13C-1,2,3,4,7,8-HxCDD | | 73.5 | (32%-141%) |
| | | 13C-1,2,3,6,7,8-HxCDD | | 81.0 | (28%-130%) |
| | | 13C-1,2,3,4,6,7,8-HpCDD | | 80.6 | (23%-140%) |
| | | 13C-OCDD | | 79.5 | (17%-157%) |
| | | 13C-2,3,7,8-TCDF | | 66.1 | (24%-169%) |
| | | 13C-1,2,3,7,8-PeCDF | | 82.5 | (24%-185%) |
| | | 13C-2,3,4,7,8-PeCDF | | 84.9 | (21%-178%) |
| | | 13C-1,2,3,4,7,8-HxCDF | | 73.2 | (26%-152%) |
| | | 13C-1,2,3,6,7,8-HxCDF | | 72.4 | (26%-123%) |
| | | 13C-2,3,4,6,7,8-HxCDF | | 73.2 | (28%-136%) |
| | | 13C-1,2,3,7,8,9-HxCDF | | 73.8 | (29%-147%) |
| | | 13C-1,2,3,4,6,7,8-HpCDF | | 76.1 | (28%-143%) |
| | | 13C-1,2,3,4,7,8,9-HpCDF | | 76.1 | (26%-138%) |
| | | 37Cl-2,3,7,8-TCDD | | 79.9 | (35%-197%) |
| 12019848 | LCS for batch 35991 | 13C-2,3,7,8-TCDD | | 80.3 | (20%-175%) |
| | | 13C-1,2,3,7,8-PeCDD | | 92.4 | (21%-227%) |
| | | 13C-1,2,3,4,7,8-HxCDD | | 79.0 | (21%-193%) |
| | | 13C-1,2,3,6,7,8-HxCDD | | 88.4 | (25%-163%) |
| | | 13C-1,2,3,4,6,7,8-HpCDD | | 83.3 | (22%-166%) |
| | | 13C-OCDD | | 78.5 | (13%-199%) |
| | | 13C-2,3,7,8-TCDF | | 76.3 | (22%-152%) |
| | | 13C-1,2,3,7,8-PeCDF | | 90.9 | (21%-192%) |
| | | 13C-2,3,4,7,8-PeCDF | | 92.6 | (13%-328%) |
| | | 13C-1,2,3,4,7,8-HxCDF | | 79.1 | (19%-202%) |
| | | 13C-1,2,3,6,7,8-HxCDF | | 79.9 | (21%-159%) |
| | | 13C-2,3,4,6,7,8-HxCDF | | 81.0 | (22%-176%) |
| | | 13C-1,2,3,7,8,9-HxCDF | | 83.5 | (17%-205%) |
| | | 13C-1,2,3,4,6,7,8-HpCDF | | 81.9 | (21%-158%) |
| | | 13C-1,2,3,4,7,8,9-HpCDF | | 80.8 | (20%-186%) |
| | | 37Cl-2,3,7,8-TCDD | | 89.8 | (31%-191%) |
| 12019849 | LCSD for batch 35991 | 13C-2,3,7,8-TCDD | | 73.5 | (20%-175%) |

## Hi-Res Dioxins/Furans
## Surrogate Recovery Report

**SDG Number: A7J0037**

**Matrix Type: SOLID**

| Sample ID | Client ID | Surrogate | QUAL | Recovery (%) | Acceptance Limits |
|---|---|---|---|---|---|
| 12019849 | LCSD for batch 35991 | 13C-1,2,3,7,8-PeCDD | | 86.0 | (21%-227%) |
| | | 13C-1,2,3,4,7,8-HxCDD | | 77.1 | (21%-193%) |
| | | 13C-1,2,3,6,7,8-HxCDD | | 81.9 | (25%-163%) |
| | | 13C-1,2,3,4,6,7,8-HpCDD | | 77.5 | (22%-166%) |
| | | 13C-OCDD | | 72.5 | (13%-199%) |
| | | 13C-2,3,7,8-TCDF | | 69.2 | (22%-152%) |
| | | 13C-1,2,3,7,8-PeCDF | | 86.3 | (21%-192%) |
| | | 13C-2,3,4,7,8-PeCDF | | 86.4 | (13%-328%) |
| | | 13C-1,2,3,4,7,8-HxCDF | | 74.6 | (19%-202%) |
| | | 13C-1,2,3,6,7,8-HxCDF | | 74.5 | (21%-159%) |
| | | 13C-2,3,4,6,7,8-HxCDF | | 76.2 | (22%-176%) |
| | | 13C-1,2,3,7,8,9-HxCDF | | 74.9 | (17%-205%) |
| | | 13C-1,2,3,4,6,7,8-HpCDF | | 73.8 | (21%-158%) |
| | | 13C-1,2,3,4,7,8,9-HpCDF | | 72.6 | (20%-186%) |
| | | 37Cl-2,3,7,8-TCDD | | 84.0 | (31%-191%) |
| 12019847 | MB for batch 35991 | 13C-2,3,7,8-TCDD | | 74.8 | (25%-164%) |
| | | 13C-1,2,3,7,8-PeCDD | | 84.7 | (25%-181%) |
| | | 13C-1,2,3,4,7,8-HxCDD | | 73.9 | (32%-141%) |
| | | 13C-1,2,3,6,7,8-HxCDD | | 82.6 | (28%-130%) |
| | | 13C-1,2,3,4,6,7,8-HpCDD | | 77.2 | (23%-140%) |
| | | 13C-OCDD | | 72.5 | (17%-157%) |
| | | 13C-2,3,7,8-TCDF | | 69.7 | (24%-169%) |
| | | 13C-1,2,3,7,8-PeCDF | | 85.4 | (24%-185%) |
| | | 13C-2,3,4,7,8-PeCDF | | 86.2 | (21%-178%) |
| | | 13C-1,2,3,4,7,8-HxCDF | | 72.7 | (26%-152%) |
| | | 13C-1,2,3,6,7,8-HxCDF | | 73.3 | (26%-123%) |
| | | 13C-2,3,4,6,7,8-HxCDF | | 74.8 | (28%-136%) |
| | | 13C-1,2,3,7,8,9-HxCDF | | 73.5 | (29%-147%) |
| | | 13C-1,2,3,4,6,7,8-HpCDF | | 74.5 | (28%-143%) |
| | | 13C-1,2,3,4,7,8,9-HpCDF | | 71.8 | (26%-138%) |
| | | 37Cl-2,3,7,8-TCDD | | 82.5 | (35%-197%) |
| 11460001 | ISM-A-170925-After Processing | 13C-2,3,7,8-TCDD | | 74.7 | (25%-164%) |
| | | 13C-1,2,3,7,8-PeCDD | | 88.1 | (25%-181%) |
| | | 13C-1,2,3,4,7,8-HxCDD | | 75.3 | (32%-141%) |
| | | 13C-1,2,3,6,7,8-HxCDD | | 89.2 | (28%-130%) |
| | | 13C-1,2,3,4,6,7,8-HpCDD | | 74.0 | (23%-140%) |
| | | 13C-OCDD | | 69.6 | (17%-157%) |
| | | 13C-2,3,7,8-TCDF | | 69.4 | (24%-169%) |
| | | 13C-1,2,3,7,8-PeCDF | | 85.0 | (24%-185%) |
| | | 13C-2,3,4,7,8-PeCDF | | 88.2 | (21%-178%) |
| | | 13C-1,2,3,4,7,8-HxCDF | | 72.7 | (26%-152%) |
| | | 13C-1,2,3,6,7,8-HxCDF | | 82.8 | (26%-123%) |
| | | 13C-2,3,4,6,7,8-HxCDF | | 78.1 | (28%-136%) |
| | | 13C-1,2,3,7,8,9-HxCDF | | 72.0 | (29%-147%) |
| | | 13C-1,2,3,4,6,7,8-HpCDF | | 76.5 | (28%-143%) |
| | | 13C-1,2,3,4,7,8,9-HpCDF | | 69.0 | (26%-138%) |
| | | 37Cl-2,3,7,8-TCDD | | 74.0 | (35%-197%) |

* Recovery outside Acceptance Limits

## Hi-Res Dioxins/Furans
## Surrogate Recovery Report

**SDG Number: A7J0037**

**Matrix Type: SOLID**

| Sample ID | Client ID | Surrogate | QUAL | Recovery (%) | Acceptance Limits |
|---|---|---|---|---|---|

* Recovery outside Acceptance Limits
# Column to be used to flag recovery values
D Sample Diluted

**Hi-Res Dioxins/Furans**

## Quality Control Summary
## Spike Recovery Report

**SDG Number:** A7J0037 **Sample Type:** Laboratory Control Sample

**Client ID:** LCS for batch 35991 **Matrix:** SOIL

**Lab Sample ID:** 12019848

**Instrument:** HRP750 **Analysis Date:** 10/27/2017 06:50 **Dilution:** 1

**Analyst:** MJC **Prep Batch ID:** 35991

**Batch ID:** 35994

| CAS No. | | Parmname | Amount Added pg/g | Spike Conc. pg/g | Recovery % | Acceptance Limits |
|---|---|---|---|---|---|---|
| 1746-01-6 | LCS | 2,3,7,8-TCDD | 20.0 | 21.9 | 110 | 67-158 |
| 40321-76-4 | LCS | 1,2,3,7,8-PeCDD | 100 | 101 | 101 | 70-142 |
| 39227-28-6 | LCS | 1,2,3,4,7,8-HxCDD | 100 | 101 | 101 | 70-164 |
| 57653-85-7 | LCS | 1,2,3,6,7,8-HxCDD | 100 | 105 | 105 | 76-134 |
| 19408-74-3 | LCS | 1,2,3,7,8,9-HxCDD | 100 | 102 | 102 | 64-162 |
| 35822-46-9 | LCS | 1,2,3,4,6,7,8-HpCDD | 100 | 99.5 | 99.5 | 70-140 |
| 3268-87-9 | LCS | 1,2,3,4,6,7,8,9-OCDD | 200 | 205 | 103 | 78-144 |
| 51207-31-9 | LCS | 2,3,7,8-TCDF | 20.0 | 19.8 | 99.2 | 75-158 |
| 57117-41-6 | LCS | 1,2,3,7,8-PeCDF | 100 | 101 | 101 | 80-134 |
| 57117-31-4 | LCS | 2,3,4,7,8-PeCDF | 100 | 101 | 101 | 68-160 |
| 70648-26-9 | LCS | 1,2,3,4,7,8-HxCDF | 100 | 106 | 106 | 72-134 |
| 57117-44-9 | LCS | 1,2,3,6,7,8-HxCDF | 100 | 111 | 111 | 84-130 |
| 60851-34-5 | LCS | 2,3,4,6,7,8-HxCDF | 100 | 108 | 108 | 70-156 |
| 72918-21-9 | LCS | 1,2,3,7,8,9-HxCDF | 100 | 101 | 101 | 78-130 |
| 67562-39-4 | LCS | 1,2,3,4,6,7,8-HpCDF | 100 | 99.3 | 99.3 | 82-122 |
| 55673-89-7 | LCS | 1,2,3,4,7,8,9-HpCDF | 100 | 101 | 101 | 78-138 |
| 39001-02-0 | LCS | 1,2,3,4,6,7,8,9-OCDF | 200 | 210 | 105 | 63-170 |

**Hi-Res Dioxins/Furans**

## Quality Control Summary
## Spike Recovery Report

**SDG Number:** A7J0037 **Sample Type:** Laboratory Control Sample Duplicate

**Client ID:** LCSD for batch 35991 **Matrix:** SOIL

**Lab Sample ID:** 12019849

**Instrument:** HRP750 **Analysis Date:** 10/27/2017 07:36 **Dilution:** 1

**Analyst:** MJC **Prep Batch ID:** 35991

**Batch ID:** 35994

| CAS No. | | Parmname | Amount Added pg/g | Spike Conc. pg/g | Recovery % | Acceptance Limits | RPD % | Acceptance Limits |
|---|---|---|---|---|---|---|---|---|
| 1746-01-6 | LCSD | 2,3,7,8-TCDD | 20.0 | 20.0 | 99.8 | 67-158 | 9.37 | 0-20 |
| 40321-76-4 | LCSD | 1,2,3,7,8-PeCDD | 100 | 101 | 101 | 70-142 | 0.121 | 0-20 |
| 39227-28-6 | LCSD | 1,2,3,4,7,8-HxCDD | 100 | 102 | 102 | 70-164 | 0.850 | 0-20 |
| 57653-85-7 | LCSD | 1,2,3,6,7,8-HxCDD | 100 | 95.6 | 95.6 | 76-134 | 9.09 | 0-20 |
| 19408-74-3 | LCSD | 1,2,3,7,8,9-HxCDD | 100 | 99.2 | 99.2 | 64-162 | 3.09 | 0-20 |
| 35822-46-9 | LCSD | 1,2,3,4,6,7,8-HpCDD | 100 | 97.6 | 97.6 | 70-140 | 1.99 | 0-20 |
| 3268-87-9 | LCSD | 1,2,3,4,6,7,8,9-OCDD | 200 | 196 | 98 | 78-144 | 4.53 | 0-20 |
| 51207-31-9 | LCSD | 2,3,7,8-TCDF | 20.0 | 19.3 | 96.4 | 75-158 | 2.83 | 0-20 |
| 57117-41-6 | LCSD | 1,2,3,7,8-PeCDF | 100 | 97.0 | 97 | 80-134 | 4.36 | 0-20 |
| 57117-31-4 | LCSD | 2,3,4,7,8-PeCDF | 100 | 97.8 | 97.8 | 68-160 | 3.42 | 0-20 |
| 70648-26-9 | LCSD | 1,2,3,4,7,8-HxCDF | 100 | 99.5 | 99.5 | 72-134 | 6.80 | 0-20 |
| 57117-44-9 | LCSD | 1,2,3,6,7,8-HxCDF | 100 | 104 | 104 | 84-130 | 6.45 | 0-20 |
| 60851-34-5 | LCSD | 2,3,4,6,7,8-HxCDF | 100 | 100 | 100 | 70-156 | 7.19 | 0-20 |
| 72918-21-9 | LCSD | 1,2,3,7,8,9-HxCDF | 100 | 99.4 | 99.4 | 78-130 | 1.22 | 0-20 |
| 67562-39-4 | LCSD | 1,2,3,4,6,7,8-HpCDF | 100 | 100 | 100 | 82-122 | 0.978 | 0-20 |
| 55673-89-7 | LCSD | 1,2,3,4,7,8,9-HpCDF | 100 | 97.9 | 97.9 | 78-138 | 3.04 | 0-20 |
| 39001-02-0 | LCSD | 1,2,3,4,6,7,8,9-OCDF | 200 | 206 | 103 | 63-170 | 2.19 | 0-20 |

## Method Blank Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Matrix:** | **SOIL** |
| **Client ID:** | **MB for batch 35991** | **Instrument ID:** | **HRP750** | **Data File:** | **A26OCT17E_3-3** |
| **Lab Sample ID:** | **12019847** | **Prep Date:** | **23-OCT-17** | **Analyzed:** | **10/27/17 08:23** |
| **Column:** | | | | | |

**This method blank applies to the following samples and quality control samples:**

| | Client Sample ID | Lab Sample ID | File ID | Date Analyzed | Time Analyzed |
|---|---|---|---|---|---|
| 01 | ISM-B-170926-After Processing | 11460002 | A26OCT17E_2-9 | 10/27/17 | 0421 |
| 02 | ISM-C-170927-After Processing | 11460003 | A26OCT17E_2-10 | 10/27/17 | 0508 |
| 03 | LCS for batch 35991 | 12019848 | A26OCT17E_3-1 | 10/27/17 | 0650 |
| 04 | LCSD for batch 35991 | 12019849 | A26OCT17E_3-2 | 10/27/17 | 0736 |
| 05 | ISM-A-170925-After Processing | 11460001 | A26OCT17E_4-4 | 10/27/17 | 2015 |

# Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **12019847** | | | **Matrix:** | **SOIL** |
| **Client Sample:** | **QC for batch 35991** | | | | |
| **Client ID:** | **MB for batch 35991** | | | **Prep Basis:** | **As Received** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 08:23** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_3-3** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|
| 1746-01-6 | 2,3,7,8-TCDD | U | 0.27 | pg/g | 0.270 | 0.500 |
| 40321-76-4 | 1,2,3,7,8-PeCDD | U | 0.12 | pg/g | 0.120 | 2.50 |
| 39227-28-6 | 1,2,3,4,7,8-HxCDD | U | 0.167 | pg/g | 0.167 | 2.50 |
| 57653-85-7 | 1,2,3,6,7,8-HxCDD | U | 0.16 | pg/g | 0.160 | 2.50 |
| 19408-74-3 | 1,2,3,7,8,9-HxCDD | U | 0.167 | pg/g | 0.167 | 2.50 |
| 35822-46-9 | 1,2,3,4,6,7,8-HpCDD | JK | 0.318 | pg/g | 0.216 | 2.50 |
| 3268-87-9 | 1,2,3,4,6,7,8,9-OCDD | J | 2.75 | pg/g | 0.546 | 5.00 |
| 51207-31-9 | 2,3,7,8-TCDF | U | 0.23 | pg/g | 0.230 | 0.500 |
| 57117-41-6 | 1,2,3,7,8-PeCDF | U | 0.145 | pg/g | 0.145 | 2.50 |
| 57117-31-4 | 2,3,4,7,8-PeCDF | U | 0.126 | pg/g | 0.126 | 2.50 |
| 70648-26-9 | 1,2,3,4,7,8-HxCDF | U | 0.121 | pg/g | 0.121 | 2.50 |
| 57117-44-9 | 1,2,3,6,7,8-HxCDF | JK | 0.128 | pg/g | 0.126 | 2.50 |
| 60851-34-5 | 2,3,4,6,7,8-HxCDF | U | 0.132 | pg/g | 0.132 | 2.50 |
| 72918-21-9 | 1,2,3,7,8,9-HxCDF | U | 0.183 | pg/g | 0.183 | 2.50 |
| 67562-39-4 | 1,2,3,4,6,7,8-HpCDF | J | 0.454 | pg/g | 0.226 | 2.50 |
| 55673-89-7 | 1,2,3,4,7,8,9-HpCDF | U | 0.346 | pg/g | 0.346 | 2.50 |
| 39001-02-0 | 1,2,3,4,6,7,8,9-OCDF | JK | 0.586 | pg/g | 0.512 | 5.00 |
| 41903-57-5 | Total TeCDD | U | 0.27 | pg/g | 0.270 | 1.00 |
| 36088-22-9 | Total PeCDD | U | 0.12 | pg/g | 0.120 | 5.00 |
| 34465-46-8 | Total HxCDD | U | 0.16 | pg/g | 0.160 | 5.00 |
| 37871-00-4 | Total HpCDD | JK | 0.318 | pg/g | 0.216 | 5.00 |
| 30402-14-3 | Total TeCDF | U | 0.23 | pg/g | 0.230 | 1.00 |
| 30402-15-4 | Total PeCDF | U | 0.0664 | pg/g | 0.0664 | 5.00 |
| 55684-94-1 | Total HxCDF | JK | 0.128 | pg/g | 0.121 | 5.00 |
| 38998-75-3 | Total HpCDF | J | 0.454 | pg/g | 0.226 | 5.00 |
| 3333-30-2 | TEQ WHO2005 ND=0 with EMPCs | | 0.0215 | pg/g | | |
| 3333-30-3 | TEQ WHO2005 ND=0.5 with EMPCs | | 0.297 | pg/g | | |

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | | 150 | 200 | pg/g | 74.8 | (25%-164%) |
| 13C-1,2,3,7,8-PeCDD | | 169 | 200 | pg/g | 84.7 | (25%-181%) |
| 13C-1,2,3,4,7,8-HxCDD | | 148 | 200 | pg/g | 73.9 | (32%-141%) |
| 13C-1,2,3,6,7,8-HxCDD | | 165 | 200 | pg/g | 82.6 | (28%-130%) |
| 13C-1,2,3,4,6,7,8-HpCDD | | 154 | 200 | pg/g | 77.2 | (23%-140%) |
| 13C-OCDD | | 290 | 400 | pg/g | 72.5 | (17%-157%) |
| 13C-2,3,7,8-TCDF | | 139 | 200 | pg/g | 69.7 | (24%-169%) |
| 13C-1,2,3,7,8-PeCDF | | 171 | 200 | pg/g | 85.4 | (24%-185%) |
| 13C-2,3,4,7,8-PeCDF | | 172 | 200 | pg/g | 86.2 | (21%-178%) |
| 13C-1,2,3,4,7,8-HxCDF | | 145 | 200 | pg/g | 72.7 | (26%-152%) |
| 13C-1,2,3,6,7,8-HxCDF | | 147 | 200 | pg/g | 73.3 | (26%-123%) |
| 13C-2,3,4,6,7,8-HxCDF | | 150 | 200 | pg/g | 74.8 | (28%-136%) |
| 13C-1,2,3,7,8,9-HxCDF | | 147 | 200 | pg/g | 73.5 | (29%-147%) |

## Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **12019847** | | | **Matrix:** | **SOIL** |
| **Client Sample:** | **QC for batch 35991** | | | | |
| **Client ID:** | **MB for batch 35991** | | | **Prep Basis:** | **As Received** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 08:23** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_3-3** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-1,2,3,4,6,7,8-HpCDF | | 149 | 200 | pg/g | 74.5 | (28%-143%) |
| 13C-1,2,3,4,7,8,9-HpCDF | | 144 | 200 | pg/g | 71.8 | (26%-138%) |
| 37Cl-2,3,7,8-TCDD | | 16.5 | 20.0 | pg/g | 82.5 | (35%-197%) |

**Comments:**

**J** **Value is estimated**

**K** **Estimated Maximum Possible Concentration**

**U** **Analyte was analyzed for, but not detected above the specified detection limit.**

# Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **12019848** | | | **Matrix:** | **SOIL** |
| **Client Sample:** | **QC for batch 35991** | | | | |
| **Client ID:** | **LCS for batch 35991** | | | **Prep Basis:** | **As Received** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 06:50** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_3-1** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|
| 1746-01-6 | 2,3,7,8-TCDD | | 21.9 | pg/g | 0.312 | 0.500 |
| 40321-76-4 | 1,2,3,7,8-PeCDD | | 101 | pg/g | 0.410 | 2.50 |
| 39227-28-6 | 1,2,3,4,7,8-HxCDD | | 101 | pg/g | 0.674 | 2.50 |
| 57653-85-7 | 1,2,3,6,7,8-HxCDD | | 105 | pg/g | 0.666 | 2.50 |
| 19408-74-3 | 1,2,3,7,8,9-HxCDD | | 102 | pg/g | 0.686 | 2.50 |
| 35822-46-9 | 1,2,3,4,6,7,8-HpCDD | | 99.5 | pg/g | 0.866 | 2.50 |
| 3268-87-9 | 1,2,3,4,6,7,8,9-OCDD | | 205 | pg/g | 1.68 | 5.00 |
| 51207-31-9 | 2,3,7,8-TCDF | | 19.8 | pg/g | 0.240 | 0.500 |
| 57117-41-6 | 1,2,3,7,8-PeCDF | | 101 | pg/g | 0.396 | 2.50 |
| 57117-31-4 | 2,3,4,7,8-PeCDF | | 101 | pg/g | 0.342 | 2.50 |
| 70648-26-9 | 1,2,3,4,7,8-HxCDF | | 106 | pg/g | 0.956 | 2.50 |
| 57117-44-9 | 1,2,3,6,7,8-HxCDF | | 111 | pg/g | 0.910 | 2.50 |
| 60851-34-5 | 2,3,4,6,7,8-HxCDF | | 108 | pg/g | 0.962 | 2.50 |
| 72918-21-9 | 1,2,3,7,8,9-HxCDF | | 101 | pg/g | 1.30 | 2.50 |
| 67562-39-4 | 1,2,3,4,6,7,8-HpCDF | | 99.3 | pg/g | 0.742 | 2.50 |
| 55673-89-7 | 1,2,3,4,7,8,9-HpCDF | | 101 | pg/g | 1.15 | 2.50 |
| 39001-02-0 | 1,2,3,4,6,7,8,9-OCDF | | 210 | pg/g | 1.21 | 5.00 |

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | | 161 | 200 | pg/g | 80.3 | (20%-175%) |
| 13C-1,2,3,7,8-PeCDD | | 185 | 200 | pg/g | 92.4 | (21%-227%) |
| 13C-1,2,3,4,7,8-HxCDD | | 158 | 200 | pg/g | 79.0 | (21%-193%) |
| 13C-1,2,3,6,7,8-HxCDD | | 177 | 200 | pg/g | 88.4 | (25%-163%) |
| 13C-1,2,3,4,6,7,8-HpCDD | | 167 | 200 | pg/g | 83.3 | (22%-166%) |
| 13C-OCDD | | 314 | 400 | pg/g | 78.5 | (13%-199%) |
| 13C-2,3,7,8-TCDF | | 153 | 200 | pg/g | 76.3 | (22%-152%) |
| 13C-1,2,3,7,8-PeCDF | | 182 | 200 | pg/g | 90.9 | (21%-192%) |
| 13C-2,3,4,7,8-PeCDF | | 185 | 200 | pg/g | 92.6 | (13%-328%) |
| 13C-1,2,3,4,7,8-HxCDF | | 158 | 200 | pg/g | 79.1 | (19%-202%) |
| 13C-1,2,3,6,7,8-HxCDF | | 160 | 200 | pg/g | 79.9 | (21%-159%) |
| 13C-2,3,4,6,7,8-HxCDF | | 162 | 200 | pg/g | 81.0 | (22%-176%) |
| 13C-1,2,3,7,8,9-HxCDF | | 167 | 200 | pg/g | 83.5 | (17%-205%) |
| 13C-1,2,3,4,6,7,8-HpCDF | | 164 | 200 | pg/g | 81.9 | (21%-158%) |
| 13C-1,2,3,4,7,8,9-HpCDF | | 162 | 200 | pg/g | 80.8 | (20%-186%) |
| 37Cl-2,3,7,8-TCDD | | 18.0 | 20.0 | pg/g | 89.8 | (31%-191%) |

**Comments:**

**U Analyte was analyzed for, but not detected above the specified detection limit.**

# Hi-Res Dioxins/Furans
## Certificate of Analysis
## Sample Summary

| | | | | | |
|---|---|---|---|---|---|
| **SDG Number:** | **A7J0037** | **Client:** | **APEX001** | **Project:** | **APEX00117** |
| **Lab Sample ID:** | **12019849** | | | **Matrix:** | **SOIL** |
| **Client Sample:** | **QC for batch 35991** | | | | |
| **Client ID:** | **LCSD for batch 35991** | | | **Prep Basis:** | **As Received** |
| **Batch ID:** | **35994** | **Method:** | **EPA Method 1613B** | | |
| **Run Date:** | **10/27/2017 07:36** | **Analyst:** | **MJC** | **Instrument:** | **HRP750** |
| **Data File:** | **A26OCT17E_3-2** | | | **Dilution:** | **1** |
| **Prep Batch:** | **35991** | **Prep Method:** | **SW846 3540C** | | |
| **Prep Date:** | **23-OCT-17** | **Prep Aliquot:** | **10 g** | | |

| CAS No. | Parmname | Qual | Result | Units | EDL | PQL |
|---|---|---|---|---|---|---|
| 1746-01-6 | 2,3,7,8-TCDD | | 20.0 | pg/g | 0.516 | 0.500 |
| 40321-76-4 | 1,2,3,7,8-PeCDD | | 101 | pg/g | 0.290 | 2.50 |
| 39227-28-6 | 1,2,3,4,7,8-HxCDD | | 102 | pg/g | 0.978 | 2.50 |
| 57653-85-7 | 1,2,3,6,7,8-HxCDD | | 95.6 | pg/g | 0.868 | 2.50 |
| 19408-74-3 | 1,2,3,7,8,9-HxCDD | | 99.2 | pg/g | 0.942 | 2.50 |
| 35822-46-9 | 1,2,3,4,6,7,8-HpCDD | | 97.6 | pg/g | 1.13 | 2.50 |
| 3268-87-9 | 1,2,3,4,6,7,8,9-OCDD | | 196 | pg/g | 1.89 | 5.00 |
| 51207-31-9 | 2,3,7,8-TCDF | | 19.3 | pg/g | 0.412 | 0.500 |
| 57117-41-6 | 1,2,3,7,8-PeCDF | | 97.0 | pg/g | 0.410 | 2.50 |
| 57117-31-4 | 2,3,4,7,8-PeCDF | | 97.8 | pg/g | 0.344 | 2.50 |
| 70648-26-9 | 1,2,3,4,7,8-HxCDF | | 99.5 | pg/g | 1.05 | 2.50 |
| 57117-44-9 | 1,2,3,6,7,8-HxCDF | | 104 | pg/g | 1.05 | 2.50 |
| 60851-34-5 | 2,3,4,6,7,8-HxCDF | | 100 | pg/g | 1.07 | 2.50 |
| 72918-21-9 | 1,2,3,7,8,9-HxCDF | | 99.4 | pg/g | 1.59 | 2.50 |
| 67562-39-4 | 1,2,3,4,6,7,8-HpCDF | | 100 | pg/g | 0.760 | 2.50 |
| 55673-89-7 | 1,2,3,4,7,8,9-HpCDF | | 97.9 | pg/g | 1.15 | 2.50 |
| 39001-02-0 | 1,2,3,4,6,7,8,9-OCDF | | 206 | pg/g | 1.68 | 5.00 |

| Surrogate/Tracer recovery | Qual | Result | Nominal | Units | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|---|
| 13C-2,3,7,8-TCDD | | 147 | 200 | pg/g | 73.5 | (20%-175%) |
| 13C-1,2,3,7,8-PeCDD | | 172 | 200 | pg/g | 86.0 | (21%-227%) |
| 13C-1,2,3,4,7,8-HxCDD | | 154 | 200 | pg/g | 77.1 | (21%-193%) |
| 13C-1,2,3,6,7,8-HxCDD | | 164 | 200 | pg/g | 81.9 | (25%-163%) |
| 13C-1,2,3,4,6,7,8-HpCDD | | 155 | 200 | pg/g | 77.5 | (22%-166%) |
| 13C-OCDD | | 290 | 400 | pg/g | 72.5 | (13%-199%) |
| 13C-2,3,7,8-TCDF | | 138 | 200 | pg/g | 69.2 | (22%-152%) |
| 13C-1,2,3,7,8-PeCDF | | 173 | 200 | pg/g | 86.3 | (21%-192%) |
| 13C-2,3,4,7,8-PeCDF | | 173 | 200 | pg/g | 86.4 | (13%-328%) |
| 13C-1,2,3,4,7,8-HxCDF | | 149 | 200 | pg/g | 74.6 | (19%-202%) |
| 13C-1,2,3,6,7,8-HxCDF | | 149 | 200 | pg/g | 74.5 | (21%-159%) |
| 13C-2,3,4,6,7,8-HxCDF | | 152 | 200 | pg/g | 76.2 | (22%-176%) |
| 13C-1,2,3,7,8,9-HxCDF | | 150 | 200 | pg/g | 74.9 | (17%-205%) |
| 13C-1,2,3,4,6,7,8-HpCDF | | 148 | 200 | pg/g | 73.8 | (21%-158%) |
| 13C-1,2,3,4,7,8,9-HpCDF | | 145 | 200 | pg/g | 72.6 | (20%-186%) |
| 37Cl-2,3,7,8-TCDD | | 16.8 | 20.0 | pg/g | 84.0 | (31%-191%) |

**Comments:**

**U Analyte was analyzed for, but not detected above the specified detection limit.**

# APPENDIX C

## DATA VALIDATION MEMORANDUM

# DATA QUALITY ASSURANCE/QUALITY CONTROL REVIEW

PROJECT NO. 9003.01.40 | JANUARY 25, 2018 | PORT OF RIDGEFIELD

Maul Foster & Alongi, Inc., conducted an independent review of the quality of analytical results for sediment monitoring samples collected in Lake River, located offshore of the former Pacific Wood Treating Co. site, in Ridgefield, Washington. The samples were collected on September 25, 26, and 27, 2017.

Apex Laboratories (Apex) and Cape Fear Analytical, LLC (CF) performed the analyses. Apex report A7J0037 and CF report WO11460 were reviewed; CF report WO11460 was appended to report A7J0037. The samples were collected using incremental sampling methodology (ISM) and were first processed at Apex. Apex analyzed the prepared samples for total organic carbon (TOC) by Puget Sound Estuary Program (PSEP)–recommended Standard Methods for the Examination of Water and Wastewater Method 5310B modified, after which the samples were submitted to CF for analysis of chlorinated dibenzo-p-dioxins and dibenzofurans (dioxins/furans) by U.S. Environmental Protection Agency (USEPA) Method 1613B. The following samples were analyzed.

| Samples Analyzed |
|---|
| **Report A7J0037/WO117460** |
| ISM-A-170925-After Processing |
| ISM-B-170926-After Processing |
| ISM-C-170927-After Processing |

## DATA QUALIFICATIONS

Analytical results were evaluated according to applicable sections of USEPA procedures (USEPA, 2017) and appropriate laboratory and method-specific guidelines (Apex, 2016; CF, 2016; USEPA, 1986).

USEPA Method 1613B detections between the method reporting limit (MRL) and the estimated detection limit (EDL) were qualified by the laboratory as estimated (J). Some USEPA Method 1613B non-detect results had EDLs greater than the MRL because of the sample matrix; the EDL result was reported as the result of record.

USEPA Method 1613B dioxin/furan results that were reported as estimated maximum potential concentrations (EMPCs) were qualified by the reviewer with "U" as non-detect at the reported value.

| Report | Sample | Component | Original Result (pg/g) | Qualified Result (pg/g) |
|---|---|---|---|---|
| WO11460 | ISM-A-170925-After Processing | 2,3,4,7,8-PeCDF | 0.414 JK | 0.414 UJ |
| WO11460 | | Total PeCDF | 2.65 JK | 2.65 UJ |
| WO11460 | | Total HxCDF | 9.93 K | 9.93 U |
| WO11460 | ISM-B-170926-After Processing | 1,2,3,7,8-PeCDF | 0.428 JK | 0.428 UJ |
| WO11460 | | Total PeCDD | 14.7 K | 14.7 U |
| WO11460 | | Total HxCDD | 62.6 K | 62.6 U |
| WO11460 | | Total TeCDF | 17.0 K | 17.0 U |
| WO11460 | | Total PeCDF | 28.9 K | 28.9 U |
| WO11460 | ISM-C-170927-After Processing | 1,2,3,7,8,9-HxCDD | 0.899 JK | 0.899 UJ |
| WO11460 | | 2,3,4,7,8-PeCDF | 0.672 JK | 0.672 UJ |
| WO11460 | | 1,2,3,6,7,8-HxCDF | 0.620 JK | 0.620 UJ |
| WO11460 | | 2,3,4,6,7,8-HxCDF | 0.759 JK | 0.759 UJ |
| WO11460 | | Total PeCDD | 2.07 JK | 2.07 UJ |
| WO11460 | | Total HxCDD | 17.0 K | 17.0 U |
| WO11460 | | Total PeCDF | 6.38 K | 6.38 U |
| WO11460 | | Total HxCDF | 18.9 K | 18.9 U |

NOTES:
J = Result is estimated value.
K = Result is an EMPC.
pg/g = picograms per gram.
U = Result is non-detect.

Data validation procedures were modified, as appropriate, to accommodate quality-control requirements for methods not specifically addressed by the USEPA procedures (e.g., PSEP/SM 5310B).

The data are considered acceptable for their intended use, with the appropriate data qualifiers assigned.

## HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

### Holding Times

Extractions and analyses were performed within the recommended holding time criteria.

In report WO11460, CF noted on the subcontract chain of custody that some sample containers had already been received. The reviewer confirmed that the samples received by CF on October 11, 2017, were replacement samples for a previous shipment that had been received out of the recommended temperature range.

### Preservation and Sample Storage

The samples were preserved and stored appropriately. The reviewer confirmed that samples were stored in a controlled-access refrigerator at 4 degrees Celsius prior to receipt by Apex.

## BLANKS

### Method Blanks

Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, laboratory method blanks were associated with all samples prepared in an analytical batch. Where an analyte was detected in a sample and in the associated method blank, the sample result was qualified if the concentration was less than five times the method blank concentration.

The USEPA Method 1613B method blank had detections between the EDL and MRL for some dioxin/furan congeners and homologs, and some method blank detections were also flagged by CF as EMPCs. All associated sample results were either greater than five times the method blank concentrations, or were qualified because of EMPCs, as noted in the data qualifications section above. No additional qualification was required.

The remaining method blank results were non-detect.

### Trip Blanks

Trip blanks were not required for this sampling event.

### Equipment Rinsate Blanks

Equipment rinsate blanks were not submitted for this sampling event.

## LABELED ANALOG STANDARD RECOVERY RESULTS

All USEPA Method 1613B samples were spiked with C13-labeled analog standards (surrogates) to evaluate and document data recovery. All surrogate recoveries were within acceptance limits.

## LABORATORY DUPLICATE RESULTS

Duplicate results are used to evaluate laboratory precision. All duplicate samples were extracted and analyzed at the required frequency. Laboratory duplicate results within five times the MRL were not evaluated for precision. All laboratory duplicate relative percent differences (RPDs) were within acceptance limits.

## LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

A laboratory control sample/laboratory control sample duplicate (LCS/LCSD) is spiked with target analytes to provide information on laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency. All LCS/LCSD results were within acceptance limits for percent recovery and RPD.

## ISM REPLICATE EVALUATION

Triplicate ISM samples were collected and submitted to Apex and CF for dioxin/furan and TOC analysis (ISM-A-170925-After Processing, ISM-B-170926-After Processing, and ISM-C-170927-After Processing). The relative standard deviations (RSDs) of dioxin/furan and TOC results were calculated when all three results were detected. RSDs were not calculated when results were non-detect or qualified "U" because of EMPCs.

RSDs were 24.2 percent for TOC and ranged from 24.2 percent to 96.3 percent for dioxin/furan congeners and homologs. When RSDs exceeded 35 percent, ISM replicate results were qualified with "J" as estimated. Results already flagged with "J" because of detection below the MRL were not additionally qualified by the reviewer. A summary of calculated RSDs and qualifiers is shown below:

| Sample ID | Analyte | Percent RSD | Qualifier Added |
|---|---|---|---|
| ISM-A-170925-After Processing, ISM-B-170926-After Processing, ISM-C-170927-After Processing | 1,2,3,6,7,8-HxCDD | 77.6 | J |
| | 1,2,3,4,6,7,8-HpCDD | 96.3 | J |
| | 1,2,3,4,7,8-HxCDF | 86.1 | J |
| | 1,2,3,4,6,7,8-HpCDF | 94.2 | J |
| | OCDD | 95.1 | J |
| | OCDF | 76.0 | J |
| | Total HpCDD | 94.0 | J |
| | Total HpCDF | 95.9 | J |
| | TOC | 24.2 | - |

## CONTINUING CALIBRATION VERIFICATION RESULTS

Continuing calibration verification (CCV) results are used to demonstrate instrument precision and accuracy through the end of the sample batch. Apex and CF did not report CCV results.

## REPORTING LIMITS

CF and Apex used routine MRLs and EDLs for non-detect results. MRLs and EDLs were adjusted for samples requiring dilutions because of high analyte concentrations, matrix interferences, or ratio criteria exceedances (resulting in EMPCs).

In report WO11460, CF noted in the case narrative that the EDLs for some dioxin/furan results were above the MRLs because of the addition of a low calibration point. The reviewer confirmed that the low calibration point had been used for all USEPA Method 1613B analyses in order to achieve low detection limits, and that the EDLs were higher than the MRLs because of the sample matrix. No action was required.

## DATA PACKAGE

The data packages were reviewed for transcription errors, omissions, and anomalies.

Apex indicated on the cooler receipt form that the sample collection time was not recorded on sample labels. No action was required.

No additional issues were found.

# REFERENCES

Apex. 2016. Quality systems manual. Rev. 5. Apex Laboratories, Tigard, Oregon. April 1.

CF. 2016. Quality assurance plan. Rev. 14. Cape Fear Analytical, LLC, Wilmington, North Carolina. May 6.

USEPA. 1986. Test methods for evaluating solid waste: physical/chemical methods. EPA-530/SW-846. Update V. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. September (revision 1, July 2014).

USEPA. 2017. USEPA contract laboratory program, national functional guidelines for inorganic Superfund methods data review. EPA 540-R-2017-001. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.