FINAL OFF-PROPERTY PORTION REMEDIAL INVESTIGATION WORK PLAN

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

Prepared for

PORT OF RIDGEFIELD

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Prepared by

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The material and data in this work plan were prepared under the supervision and direction of the undersigned.

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TABLES AND ILLUSTRATIONS

ACRONYMS AND ABBREVIATIONS

AOI	area of investigation
bgs	below ground surface
CSM	conceptual site model
CUL	cleanup level
dioxins	chlorinated dibenzo-p-dioxins and dibenzofurans
Ecology	Washington State Department of Ecology
FS	feasibility study
GIS	Geographic Information Systems
ISM	incremental sampling methodology
LRIS	Lake River Industrial Site
MFA	Maul Foster & Alongi, Inc.
mg/kg	milligrams per kilogram
MTCA	Model Toxics Control Act
ng/kg	nanograms per kilogram
NGVD	National Geodetic Vertical Datum of 1927/1947
OPP	off-property portion
the Order	Agreed Order No. DE 11057 between the Port and Ecology
PAH	polycyclic aromatic hydrocarbon
PCP	pentachlorophenol
POC	point of compliance
the Port	Port of Ridgefield
PWT	Pacific Wood Treating Co.
QAPP	quality assurance project plan
RA	risk assessment
RI	remedial investigation
ROW	right-of-way
SAP	sampling and analysis plan
site	former PWT site
SSAP	site-specific sampling and analysis plan
TCDD	2,3,7,8-tetrachloro dibenzo-p-dioxin
TEC	toxicity equivalent concentration
TEE	terrestrial ecological evaluation
TEF	toxic equivalency factor
TEQ	toxicity equivalent
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

1 INTRODUCTION

On behalf of the Port of Ridgefield (the Port), Maul Foster & Alongi, Inc. (MFA) has prepared this remedial investigation (RI) work plan for the off-property portion (OPP) of the former Pacific Wood Treating Co. (PWT) site (the site) in Ridgefield, Washington (see Figure 1). The OPP is adjacent to Port's Lake River Industrial Site (LRIS), now known as Miller's Landing. This RI work plan was prepared under the authority of Agreed Order No. DE 11057 (the Order) between the Port and the Washington State Department of Ecology (Ecology).

PWT operated a wood-treating facility from 1964 to 1993 at the LRIS. Historical wood-treating operations at the LRIS resulted in the release of hazardous chemicals, including chlorinated dibenzo-p-dioxins and dibenzofurans (dioxins). Previous investigations indicate that dioxins are present on public rights-of-way (ROWs) in the OPP at levels exceeding the Model Toxics Control Act (MTCA) Method B cleanup level (CUL) of 13 nanograms per kilogram (ng/kg) (MFA, 2013b). The extent of soil dioxin impacts associated with PWT operations, if any, on residential properties in the OPP is unknown.

This work plan is a single, stand-alone document that describes the approach to completing RI activities for the OPP. The work plan presents the OPP setting and evaluates data from previous investigations. An assessment of potential exposure pathways for human and ecological receptors is provided. The RI work plan describes preliminary CULs and describes the RI approach for characterizing soils in the OPP. The feasibility study (FS) approach, should any remedial action be necessary, is presented. The work plan provides the project organization for the RI, as well as the schedule.

1.1 Definition of Site and Off-Property Portion

The former PWT site is generally located at and near 111 West Division Street in Ridgefield, Washington (see Figure 2). The site is defined by the extent of contamination caused by the release of hazardous substances from the site. The site constitutes a "Facility" under Revised Code of Washington 70.105D.020(4). The areas addressed by previous site investigations include the LRIS, Port-owned properties, nearby water bodies (Carty Lake and Lake River), and ROWs in the upland off-property area. Remedial actions have been completed or are under way at the LRIS, Port-owned properties, Carty Lake, and Lake River, pursuant to the 2013 partial Consent Decree (Ecology, 2013c).

The OPP refers to the portion of the site where RI activities have not been completed and remedial characterization is required under the Order. The OPP differs from the upland off-property area (previously defined as the residential off-property area and a privately owned marina) (Ecology, 2013b). For purposes of this RI work plan, and consistent with the Order, the OPP is defined to include the residential off-property area shown in Figure 2.

1.2 Purpose and Objectives

This RI work plan is designed to meet the requirements of MTCA (Washington Administrative Code [WAC] 173-340) for performing an RI and risk assessment (RA) for the OPP. The purpose of the RI will be to generate sufficient data to adequately characterize the nature and extent of soil impacts in areas of investigation (AOIs) in the OPP and to allow for completion of an RA. Using information gathered from the RI, an FS evaluating options for remediation, if necessary, will be completed and a draft RI/FS report will be prepared.

1.3 Regulatory Framework

The October 2013 partial Consent Decree requires cleanup actions that have been or are being conducted for portions of the site: the LRIS, Port-owned properties, and adjacent water bodies (Carty Lake and Lake River). The cleanup actions selected are described in the Ecology-issued Cleanup Action Plan (Ecology, 2013b). The 2013 partial Consent Decree did not include the OPP; however, it acknowledged that additional remedial characterization was required and indicated that the work would be done under a separate Agreed Order (Ecology, 2013c). Ecology and the Port subsequently entered into the Order. The Order includes conducting an RI to determine the nature and extent of hazardous substances at the OPP and to identify potential threats to human health and the environment pursuant to MTCA. This RI work plan has been prepared to satisfy the requirements of the Order.

1.4 Work Plan Organization

The work plan is organized as follows:

- Section 2 provides background information for the site and the OPP.
- Section 3 summarizes previous investigations and delineates areas of potential impacts.
- Section 4 presents a preliminary conceptual site model (CSM) identifying potentially complete exposure pathways by identifying sources, transport mechanisms, exposure media, and potential receptors.
- Section 5 describes preliminary CULs and points of compliance (POCs).
- Section 6 describes the RI scope of work.
- Section 7 describes the FS scope of work.
- Section 8 describes the project management plan and schedule.

The following appendices are attached to satisfy requirements of WAC 173-340-350(7)(c)(iv):

- Appendix A—sampling and analysis plan (SAP), consistent with WAC 173-340-810. The SAP consists of a field sampling plan and a quality assurance project plan (QAPP), consistent with analytical requirements in WAC 173-340-830.

- Appendix B—site-specific health and safety plan, consistent with WAC 173-340-810.

In addition, the following appendices provide supporting information for procedures described in the work plan:

- Appendix C—a database for properties in the OPP
- Appendix D—historical aerial analysis for properties in the OPP
- Appendix E—a property survey form
- Appendix F—a tenant/owner questionnaire form
- Appendix G—a access agreement form

Standard field operating procedures for collecting AOI soil samples, the number of soil samples to be collected, analyzing samples, cleaning equipment, and managing waste are described in the SAP. The basis for determining the AOIs is provided in this RI work plan, and selection relies in part on information gathered during the RI. Site-specific SAPs (SSAPs) that identify sample locations for each AOI selected for characterization will therefore be developed and provided to Ecology before sampling activities begin. The SAP includes elements of a QAPP that defines laboratory and field analytical quality procedures and quality assurance/quality control requirements for analytical sampling and analysis.

2 BACKGROUND AND SETTING

This section presents a description of the OPP.

2.1 Background

The OPP is located to the east and upgradient of the LRIS. Figure 2 shows the OPP and vicinity, including the Port-owned, approximately 40-acre LRIS. PWT leased the LRIS from approximately 1964 to 1993. PWT's operations involved pressure-treating wood products with oil-based treatment solutions containing creosote, pentachlorophenol (PCP), and water-based mixtures of copper, chromium, arsenic, and/or zinc. Potential release and transport mechanisms are described in the former PWT site RI/FS (MFA, 2013b). PWT filed for bankruptcy in 1993 and abandoned the LRIS. The Port has established office spaces on the LRIS and manages the property. Multiple upland and in-water cleanup actions have been conducted or are under way, consistent with the 2013 partial Consent Decree (Ecology, 2013c).

2.2 Off-Property Setting

The area defined as the OPP includes sample locations at which dioxins were found at concentrations exceeding MTCA Method B CULs during previous RI investigations and is bounded as follows: the west boundary extends along Railroad Avenue from Mill Street to Maple Street; the eastern boundary runs along Main Avenue from Mill Street to Maple Street (see Figure 3). It is located in section 24, township 4 north, range 1 west, Willamette Meridian. The OPP includes 48 taxlots.

OPP soils are classified as Hillsboro silt loam and are well drained. There is substantial development and minimal viable ecological habitat in the OPP. The OPP is currently zoned low-density residential (the area is zoned primarily for 5,000-square-foot or larger lots) (see Figure 4). Primary land use is expected to remain residential.

Groundwater in the vicinity of the OPP is not used for drinking. Drinking water is provided by the City of Ridgefield (i.e., municipal water supply). Based on the Clark County MapsOnline database no domestic drinking water wells were identified in the OPP. The closest domestic drinking water well belongs to the city and those wells are located approximately 2,500 feet (0.5 mile) upgradient of the OPP, in Abrams Park. If additional water needs arise, beyond any additional wells at Abrams Park and the I-5 junction, the city will install wells east of I-5. Mr. Steven Wall, PE, the city's public works director, stated that water wells will not be installed west of Abrams Park, in the direction of the OPP (Wall, 2006).

2.2.1 Topography

The OPP is relatively flat, with a slight downward slope from east to west. The elevation ranges from approximately 78 feet National Geodetic Vertical Datum of 1927/1947 (NGVD) at the eastern extent to approximately 50 feet NGVD at the western extent.

2.2.2 Area Geology

At the nearby LRIS, four principal geologic units have been identified (MFA, 2013b). These include fill, younger alluvium, older alluvium, and the upper Troutdale Formation. The younger alluvium (clayey silts, sandy silts, and sands) appears to be thicker to the west near Lake River, and the older alluvium (sandy gravel) appears to be thicker to the east. The silty gravel observed beneath the alluvium may represent the top of the Troutdale Formation and forms an aquitard. Note that the LRIS is west of the OPP and approximately 25 to 50 feet lower in elevation.

Six soil borings from 0 to 10 feet below ground surface (bgs) were collected in OPP ROWs in September 2012. The borings generally indicate gravel with sand fill layer or gravel with silt from approximately 0 to 1 foot bgs, sand and/or silts from approximately 1 to 8 feet bgs, and sand from approximately 8 to 10 feet bgs (MFA, 2013a).

3 PREVIOUS INVESTIGATIONS AND DATA EVALUATION

This section delineates areas of potential impacts, based on available information from prior investigations. Chemicals detected in one or more samples are screened against relevant criteria to determine preliminary hazardous substances. Hazardous substances are those compounds that are included for further consideration during the development of the RI approach because of their frequency, mobility, persistence in the environment, or toxicity.

Since 1985, multiple investigations have been conducted at the site to characterize the impacts associated with historical PWT operations; these investigations are summarized in the former PWT site RI/FS (MFA, 2013b). Investigations conducted on the OPP are further described below.

3.1 Off-Property Portion Investigations

Soil sample results are presented in the attached table. Surface soil samples were collected at sixteen locations to define the extent of contamination in the OPP. Chemicals known to have impacted LRIS soils were analyzed: polycyclic aromatic hydrocarbons (PAHs), PCP, arsenic, chromium, copper, zinc, and dioxins. In June and September 2010, surface soil sampling was conducted at the request of Ecology to evaluate the same seven chemicals; six samples were collected (MFA, 2010). Ecology required additional off-property surface soil sampling for dioxins, and ten additional surface soil samples were collected in May 2011 (MFA, 2011). Composite soil sampling (0 to 6 feet bgs) was conducted at six locations in the OPP in September 2012 to further support evaluation of potential risks to terrestrial ecological receptors (MFA, 2013a).

3.1.1 Potential Hazardous Substances

Existing data for the OPP were compared with MTCA Method B soil CULs protective of human health (WAC 173-340-705) to identify potential hazardous substances. The screening results are summarized in the attached table.

In the OPP, no PCP or associated chlorinated phenolics have been detected above Method B CULs. Similarly, PAHs were rarely detected and no exceedances of Method B CULs occurred. Chromium, copper, and zinc were all below Method B CULs in OPP soils. Arsenic concentrations exceeded the Method B CUL of 0.67 milligram per kilogram (mg/kg); however, arsenic is commonly found at levels that exceed risk-based CULs as a result of natural background conditions. Arsenic ranged from 2.78 mg/kg to 9.81 mg/kg in OPP soils and was below the MTCA Method A level, adjusted for natural background, of 20 mg/kg. These chemicals are therefore not selected as hazardous substances for further characterization in the OPP (MFA, 2013b).

Dioxins (measured as the toxicity equivalent [TEQ]) were detected above the Method B soil CUL in portions of the OPP (see Figure 3). Under MTCA, the default soil CUL for unrestricted property, based on direct contact, is 13 ng/kg dioxin TEQ. Dioxin TEQ concentrations in surface soil ranged from 0.49 ng/kg to 57 ng/kg in ROWs, and the median dioxin TEQ is 5.2 ng/kg. ROW composite soil samples from 0 to 6 feet bgs were generally below the Method B CUL, with the exception of one sample at location SS-47. Soils more representative of potential human health exposure points in this area (i.e., soil concentrations in yards) have not been characterized. However, based on detections above 13 ng/kg in ROWs, dioxins are identified as potential hazardous substances for further investigation.

No unacceptable risk to ecological receptors in the OPP is expected. A supplemental terrestrial ecological evaluation (TEE) showed that dioxins in composite soil samples representative of potential ecological exposure are below ecological indicator concentrations protective of ecological receptors (MFA, 2013a). Ecology approved the supplemental TEE in February 2013 (Ecology, 2013a).

In summary, potential hazardous substances selected for further investigation are limited to dioxins (for evaluation of human health), and no adverse effects to ecological receptors are expected.

3.2 Data Usability

Data collected during previous investigations were reviewed for usability and were qualified consistent with U.S. Environmental Protection Agency (USEPA) procedures and appropriate laboratory and method-specific guidelines. Data quality review memoranda for historical data have been reviewed and approved by Ecology and are available in the former PWT site RI/FS report (MFA, 2013b) or reports referenced therein. All validated analytical data have been uploaded to Ecology's Environmental Information System database.

Consistent with WAC 173-340-708(8), mixtures of dioxins are considered a single hazardous substance in the evaluation of compliance with CULs such that the toxicity of a particular congener is expressed relative to the most toxic dioxin congener (i.e., 2,3,7,8-tetrachloro dibenzo-p-dioxin [TCDD]). The toxicity of dioxins is assessed using a toxic equivalency approach. Each congener in the group is assigned a toxic equivalency factor (TEF) describing the toxicity of that congener relative to the toxicity of the reference compound, TCDD. For example, a congener that is equal in toxicity to TCDD would have a TEF of 1.0. Similarly, a congener that is half as toxic as TCDD would have a TEF of 0.5, and so on. Multiplying the concentration of a congener by its TEF produces the concentration of TCDD that is equivalent in toxicity to the congener concentration of concern, known as the toxicity equivalent concentration (TEC). Computing the TEC for each congener (Ci in the equation below) in a sample, followed by summing all TEC values, permits expression of all congener concentrations in terms of a total TCDD TEQ (i.e., dioxin TEQ):

$$\text{Dioxin TEQ} = \sum_{i=1}^{k} \text{Ci x TEFi}$$

Dioxin results and TEQs are qualified and calculated as follows:

- Congeners qualified as non-detect and flagged with a "U" are used in the TEQ calculation at one-half the associated value.
- Congeners qualified as estimated and flagged with a "J" are used without modification in the TEQ calculation.
- Congeners qualified as non-detect with an estimated limit (i.e., flagged with a "UJ") are used in the TEQ calculation at one-half the associated value.
- If all congeners in a chemical group are undetected, the group sum is reported as undetected.

For further details on data validation and data treatment used for dioxins, see Appendix A. The most recent effort to develop TCDD TEFs for dioxins was made at an expert meeting organized by the World Health Organization in 2005 (Van den Berg et al., 2006) and used multiple lines of evidence to develop a consensus-based list of TEFs for mammal receptors.

4 PRELIMINARY CONCEPTUAL SITE MODEL

The preliminary CSM describes the physical and chemical conditions on the OPP. The primary purpose of the CSM is to describe pathways by which human and ecological receptors may be exposed to site-related chemicals in the environment. According to the USEPA (1989), a complete exposure pathway consists of four necessary elements: (1) a source and mechanism of chemical release to the environment; (2) an environmental transport medium for a released chemical; (3) a point of potential contact with the impacted medium (referred to as the exposure point); and (4) an exposure route (e.g., incidental sediment ingestion) at the exposure point.

4.1 Sources

Suspected historical sources of soil impacts include wood-treating chemicals and other substances that were used as part of wood-treating operations during PWT activities from 1964 to 1993. The specific operational activities leading to dioxin formation and the proximate source(s) are not well established. Dioxins can also result from anthropogenic sources (USEPA, 2006), which include vehicle emissions, back-yard trash burning, structure fires, vegetation treated with chlorinated pesticides, and other common events and activities. These sources may now release, or have historically released, dioxins to the environment. Typical human activities, in the absence of any notable point source of air emissions, have been shown through ambient air sampling to behave as areawide sources of dioxins in urban areas.

4.2 Fate and Transport

Dioxins are stable compounds and are highly resistant to most environmental degradation processes. Because of their low vapor pressure and low solubility, dioxins released via air emissions will ultimately be bound to organic matter found in surface soil (surface soil is defined here as the top 0.5 foot of soil). Particulates deposited on soils may be re-entrained by soil erosion (wind or water) or tracked by vehicles and transported to other areas. Because of their lack of mobility, dioxins are most often found in the upper several centimeters of surface soil, and the higher the organic carbon content in soil, the less mobile the compounds will be. Dioxins may deposit on vegetation; however, dioxins in soil are not likely to be taken up by plant roots and translocated to the plant shoots because they are hydrophobic and bind strongly to soil. The hydrophobicity of dioxins, combined with low vapor pressure and low water solubility, further indicates that leaching to subsurface soil and groundwater is insignificant in the absence of mechanical disturbance or organic solvents. Similarly, dioxins have little potential for volatilizing from soil (ATSDR, 1998; USEPA, 2003).

Primary suspected transport mechanisms that may have impacted the OPP are atmospheric deposition to surface soil (due to indeterminate PWT sources and/or anthropogenic sources) and tracking of impacted soil by vehicles exiting the PWT and subsequent dispersion (e.g., by wind, stormwater) to surface soil.

4.3 Human Health Exposure Scenarios

Human health exposure scenarios are shown in Figure 5. Potential human receptors include residents (adults and children) and workers (e.g., construction). Potential soil exposure pathways include direct contact (incidental soil ingestion, dermal contact, or inhalation) and secondary ingestion (consumption of chemicals in or on produce). Incidental ingestion of soils may occur during activities (e.g., playing in yards, gardening, yard improvement projects [digging]) followed by hand-to-mouth contact. Children may ingest significantly more soils than adults because of more frequent hand-to-mouth contact and/or more time spent in close proximity to soils (USEPA, 2011). Paustenbach et al. (2006) found dermal contact with dioxins in soil to be an insignificant exposure pathway relative to incidental soil ingestion and stated that the inhalation pathway for dioxins in soil is insignificant relative to the ingestion/dermal contact pathways. Paustenbach et al. (2006) also discussed the transfer of dioxins in soil to homegrown vegetables and other plants (also see Section 4.2) and concluded that this exposure pathway was insignificant, given that:

- The low vapor pressure of dioxins prevents any substantial vapor flux from contaminated (and often long-weathered) soils.
- The suspension of local soils, with subsequent deposition on plants, is expected to be nominal for dioxins because of normal washing, processing, and/or cooking of vegetables.

The recent findings support limited potential exposure to dioxins in soil from the dermal contact, inhalation, and produce-consumption pathways. Incidental ingestion is considered a potentially complete pathway.

Human receptors are unlikely to have direct exposure to groundwater. Groundwater is not used for drinking and, given the availability, reliability, and relatively low cost of municipal water, it is unlikely that water-supply wells will be developed at or near the OPP in the foreseeable future (see Section 2.2). Furthermore, dioxins do not readily leach to groundwater (see Section 4.2), and the associated exposure pathway is considered incomplete.

As described in Section 4.2, dioxins do not readily migrate to subsurface soils or volatilize to air, and the associated exposure pathways are considered insignificant.

In summary, incidental ingestion of surface soil is the most significant potential exposure pathway and is considered potentially complete.

4.4 Ecological Receptor Exposure Scenarios

Ecological exposure scenarios are shown in Figure 5. Potential ecological receptors include wildlife (e.g., mammals and birds) and plants. Potential exposure pathways for ecological receptors include direct contact (soil ingestion/uptake, dermal contact, or inhalation) and secondary ingestion (consumption of chemicals in plant material and/or prey by upper-trophic-level receptors). However, because of residential development, the OPP does not provide important ecological habitat. There is substantial human disturbance and there are no important resources for wildlife. Wildlife may visit the area, but potential exposures of wildlife receptors to impacted soil are expected to be minimal, as their foraging range is unlikely to be restricted to this developed area. In addition, a TEE conducted for the OPP indicated that dioxins in soil are not expected to result in unacceptable risk to ecological receptors (MFA, 2013a). Potential exposure pathways are therefore considered incomplete or insignificant, and ecological receptors are not further considered.

4.5 Data Gaps

The soil samples analyzed from previous investigations have been collected from public ROWs adjacent to private residential properties (see Section 3.1). Soils that residents and construction workers are most likely to encounter frequently have not been characterized; significantly more exposure to surface soils in yards (e.g., gardening, children playing) is likely. Therefore, during this investigation, surface soil samples (0 to 0.5 foot bgs) will be collected from residential yards.

Because any site-related releases of dioxins would be associated primarily with the former PWT years of operation (1964 to 1993), selection of AOIs must consider significant land modifications that occurred after 1993. For example, construction of a residence after 1993 likely involved significant excavation of soils throughout the property, and existing conditions would not reflect historical dioxin deposition. Furthermore, certain anthropogenic activities (e.g., burn pits in residential yards) may have resulted in dioxin impacts unrelated to PWT operations. This RI work plan therefore considers several data sources and factors in determining AOIs for surface soil sampling that are most likely to reflect PWT-related dioxin releases.

5 PRELIMINARY CLEANUP LEVELS AND POINTS OF COMPLIANCE

This section describes preliminary soil CULs protective of human health. A CUL is the concentration of a hazardous substance in soil, water, air, or sediment that is determined to be protective of human health and the environment under specified exposure conditions. CULs, in combination with POCs, typically define a site's area or volume of media that must be addressed by a cleanup action (WAC 173-340-700 through 173-340-760). Cleanup standards must also incorporate other state and federal regulatory requirements applicable to the cleanup action and/or its location. POCs are identified in accordance with standard MTCA protocols for soil.

MTCA includes procedures for developing standard and modified Method B cleanup levels for media, including residential soils (WAC 173-340-700). Under the standard MTCA Method B, generic default assumptions are used to calculate risk-based CULs protective of human health. The standard MTCA Method B level of 13 ng/kg dioxin TEQ is protective of children ingesting dioxins in soil and dust particles and is considered the preliminary CUL. Note that modified Method B provides for the use of chemical-specific or site-specific information to change selected default assumptions, within the limitations allowed in WAC 173-340-708. Modified Method B may also be used to establish CULs.

The POC for human exposure via direct contact is 0 to 15 feet bgs for soil (WAC 173-340-740 (6)(d)).

6 REMEDIAL INVESTIGATION SCOPE OF WORK

This section describes the objectives and scope of work for the RI. The field investigations will be completed consistent with the methods and protocol described in the SAP (see Appendix A). A Health and Safety Plan is included as Appendix B.

6.1 RI Objectives

As stipulated in WAC 173-340-350, the purpose of an RI/FS is to collect, develop, and evaluate sufficient information regarding a site to select a cleanup action under WAC 173-340-360 through 173-340-390. RI objectives as they relate to the OPP include the following:

- Determination of the nature, extent, and distribution of dioxins in surface soils, focusing on the lateral and vertical extent of contamination.
- Identification of any significant dioxin source areas in the OPP. Source areas shall be characterized through a review of historical information and land use permits, and through tenant/owner questionnaires. Source area evaluations will guide selection of AOIs for characterization.
- Identification of all current and reasonably likely future human receptors at the OPP. This analysis should consider all relevant contaminant migration pathways and the nature, extent, and distribution of dioxins in soil.
- Evaluation of the risk to human health from releases of dioxins at or from historical PWT operations.
- Generation or use of data of sufficient quality for characterization and RA.
- Development of the information required for conducting an FS to address contaminant releases from the site, if deemed necessary.

The proposed RI scope of work is designed to meet each of these objectives as they relate to the potential hazardous substances (dioxins) identified for the OPP.

6.2 RI Characterization

ROWs in the OPP were characterized during previous investigations and indicate a need for additional characterization efforts in the yards of private properties. A database with tax-parcel-specific information was compiled for each property in the OPP (see Appendix C). In some cases, houses span more than one tax lot or adjacent lots have the same owner; these lots were considered one property. Each property initially considered for sampling is shown in Figure 6.

A tiered evaluation will be conducted to select and sample AOIs as follows:

- **Phase 1.** A Phase 1 evaluation has been conducted, as presented in this RI work plan, to identify preliminary AOIs; preliminary AOIs are those properties at which dioxin impacts, if present, may be associated with former PWT operations.
- **Phase 2.** Additional evaluations will be conducted during RI activities to select AOIs; the evaluations will confirm whether preliminary AOIs identified are appropriate for analysis and will confirm sampling locations.
- **Phase 3.** Soil sampling will be conducted in selected AOIs for which access agreements have been obtained.

The phases are further described below.

6.2.1 Phase 1: Identify Preliminary AOIs

OPP properties are shown in Figure 6. Geographic Information Systems (GIS) analysis was conducted using Clark County Maps Online information to identify properties at which dioxin impacts, if present, may be associated with former PWT operations. Home construction involves significant soil disturbance/grading, excavation, or import of soil fill, to name a few. As a result, properties with homes built in approximately 1993 or later are highly unlikely to reflect dioxin contamination associated with the site. Appendix C shows the year homes were built for all properties. Appendix D presents the results of the aerial analysis conducted to confirm that properties 001, 002, 003, 009, 010[1], 026, and 028A were built since approximately 1993.[2] These properties are not further considered as AOIs and will not be surveyed. Preliminary AOIs that will be further evaluated during Phase 2 activities are shown in Figure 6.

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[1] The property database based on Clark County information (see Appendix C) indicates the home was built in 1920, however, aerial analysis shows a different home was present until at least 1996 and a new home was constructed on this property.

[2] The property database based on Clark County information (see Appendix C) indicates the homes on properties 034 and 035 were built in 1993, however, the preliminary aerial analysis did not confirm whether construction had occurred. These properties will be further assessed in Phase 2 (see Section 6.2.2).

6.2.2 Phase 2: Identify AOIs

Preliminary AOIs identified will be further assessed for selection as AOIs, based on the following:

- **Refined GIS Analysis.** Additional GIS aerial analysis will be conducted. Methods may include, but are not limited to, obtaining current satellite imagery for the OPP. Further analysis of the following will be conducted:
  - **Significant land or yard modifications since 1993.** Building permits will be queried and historical aerial analysis conducted to identify significant structural (e.g., removal of buildings) and landscaping (e.g., installation of lawns) changes to properties since 1993.
  - **Exposure area.** Yards with limited exposure area (e.g., primarily impervious surface) will be identified and may not be further considered as AOIs.
- **Yard Survey.** A yard survey will be conducted for each preliminary AOI. MFA will conduct the survey from public ROWs. Based on aerial photography, many of the yards can be observed without accessing the properties. The surveyor will note yard characteristics, including presence/absence of burn pits or burn areas and presence/absence of spills or staining, as well as other factors that may indicate potential point sources of dioxins (e.g., wood-burning stoves). In addition, aerial photographs (based on 2014) will be field verified to determine if any recent significant changes have occurred. Photographs will be taken of each property and associated features of interest. A field survey sheet has been developed and is provided in Appendix E.
- **Tenant/Owner Questionnaires.** During or following the field survey, questionnaires will be delivered or sent to preliminary AOI property tenants and owners. An attempt will be made to contact each tenant/owner by telephone before delivery of the forms. The questionnaire will address potential point sources of dioxins (e.g., whether burn barrels were used in the past, use of chlorinated pesticides), significant land/structural changes since 1993, typical yard use(s) and high-use areas, and potential safety hazards. It is anticipated that not all recipients will remit the questionnaire, and a followup telephone call may be placed within 15 days. The questionnaire will be developed in coordination with Ecology and will be submitted on official Ecology letterhead. Questions are provided in Appendix F.

Based on the results of Phase 2 activities, each preliminary AOI will be assessed to determine whether former PWT operations are likely to be the primary source of dioxins. In general, the assessment will conservatively assume that former PWT operations are the most likely potential source. Evidence of potential sources unrelated to the former PWT, or previously unknown significant land modifications (e.g., lawn installation since 1993), will be necessary in order to make a determination of no further assessment. Associated documentation (updated imagery, photographs, and/or questionnaire responses) will be provided to support determinations of no further assessment. In cases where the questionnaire was not remitted, only the results of the field survey and any additional GIS analysis will be used to make a determination. AOIs selected for further evaluation will be sampled during Phase 3.

6.2.3 Phase 3: Sample AOIs

MFA will complete an investigation to determine the nature and spatial extent of dioxin impacts to soil for AOIs as described below.

6.2.3.1 Access Agreements

Following selection of AOIs, attempts will be made to contact each tenant/owner, and access agreements will be prepared and sent. A sample access agreement is provided in Appendix G. It is anticipated that not all recipients will respond or grant access. In the event that no response is received within 15 days, a followup telephone call may be placed or an MFA and/or Ecology representative will visit the property and attempt to secure an access agreement in person. Only AOIs for which access agreements are secured will be sampled.

6.2.3.2 CSM Development

Site-specific CSMs will be developed for each AOI. The CSM will consist of a graphical representation including, but not limited to, structures and their characteristics, landscape features, probable high-use yard areas, and sampling area(s). The CSM will be linked with the database developed for OPP properties (see Appendix C) to form a comprehensive AOI representation.

6.2.3.3 AOI Visit

Before sampling begins, an AOI visit will be conducted to accomplish the following tasks:

- Information about the scope of the assessment will be provided to tenants.
- CSM assumptions will be verified by the tenant and MFA representatives.
- Potential sampling hazards (e.g., dogs, unsound structures) will be assessed.
- An acceptable sampling timeframe will be determined or confirmed.

The AOI visit will facilitate sampling efforts and provide tenants/owners an opportunity to ask questions in an informal setting. Ideally, both Ecology and MFA representatives will conduct the AOI visit; experience in Ridgefield suggests that Ecology representation may help alleviate any potential concerns.

6.2.3.4 Sampling Approach

The sampling approach is presented below in brief and is described in the SAP (see Appendix A). An SSAP will be prepared for each AOI prior to sampling. SSAPs will contain the following:

- A description of the AOI, including property ID, property tenant/owner, and yard area
- Reference to sampling procedures described in the SAP
- A figure showing sampling locations for the AOI
- A graphical CSM
- Description of any conditions that may require a change to SAP procedures

The incremental sampling methodology (ISM) approach will be applied to the top six inches of soil (zero to 0.5 foot bgs) in each AOI. ISM is a structured composite sampling and processing protocol that reduces data variability and increases the probability of identifying areas of elevated concentrations, thereby increasing data representativeness. ISM provides a single sample for analysis with a concentration representative of the mean concentration in a predefined area termed by literature as a "decision unit" (ADEC, 2009; HDOH, 2009; ITRC, 2012). For the purposes of this work plan the decision unit will be called the sampling area.

For this work, at least one sampling area will be identified for each AOI. Based on information from Phase 2 activities there may be more than one sampling area per AOI. For ISM sampling ten continuous soil cores (with surface vegetation removed) will be retrieved from zero to 0.5 foot bgs in each sampling area. The ten cores will be composited into one sample and analyzed to obtain a representative average contaminant concentration for each sampling area. Triplicates (three sets of ten increment samples) will be collected for at least two AOI sampling areas. Triplicate sampling will provide a measure of ISM sample variability. Note that ISM obtains data that are more representative of average concentrations than data from discrete or composite samples, and is particularly appropriate when the receptors of concern are expected to be exposed to larger areas (i.e., multiple areas in a yard) rather than discrete locations.

Discrete samples from 0.5 to 1 foot bgs will also be collected to evaluate the vertical extent of dioxin contamination in AOIs. These samples will be collected from AOIs near previous ROW sample locations (SS-43, SS-44, SS-47, SS-48, SS-49 and SS-57) at which dioxin levels were detected above the Method B soil CUL. A total of six discrete vertical extent samples will be collected.

Finally, surface (zero to 0.5 foot bgs) and subsurface (0.5 to 1 foot bgs) discrete samples will be collected at several locations to further define impacts to ROWs, if any. These discrete ROW samples will be collected in ROWs where visual surveys determine significant differences between AOIs and the adjacent ROWs (e.g., dividing structures, substrate and topographic differences), as well as along Division St., where historical truck traffic leaving the LRIS was most prominent. Subsurface samples will be archived and analyzed only if impacts to the corresponding surface sample are determined. The locations and number of ROW discrete samples will be identified in the SSAPs.

A stainless steel soil core sampler or hand auger will be used to collect both surface and deeper soil samples.

Increment locations will be 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. Increment locations will be provided in the SSAPs prepared for each AOI.

Each ISM sample and the discrete samples will be analyzed for dioxins, using USEPA Method 1613B and total organic carbon. Laboratory test methods, quality assurance and quality control procedures, and data validation and reporting procedures are provided in Appendix A.

6.3 Public Participation

A public participation plan is required for the OPP per the Order and has been prepared by Ecology (2014). It describes the tools Ecology will use to inform the public and is intended to address concerns from individuals, community groups, local governments, tribes, federal and state agencies, and any other organization that may have an interest in or knowledge of the OPP.

Ecology and the Port have addressed community concerns throughout the history of the former PWT site project, and will continue coordination to ensure that project activities at the OPP account for community input. Ecology shall maintain the responsibility for public participation, and the Port shall cooperate with Ecology. Ecology will provide public notice (e.g., distribute fact sheets), and comments on the project will be solicited from the community at important stages of the project, such as the submission of work plans, study reports, cleanup action plans, and engineering design reports. As appropriate, Ecology will edit, finalize, and distribute such fact sheets and prepare and distribute public notices of Ecology's presentations and meetings. In particular, a public meeting and/or distribution of public notice is recommended as part of Phase 2 and Phase 3 RI activities, further described below.

A public meeting and/or distribution of public notice as part of the Phase 2 yard survey and the questionnaire mailing (see Section 6.2.2) is recommended. This meeting/notice would serve to inform residents that yards may be surveyed and photographed, and a questionnaire may be submitted. The questionnaire shall be developed in coordination with Ecology and prepared on official Ecology letterhead. A questionnaire is presented in Appendix F. After review and consideration of any public comments, project activities may be modified to account for any concerns.

A public meeting and/or distribution of public notice is also recommended before the start of the Phase 3 activities (see Section 6.2.3). Phase 3 activities include solicitation of access agreements and AOI visits to finalize AOI-specific CSMs and to coordinate sampling efforts and timing. The access agreement shall be developed in coordination with Ecology and prepared on official Ecology letterhead; an access agreement is presented in Appendix G. The AOI visits may include both Ecology and MFA representatives to help alleviate potential concerns prior to sampling efforts.

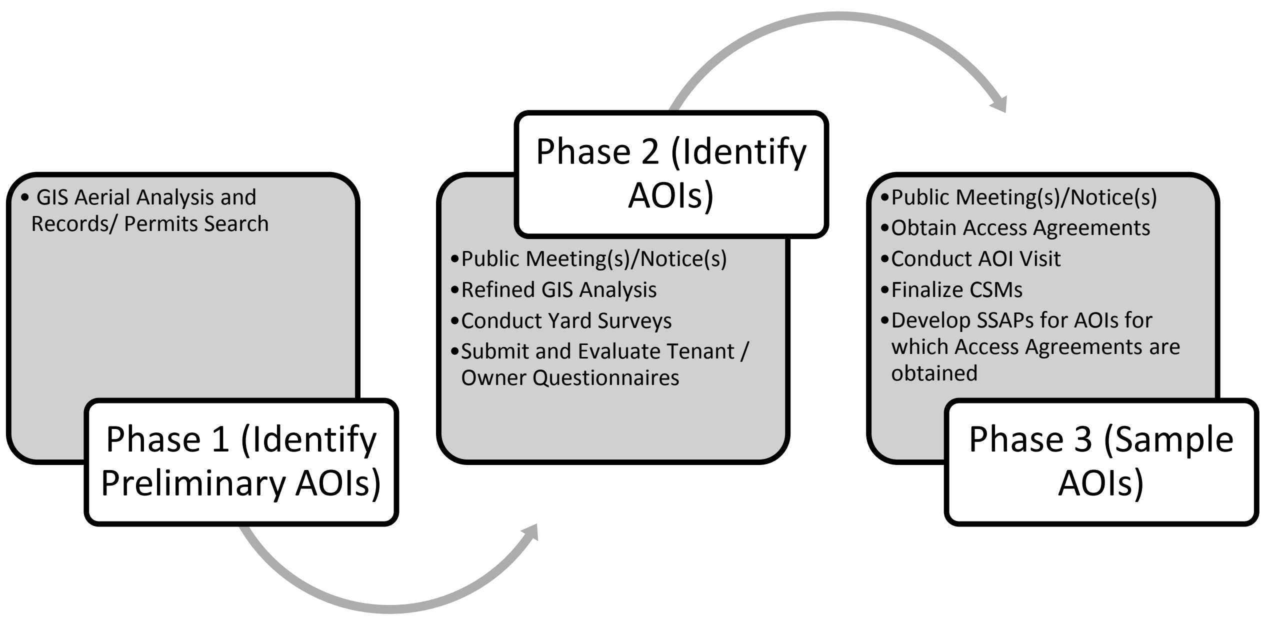
Common community concerns may include noise and traffic, short- and long-term risks, socioeconomic impacts, potential yard cleanup/modifications, and the time frame of any proposed activities.

Ecology's project coordinator shall be notified before the preparation of all press releases and fact sheets, and before major meetings with the interested public and local governments. Likewise, Ecology shall notify the Port before issuing any press releases and fact sheets, and before major meetings with the interested public and local governments. For all press releases, fact sheets, meetings, and other outreach efforts by the Port that do not receive prior Ecology approval, the Port shall clearly indicate to its audience that the press release, fact sheet, meeting, or other outreach effort was not sponsored or endorsed by Ecology. When requested by Ecology, the Port or its representatives shall participate in public presentations on the progress of the project activities.

Participation may be through attendance at public meetings to assist in answering questions or as a presenter.

6.4 RI Scope of Work Process Chart

A process chart showing major RI components that support the goal of each RI phase is provided below. Note that this chart is conceptual and individual events/time lines may be modified:



6.5 Risk Assessment

MFA will assess the risk to human health posed by dioxins. The RA will be completed in accordance with MTCA guidance for the potentially complete pathways identified in the CSM.

7 FEASIBILITY STUDY

The purpose of the FS is to develop and evaluate alternative cleanup actions to enable selection of the most feasible and protective of these for the OPP (WAC 173-340-350). Additional data collection is proposed by this work plan to assess human health risks (see Section 6.2). Based on the results of the RI and RA, the FS will include cleanup action alternatives that protect human health by eliminating, reducing, or otherwise controlling risks, consistent with WAC 173-340-350(8) and WAC 173-340-355, as necessary.

The FS will consider cleanup actions that meet requirements specified in WAC 173-340-360. The requirements stipulate that a cleanup action shall, at a minimum:

- Protect human health and the environment.
- Comply with cleanup standards (see WAC 173-340-700 through 173-340-760).
- Comply with applicable state and federal laws (see WAC 173-340-710).
- Provide for compliance monitoring (WAC 173-340-410; 173-340-720 through 173-340-760).
- Use permanent solutions to the maximum extent practicable.
- Provide for a reasonable restoration time frame.
- Consider public concerns (see WAC 173-340-600).

In addition, soils at current or potential future residential areas with hazardous substance concentrations that exceed soil CULs must be treated, removed, or contained. A property qualifies as a current or potential residential area if:

- The property is currently used for residential purposes; or
- The property has a potential to serve as a future residential area, based on the consideration of zoning, statutory and regulatory restrictions, comprehensive plans, historical use, adjacent land uses, and other relevant factors.

Based on existing and likely future land use, all properties in the OPP qualify as a current or potential residential area. Therefore, the FS will consider only cleanup actions that specify treatment, removal, or containment of soil, if hazardous substance concentrations exceed the soil cleanup level.

8 PROJECT MANAGEMENT PLAN

The following describes the role of key personnel on the project.

Laurie Olin will be the project director for the Port. The Port is conducting or has conducted remedial actions associated with former PWT operations on the LRIS and Port-owned properties, and in Lake River and Carty Lake. Ms. Olin will be kept informed of the status of the project and of project activities. Ms. Olin will review all data, reports, and other project-related documents prepared by MFA before their submittal to Ecology.

Steve Taylor will be the principal in charge for MFA. Mr. Taylor will coordinate with the project manager and will be responsible for allocating the resources necessary to ensure that the objectives of the RI are met.

Madi Novak will be the project manager, responsible for managing the overall completion of the RI and the RA and for regular communication of project status to the project director and Ecology project managers. Ms. Novak will provide technical assistance to the assigned staff scientists, data manager, and health and safety officer, as appropriate; assist with resolution of technical or logistical challenges that may be encountered during the investigation; assist with field activities and write and review reports; and participate in discussions with Ecology at the request of the Port.

Phil Wiescher will be responsible for assisting in the completion of the RI and the RA and for communications of project status with the project manager and the project director. He will assist with field activities, write and review reports, and participate in discussions with Ecology at the request of the Port.

8.1 Schedule

The RI schedule as stipulated by the Order is as follows:

Task	Start Date or Event	Time Frame
Submit draft RI work plan	Effective date of the Order (December 8, 2014)	30 days (January 8, 2014)
Submit final RI work plan incorporating agency comments	Receipt of Ecology comments on draft RI work plan	30 days
RI fieldwork	Approval of final RI work plan by Ecology	Complete within 90 days
Draft RI/FS report	Receipt of analytical data	60 days
Public review RI/FS report	Receipt of Ecology comments on draft RI/FS report	45 days
Preliminary Draft Cleanup Action Plan	Approval of public review RI/FS report by Ecology	60 days
Public review Preliminary Draft Cleanup Action Plan	Receipt of Ecology comments on Preliminary Draft Cleanup Action Plan	30 days

The time frames for the work to be performed may change, based on changes to the scope of work, site access, permitting requirements, and subcontractor availability, and subject to Ecology approval.

LIMITATIONS

The services undertaken in completing this work plan 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 work plan is solely for the use and information of our client unless otherwise noted. Any reliance on this work plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this work plan 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 work plan.

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TABLE

Table
Off-Property Soil Sample Results
Former PWT Site
Ridgefield, Washington

Location ID	MTCA Method B Soil CULs	SS-34	SS-35	SS-36	SS-43	SS-44	SS-45	SS-46	SS-47	SS-48	SS-49	SS-54
Sample ID		SS-34	SS-35	SS-36	SS-43	SS-44	SS-45	SS-46	SS-47	SS-48	SS-49	SS-54
Sample Date		06/17/2010	06/17/2010	06/17/2010	09/21/2010	09/21/2010	09/21/2010	05/24/2011	05/24/2011	05/24/2011	05/24/2011	05/24/2011
Sample Depth (feet bgs)		0	0	0	0	0	0	0	0	0	0	0
Area		Residential	Residential	Residential	OPP	OPP	OPP	Residential	OPP	OPP	OPP	OPP
Phenols (ug/kg)												
Pentachlorophenol	8,300	19.9 U	18.3 U	18.7 U	23.2	17.8 U	18 U	NV	NV	NV	NV	NV
Metals (mg/kg)												
Arsenic	20[a]	9.52	8.90	6.89	7.99	6.58	7.17	NV	NV	NV	NV	NV
Chromium	120,000	15.6	18.2	12.5	15.9	17.3	18.1	NV	NV	NV	NV	NV
Copper	3,000	9.56	15.3	11.7	12.0	16.5	8.10	NV	NV	NV	NV	NV
Zinc	24,000	99.7	97.4	82.5	119	160	76.2	NV	NV	NV	NV	NV
PAHs (ug/kg)												
Total PAH	NV	ND	110	ND	251	143	ND	NV	NV	NV	NV	NV
Naphthalene	1,600,000	8.83 U	8.12 U	8.32 U	7.49 U	7.89 U	8 U	NV	NV	NV	NV	NV
Acenaphthylene	NV	8.83 U	8.12 U	8.32 U	7.49 U	7.89 U	8 U	NV	NV	NV	NV	NV
Acenaphthene	4,800,000	8.83 U	8.12 U	8.32 U	7.49 U	7.89 U	8 U	NV	NV	NV	NV	NV
Fluorene	3,200,000	8.83 U	8.12 U	8.32 U	7.49 U	7.89 U	8 U	NV	NV	NV	NV	NV
Phenanthrene	NV	8.83 U	8.12	8.32 U	14.2	11.8	8 U	NV	NV	NV	NV	NV
Anthracene	24,000,000	8.83 U	8.12 U	8.32 U	7.49 U	7.89 U	8 U	NV	NV	NV	NV	NV
2-Methylnapthalene	320,000	NV	NV	NV	7.49 U	7.89 U	8 U	NV	NV	NV	NV	NV
Fluoranthene	3,200,000	8.83 U	9.74	8.32 U	37.4	18.9	8 U	NV	NV	NV	NV	NV
Pyrene	2,400,000	8.83 U	9.74	8.32 U	24.7	14.2	8 U	NV	NV	NV	NV	NV
Benzo(a) anthracene	NV	8.83 U	8.12 U	8.32 U	12.7	7.89 U	8 U	NV	NV	NV	NV	NV
Chrysene	NV	8.83 U	8.12 U	8.32 U	27.7	13.4	8 U	NV	NV	NV	NV	NV
Benzo(a) pyrene	140	8.83 U	11.4	8.32 U	15.7	8.68	8 U	NV	NV	NV	NV	NV
Indeno (1,2,3-c,d)-pyrene	NV	8.83 U	9.74	8.32 U	18.7	11.0	8 U	NV	NV	NV	NV	NV
Dibenzo(a,h) anthracene	NV	8.83 U	8.12 U	8.32 U	11.2	7.89 U	8 U	NV	NV	NV	NV	NV
Benzo(ghi) perylene	NV	8.83 U	12.2	8.32 U	21.0	11.8	8 U	NV	NV	NV	NV	NV
Benzo(b) fluoranthene	NV	8.83 U	12.2	8.32 U	30.7	13.4	8 U	NV	NV	NV	NV	NV
Benzo(k) fluoranthene	NV	8.83 U	8.12 U	8.32 U	10.5	7.89 U	8 U	NV	NV	NV	NV	NV
1-Methyl naphthalene	24,000	NV	NV	NV	7.49 U	7.89 U	8 U	NV	NV	NV	NV	NV
cPAH TEQ	140	ND	14.9	ND	24.4	12.4	ND	NV	NV	NV	NV	NV
Dioxins (ng/kg)												
Dioxin TEQ (Mammal)	13	0.49	2.3	2.8	**48**	**23**	6.6	0.57	**57**	**27**	**20**	0.64
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	NV	4.3 J	17	10	210	150	79	18	230	510	160	0.13 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	NV	69	370	500	6500 J	3500	1400	150	11000 J	5200	3500	130
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	NV	1.5 J	7.8	8.2	170	110	25	5.3	190	160	93	12
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	NV	9.7	59	68	1100	550	160	21	1400	670	590	21
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	NV	0.33 U	0.63 J	0.61 J	11	6.1	2.1 J	0.22 U	13	10	5.5	0.12 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	NV	0.35 J	1.4 J	2.1 J	25	12	2.3 J	0.072 U	50	16	13	0.09 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NV	0.17 J	0.61 J	0.33 U	14	7.5	2.5 J	0.091 U	14	8.8	9.5	0.38
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	NV	0.15 U	0.74 J	0.99 J	16	4.9	1.3 J	1.1 U	31 U	28 U	16 U	0.14 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NV	0.54 J	3.1 J	3.3 J	72	32	9	0.11 U	71	30	33	0.11 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	NV	0.18 U	0.39 J	0.66 J	6.6	3.4 J	0.7 J	0.081 U	13	0.17 U	0.15 U	0.13 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	NV	0.25 J	1.3 J	1.4 J	34	16	4.9	0.077 U	32	15	19	0.14 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	NV	0.088 U	0.18 U	0.41 J	4.6	3.1 J	0.53 J	0.14 U	7.6	3.3 U	0.2 U	0.14 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	NV	0.15 J	0.37 J	0.35 J	8.2	3.9 J	1.3 J	0.077 U	5.6	0.27 U	0.17 U	0.18 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	NV	0.21 J	0.81 J	1.2 J	17	8.6	2 J	0.068 U	27	11	11	0.11 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	NV	0.13 J	0.8 J	1.4 J	11	6	1.2 J	0.19 U	23	7.3	9.5	0.13 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	NV	0.24 J	0.25 J	0.3 J	1.9 U	1.7 U	1 U	0.51	3.1	3	1.3	0.16 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	13	0.13 U	0.12 U	0.2 U	3.1	0.76 J	0.28 J	0.11 U	2.3	4.5	0.12 U	0.16 U

Location ID	MTCA Method B Soil CULs	SS-55	SS-56	SS-57	SS-58	SS-59	SS-43-Comp-0-6	SS-44-Comp-0-6	SS-47-Comp-0-6	SS-48-Comp-0-6	SS-49-Comp-0-6	SS-57-Comp-0-6
Sample ID		SS-55	SS-56	SS-57	SS-58	SS-59	SS-43-Comp	SS-44-Comp	SS-47-Comp	SS-48-Comp	SS-49-Comp	SS-57-Comp
Sample Date		05/24/2011	05/24/2011	05/24/2011	05/24/2011	05/24/2011	9/20/2012	9/20/2012	9/20/2012	9/20/2012	9/20/2012	9/20/2012
Sample Depth (feet bgs)		0	0	0	0	0	0-6	0-6	0-6	0-6	0-6	0-6
Area		Residential	OPP	OPP	Residential	Residential	OPP	OPP	OPP	OPP	OPP	OPP
Phenols (ug/kg)												
Pentachlorophenol	8,300	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Metals (mg/kg)												
Arsenic	20[a]	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Chromium	120,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Copper	3,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Zinc	24,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
PAHs (ug/kg)												
Total PAH	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Naphthalene	1,600,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Acenaphthylene	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Acenaphthene	4,800,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Fluorene	3,200,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Phenanthrene	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Anthracene	24,000,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
2-Methylnapthalene	320,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Fluoranthene	3,200,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Pyrene	2,400,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Benzo(a) anthracene	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Chrysene	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Benzo(a) pyrene	140	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Indeno (1,2,3-c,d)-pyrene	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Dibenzo(a,h) anthracene	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Benzo(ghi) perylene	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Benzo(b) fluoranthene	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Benzo(k) fluoranthene	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
1-Methyl naphthalene	24,000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
cPAH TEQ	140	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Dioxins (ng/kg)												
Dioxin TEQ (Mammal)	13	5.2	1.7	**23**	1.6	1.0	2.6	0.41	**22**	0.85	1.4	0.63
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	NV	36	0.15 U	110	13	16	12	2.6 J	87	5.9 J	5.2 J	1.1 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	NV	770	460	3500	360	330	440	74	4600	78	170	31
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	NV	26	12	100	11	9.6	12	1.6 J	55 U	2.3 J	3.4 J	0.65 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	NV	140	82	670	63	54	83	9.3	590	9.9	31	4.2 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	NV	0.24 U	0.69	6.5	0.3 U	0.52	0.65 J	0.13 U	6.1	0.22 U	0.23 J	0.28 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	NV	0.24 U	0.12 U	21 U	2.9 U	0.24 U	1.4 J	0.15 U	29	0.24 U	0.56 J	0.25 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NV	0.18 U	0.22 U	9.7	0.15 U	0.15 U	0.99 J	0.14 U	5.4	0.25 U	0.64 J	0.16 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	NV	0.09 U	0.097 U	11	0.17 U	0.24 U	0.51 J	0.2 U	16 U	0.2 U	0.3 J	1.7 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NV	7.5	0.14 U	40	0.15 U	0.15 U	4 J	0.58 J	36	0.64 J	1.8 J	0.5 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	NV	0.17 U	0.15 U	0.18 U	0.15 U	0.12 U	0.11 U	0.085 U	6.1	0.26 U	0.12 U	0.23 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	NV	0.13 U	0.13 U	18	0.15 U	0.13 U	2 J	0.3 J	11	0.31 J	1 J	0.42 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	NV	0.12 U	0.14 U	0.11 U	0.28 U	0.22 U	0.31 U	0.15 U	4.4 J	0.19 U	0.18 U	0.26 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	NV	0.12 U	0.42	0.16 U	0.48	0.2 U	0.41 U	0.16 U	1.8 J	0.18 U	0.21 J	0.17 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	NV	0.12 U	0.1 U	13	0.074 U	0.11 U	0.94 J	0.14 U	13	0.27 J	0.59 J	0.78 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	NV	8	0.11 U	13	0.12 U	0.16 U	0.58 J	0.13 U	5.9	0.21 J	0.59 J	0.38 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	NV	0.28 U	0.23 U	1.4	0.12 U	0.24 U	0.19 J	0.13 U	1.1 U	0.16 U	0.2 U	0.25 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	13	0.12 U	0.26 U	0.19 U	0.12 U	0.12 U	0.13 J	0.1 U	0.19 U	0.37 J	0.12 U	0.18 U

NOTES:

Bold indicates values that exceed MTCA Method B Soil CUL; if values were non-detects ("U"), one-half the reported concentration was compared with the MTCA Method B Soil CUL. Estimated values were compared with MTCA Method B Soil CUL.

Total PAH includes the following PAHs: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, 2-methylnaphthalene, 1-methylnaphthalene (if available), fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

bgs = below ground surface.

cPAH = carcinogenic PAH.

CUL = cleanup level.

J = Estimated value. Value used in calculations.

mg/kg = milligrams per kilogram.

MTCA = Model Toxics Control Act.

ND = not detected.

ng/kg = nanograms per kilogram.

NV = no value.

OPP = off-property portion.

PAH = polycyclic aromatic hydrocarbon.

PWT = Pacific Wood Treating Co.

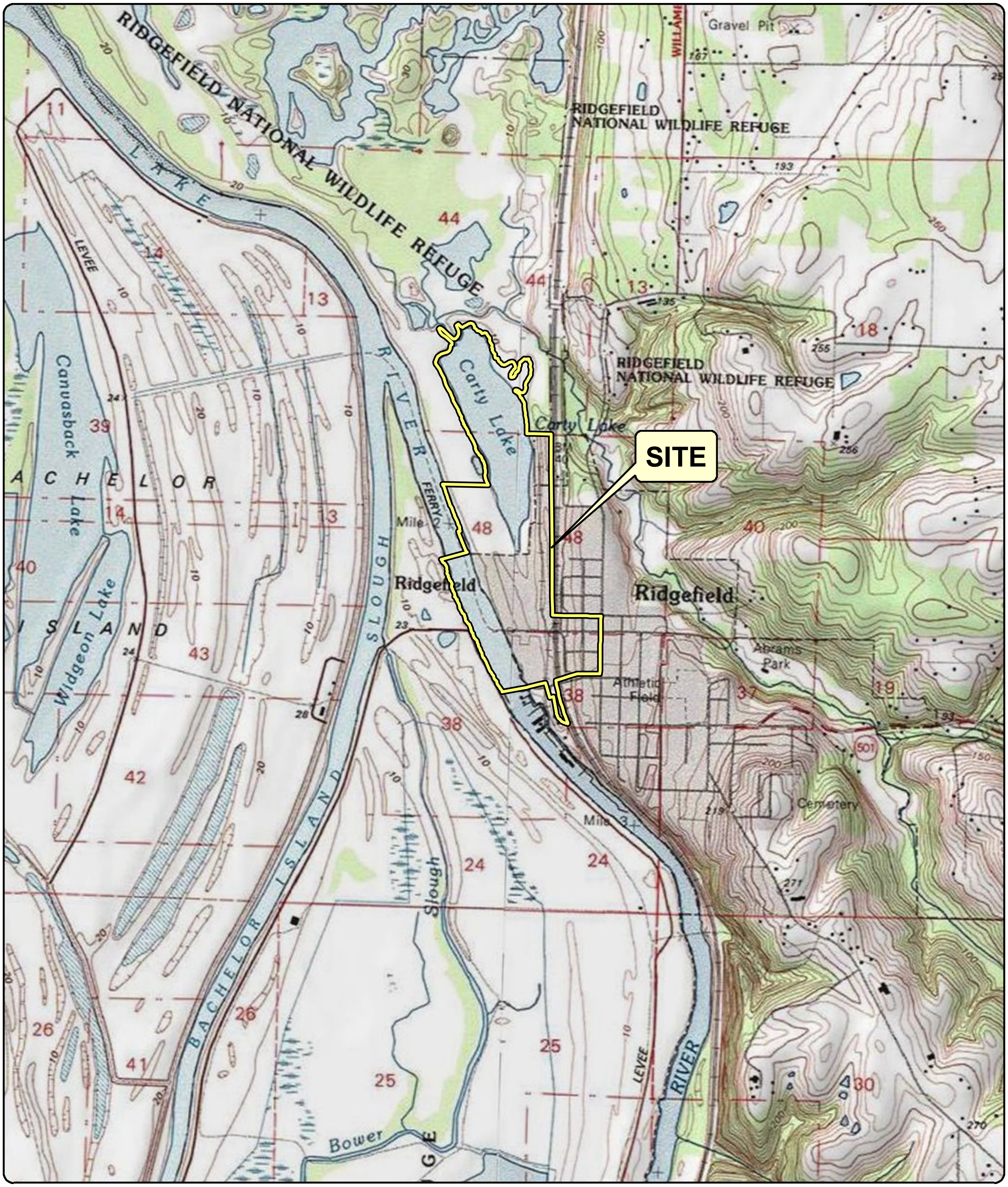
TEQ = toxicity equivalent.

U = Not detected. One half the reported concentration used in dioxin TEQ and Total PAH calculations.

ug/kg = micrograms per kilogram.

[a]MTCA Method A level adjusted for background.

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

Legend

Former Pacific Wood Treating Site

Figure 1
Site Location

Former PWT Site
Ridgefield, Washington

0 1,000 2,000
Feet

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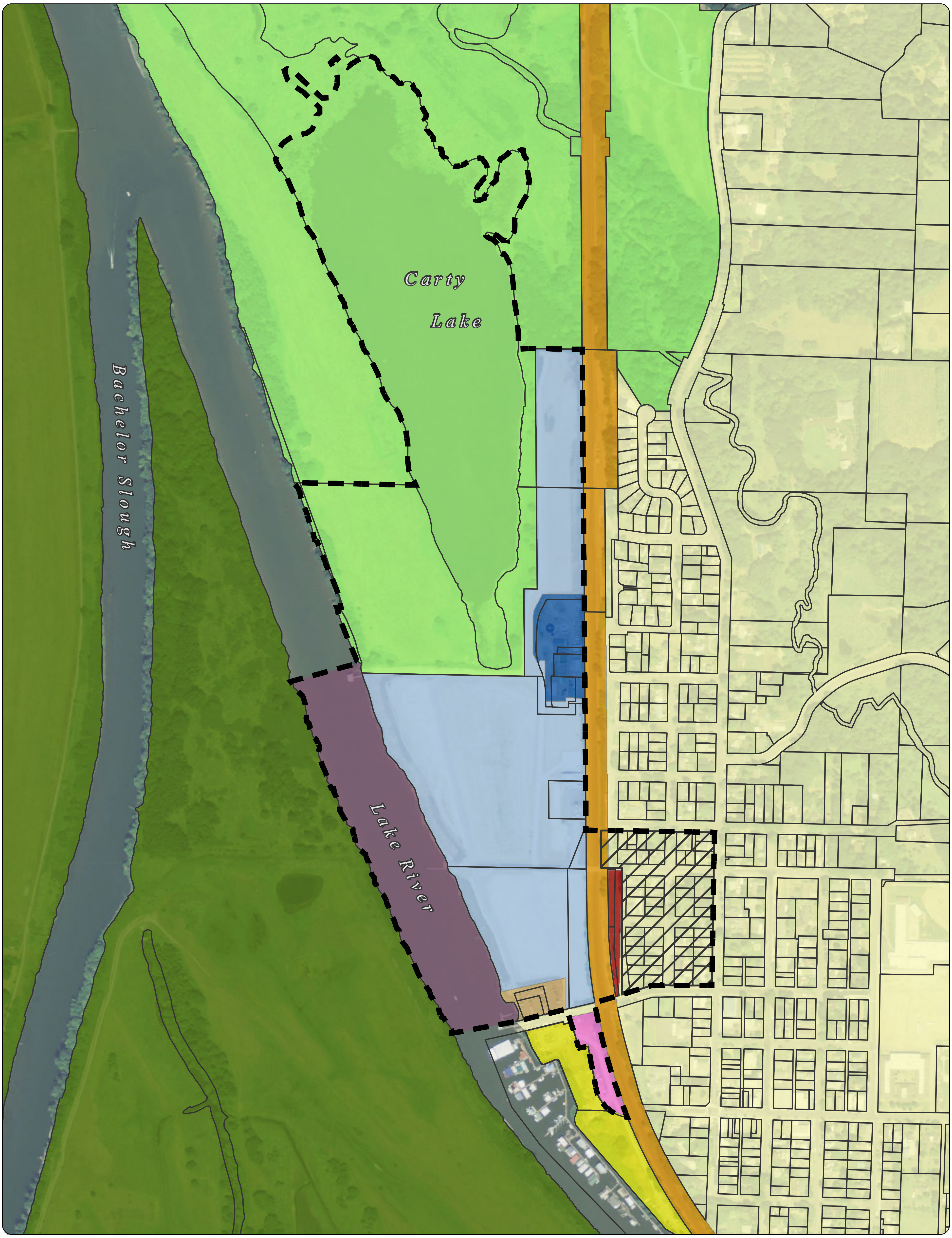
Project: 9003.01.39 Produced By: jschane Approved By: pwiescher Print Date: 1/5/2015 Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig1_Site Location.mxd



Source: Aerial photograph (2013) obtained from the National Agriculture Imagery Program (NAIP). Tax lots obtained from Clark County GIS.

Notes:
1. BNSF = Burlington Northern Sante Fe
2. LRIS = Lake River Industrial Site
3. Port = Port of Ridgefield
4. RNWR = Ridgefield National Wildlife Refuge
5. WWTP = Wastewater treatment plant

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Legend

Pacific Wood Treating Site
Off-Property Portion
Clark County Tax Lots (2014)

Area Designations

LRIS
- Port-Owned
- City of Ridgefield WWTP

Port-Owned
- Railroad Avenue Property
- Marina Property
- Overpass Property

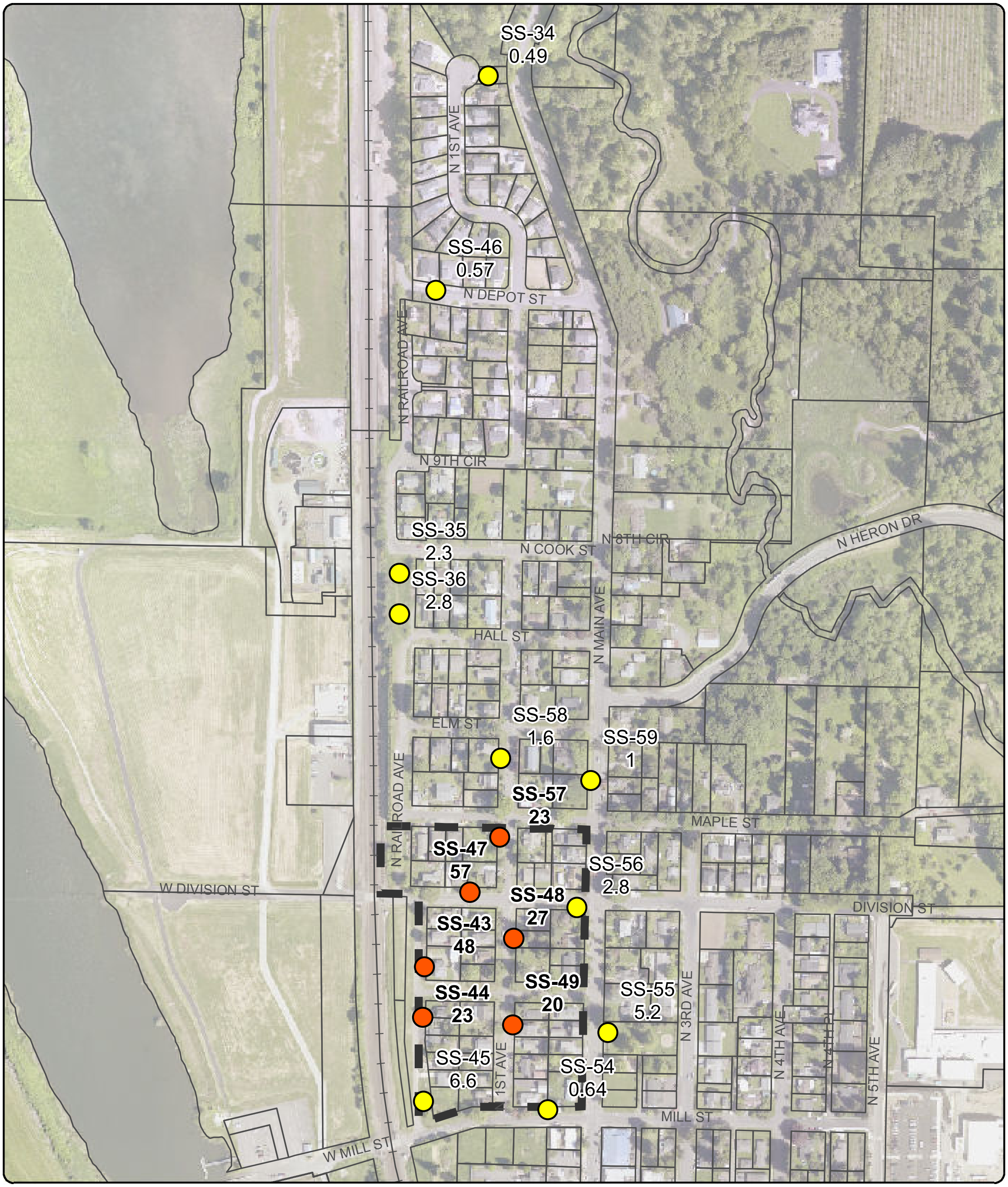
Upland Off-Property
- Residential; Low-Density
- McCuddy's Marina Property

Other
- RNWR-Carty Unit
- RNWR-River S Unit
- BNSF Railroad Property
- Lake River

0 250 500
Feet

Figure 2
Site and Off-Property Portion Diagram
Former PWT Site
Ridgefield, Washington

Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig2_Site and Off-Property Portion Diagram.mxd
Print Date: 1/5/2015
Approved By: M. Novak
Produced By: J. Schane
Project: 9003.01.49



Source: Aerial photograph (2013) obtained from the National Agriculture Imagery Program (NAIP). Tax lots (2014) from Clark County GIS.

ng/kg = nanograms per kilogram
MTCA = Model Toxins Control Act
CUL = cleanup level
TEQ = toxicity equivalent quotient

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Surface Soil Sample Location

Dioxin Toxicity Equivalent (TEQ)

- Below MTCA B CUL (< 13 ng/kg)
- Above MTCA B CUL (> 13 ng/kg)
- Off-Property Portion
- Clark County Tax Lots (2014)

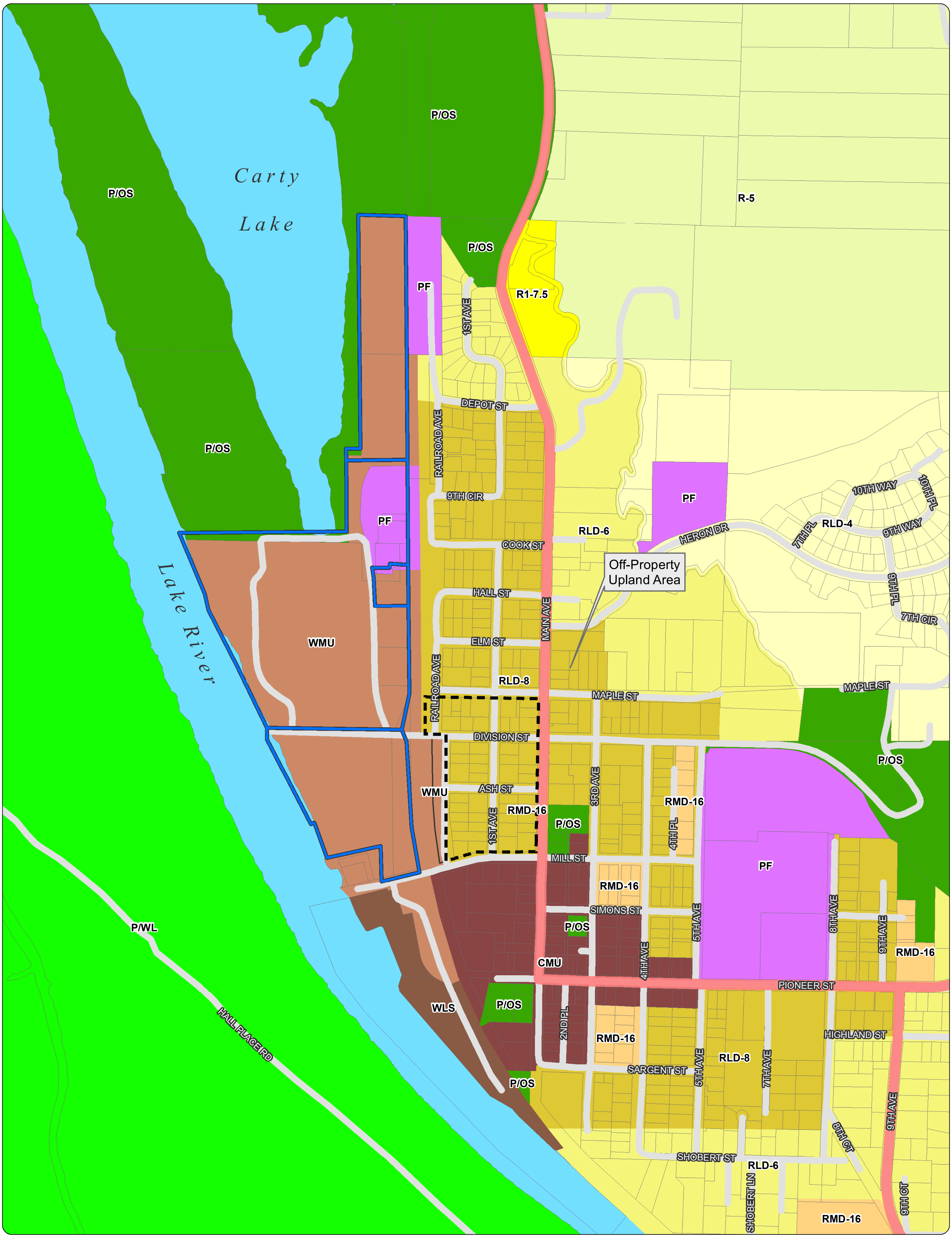
SS-59 = surface soil sample identification
2.1 = Dioxin TEQ in ng/kg

Figure 3
Off-Property Portion Dioxin Toxicity Equivalent in Soil

Former PWT Site
Ridgefield, Washington

0 150 300
Feet

Project: 9003.01 39 Produced By: jschane Approved By: pwieschner Print Date: 2/20/2015 Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig3_Off-Property Portion Dioxin TEQ in Soil.mxd



Source: Zoning, tax lots, and roads data obtained from Clark County GIS (2014).

Legend

Zoning

- Single Family Residential (R1-7.5)
- Residential Low Density - 4 (RLD-4)
- Residential Low Density - 6 (RLD-6)
- Residential Low Density - 8 (RLD-8)
- Residential Medium Density (RMD-16)
- Rural-5 (R-5)
- Parks/Open Space (P/OS)
- Parks/Wildlife Refuge (P/WL)
- Public Facilities (PF)
- Central Mixed Use (CMU)
- Waterfront Low Scale (WLS)
- Waterfront Mixed Use (WMU)
- Water
- Port of Ridgefield Cell Boundaries
- Off-Property Areas
- Tax Lots

Figure 4
Zoning Designations
Former PWT Site
Ridgefield, Washington

0 240 480
Feet

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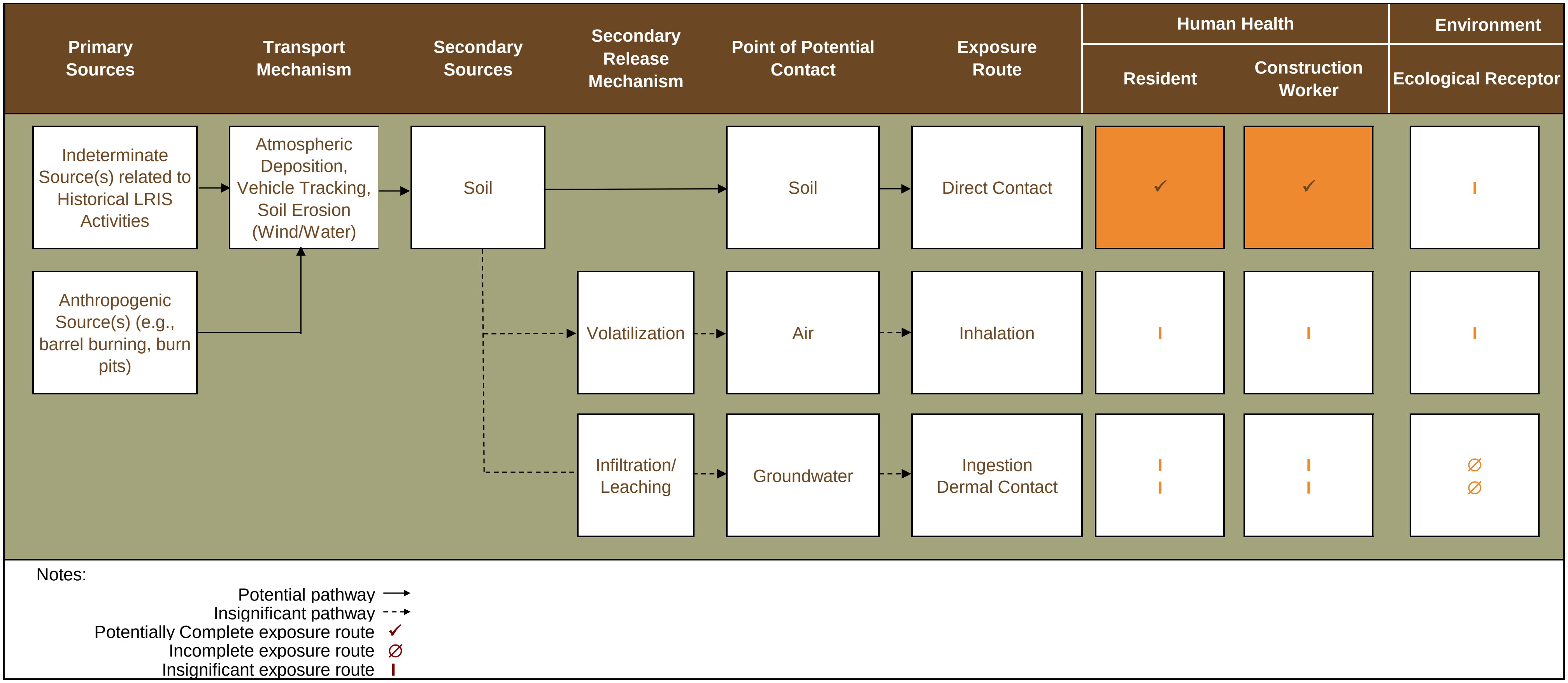
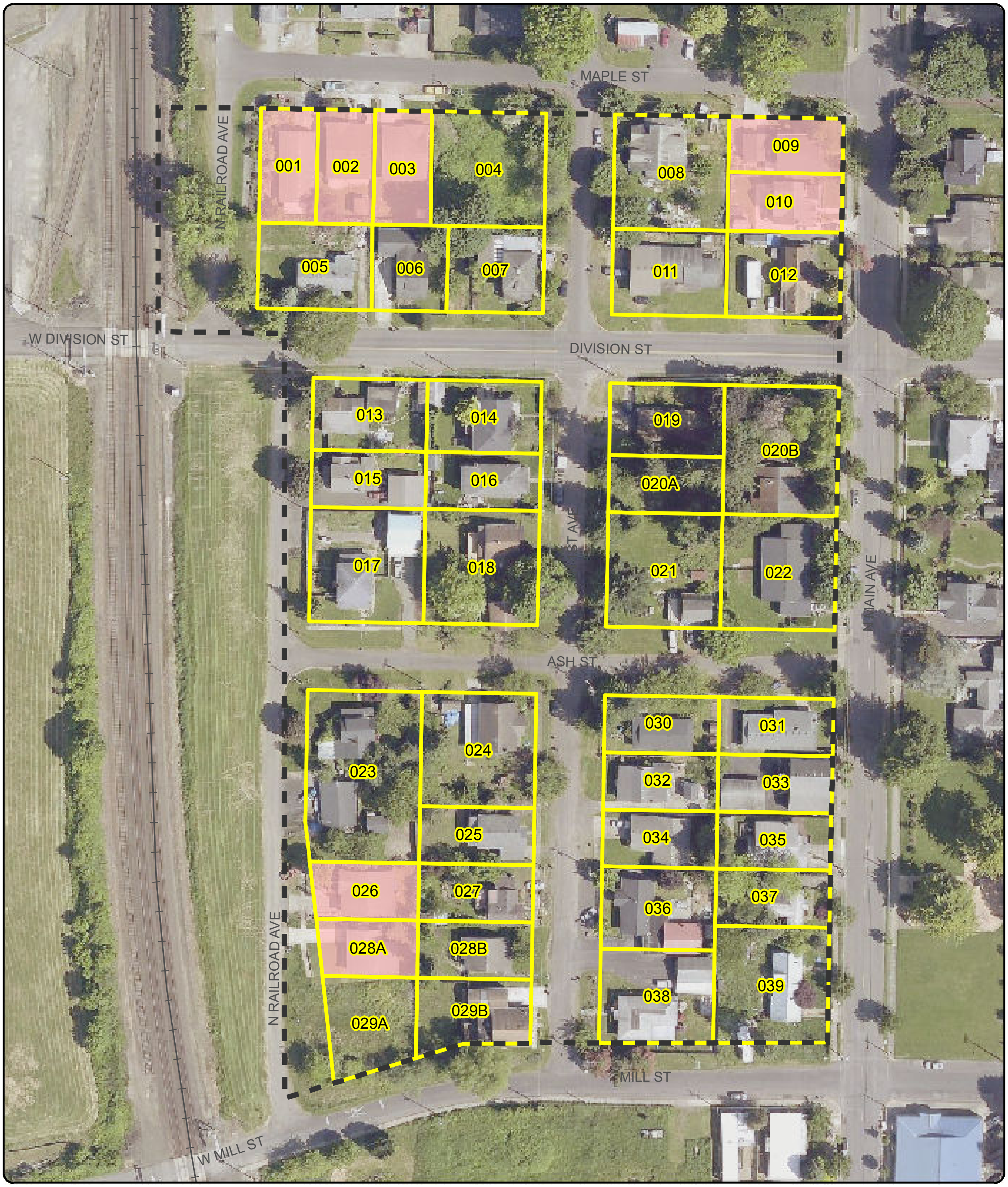
Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig4_Zoning Designations.mxd
Print Date: 1/5/2015
Approved By: pwiescher
Produced By: jschane
Project: 9003.01.39

Figure 5
Off-Property Portion Preliminary Conceptual Site Model
Former PWT Site
Ridgefield, WA





Source: Aerial photograph (2010) obtained from Esri ArcGIS Online. Taxlots (2014) from Clark County GIS.

Legend

- Off-Property Portion
- Taxlots
- Preliminary Areas of Investigation
- Areas with significant structural changes since 1993 (will not be surveyed)
- Clark County Tax Lots (2014)

0 125
Feet

Figure 6
Aerial Review of Preliminary Areas of Investigation

Former PWT Site
Ridgefield, Washington

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APPENDIX A

SAMPLING AND ANALYSIS PLAN

FINAL OFF-PROPERTY PORTION SAMPLING AND ANALYSIS PLAN

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

Prepared for

PORT OF RIDGEFIELD

April 2, 2015
Project No. 9003.01.39

Prepared by
Maul Foster & Alongi, Inc.
400 East Mill Plain Blvd., Suite 400
Vancouver, WA 98660

MAUL
FOSTER
ALONGI

FINAL OFF-PROPERTY PORTION SAMPLING AND ANALYSIS PLAN

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

The material and data in this plan were prepared under the supervision and direction of the undersigned.

MAUL FOSTER & ALONGI, INC.

Madi Novak
Senior Environmental Scientist/Project Manager

Phil Wiescher, PhD
Project Environmental Scientist

CONTENTS

ACRONYMS AND ABBREVIATIONS

AOI	area of investigation
CFR	Code of Federal Regulations
COC	chain of custody
CSM	conceptual site model
dioxins	chlorinated dibenzo-p-dioxins and dibenzofurans
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
ISM	incremental sampling methodology
LCS	laboratory control sample
MFA	Maul Foster & Alongi, Inc.
OPP	off-property portion
the Port	Port of Ridgefield
PWT	Pacific Wood Treating Co.
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RI	remedial investigation
RSD	relative standard deviation
SAP	sampling and analysis plan
the site	PWT site
SSAP	site-specific SAP
TOC	total organic carbon
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

1 INTRODUCTION

Maul Foster & Alongi, Inc. (MFA) has prepared this sampling and analysis plan (SAP), including quality assurance project plan (QAPP) elements, consistent with the requirements of Washington Administrative Code (WAC) 173-340-820 for the Port of Ridgefield (the Port) to guide the collection of soil samples during the remedial investigation (RI) at the off-property portion (OPP) adjacent to the former Pacific Wood Treating Company (PWT) site (the site). PWT operated a wood-treating facility from 1964 to 1993 at the Port's Lake River Industrial Site; historical operations and other indeterminate sources may have resulted in impacts to soil on the OPP.

This SAP is to be used in conjunction with the associated work plan, which provides the background and rationale to support the sampling approach. This SAP has been prepared under the authority of Agreed Order No. DE 11057 between the Port and the Washington State Department of Ecology (Ecology) to satisfy the requirements of the Model Toxics Control Act, and addresses the requirements of WAC 173-340-810. QAPP elements that address the requirements of WAC 173-340-830 are included. This SAP describes procedures for collection, preservation, and analysis of samples of soil at the OPP. The goals of the sampling are to (1) obtain reliable data about conditions at the OPP that will support delineation of the nature and extent of chlorinated dibenzo-p-dioxins and dibenzofurans (collectively referred to as dioxins) in surface soil and (2) provide the data to conduct a human health risk assessment.

This SAP has been prepared consistent with the requirements of Ecology's Guidance on Sampling and Data Analysis Methods (Ecology, 1995), Guidance for Preparing Quality Assurance Project Plans for Environmental Studies (Ecology, 2004), and the Model Toxics Control Act (WAC Chapter 173-340).

1.1 Investigation Objectives

The primary objective of this SAP is to establish procedures for the collection of data of sufficient quality for their intended use. This SAP describes the methods that will be used during the RI sampling activity, i.e., surface soil sampling using the incremental sampling methodology (ISM).

The SAP is meant to ensure that reliable data about chemical conditions at the OPP are obtained. It provides a consistent set of procedures that will be used throughout the sampling conducted for areas of investigation (AOIs) in the OPP. Sampling locations for each AOI will be identified in a site-specific SAP (SSAP) that will be prepared for each AOI prior to sampling. The SSAPs will also accommodate site-specific conditions that may require a change in the methodology specified in the SAP. Any deviation from the SAP will also be documented in the SSAP. This SAP provides procedures that will be used to direct the investigation process so that the following conditions are met:

- Data collected are of high quality, representative, and verifiable.

- Use of resources is cost effective.
- Data can be obtained within the time frame of RI activities.

This SAP describes methods that will be used for sampling soil and decontaminating equipment. It includes procedures for collecting, analyzing, evaluating, and reporting the data. This SAP includes all currently foreseen analytical methods that may be used for analyzing environmental samples. The document includes quality assurance (QA) procedures for field activities, sampling QA and quality control (QC) procedures, and data validation.

2 ACCESS AND SITE PREPARATION

2.1 Access

MFA personnel will obtain soil samples from private residential properties in the OPP. Residential yards (i.e., AOIs) will be accessed only if an access agreement has been obtained for a date and time coordinated with the AOI tenant and owner. In addition, sampling will generally be confined to the hours between 8 a.m. and 5 p.m. or what can be coordinated with property tenant and owner.

2.2 Preparation and Coordination

Before soil sampling begins, a site-specific conceptual site model (CSM) will be prepared for each AOI. CSM development includes an AOI visit prior to sampling. The visit will be conducted to confirm CSM assumptions (e.g., yard features that may inform sampling locations), and any safety hazards that may be present will be assessed. The CSM will be included with the SSAP; CSM development and the AOI visit are further described in the RI work plan.

Before work begins, the Northwest Utility Notification Center (Oregon One-Call, 1-800-424-5555) will be notified at least two business days before sampling and a private utility-locating company will be contracted to identify subsurface utilities on AOIs.

3 SAMPLE PROGRAM DESIGN

The ISM approach, with some modification, will be applied at each AOI (ADEC, 2009; HDOH, 2009; ITRC, 2012). ISM is a structured composite sampling and processing protocol that reduces data variability and increases the probability of identifying areas of elevated concentrations, thereby increasing data representativeness. ISM provides a single sample for analysis with a concentration representative of the mean concentration in a predefined area termed a "decision unit" (ADEC, 2009; HDOH, 2009; ITRC, 2012). Samples (called increments) are collected from multiple locations in a decision unit under evaluation; the decision unit (hereafter termed the "sampling area") is the area and depth of soil to be represented by the sampling process. The increments are combined into one sample and analyzed to obtain a representative average contaminant concentration for the entire sampling area. Typically, a minimum of 30 increments are collected per sampling area (ITRC, 2012); however, given the limited areal extent of AOIs and the desire to limit disturbance in residential yards, ten increments will be collected. Note that a modified ISM approach involving ten, rather than 30, increments was previously implemented nearby and was determined to produce representative results (MFA, 2014).

Replicates can be collected to define variability due to sampling error or spatial heterogeneity; it is recommended that replicate samples be collected in sampling areas with the highest anticipated contamination (assumed to also have highest variability) (HDOH, 2011). ISM obtains data that are more representative of average concentrations than data from discrete or composite samples, and is particularly appropriate when the receptors of concern are expected to be exposed to larger areas (i.e., multiple areas within a yard) rather than discrete locations.

Discrete samples from 0.5 to 1 foot bgs will also be collected to evaluate the vertical extent of dioxin contamination. These samples will be collected from AOIs near previous right-of-way sample locations at which dioxin levels were detected above the Method B soil cleanup level. In addition, surface (zero to 0.5 foot bgs) and subsurface (0.5 to 1 foot bgs) discrete samples will be collected at several locations in right-of-ways adjacent to AOIs to further define impacts, if any.

3.1 Sampling Procedure

For this work, at least one sampling area will be identified for each AOI. Based on information from Phase 2 activities (see the RI work plan) there may be more than one sampling area per AOI. Using a stainless steel soil core sampler or hand auger, ten continuous soil cores will be retrieved from zero to 0.5 foot below ground surface in each AOI. Prior investigations indicate that approximately 1.5-inch-diameter increments will provide the overall mass required by the analytical laboratory for each AOI (MFA, 2014). Note that MFA has field-verified that a 1.5-inch-diameter core for sediment provides sufficient analytical mass; however, the appropriate sample diameter for soils will be determined during sampling activities. Approximately 200 grams of soil per increment (± approximately 20 percent) will be collected, for a total of approximately 2 kilograms per sampling area. Organic debris (including surface vegetation) and inorganic debris will be removed. This effort will ensure that excessive organic matter is not included in sediment collected and will ensure substrate consistency between sample increments. Each sample increment will be measured, trimmed to 0.5 foot, and placed in a sampling area-dedicated jar with the other increments from that AOI. Effort will be made to selectively sample finer substrate material of approximately 2 millimeters and less (i.e., sand and finer). Purposefully excluding larger substrates will improve the probability that a consistent, uniform sample from each increment location will be incorporated, resulting in a representative average concentration. Thirty increments or more are generally recommended for ISM sampling; however, the AOIs are generally small (<0.25 acre) and therefore the absolute distance between increments in each AOI sampling area is low and the distance between increment locations would not differ strongly from a 30-increment sampling scheme.

Increment locations will be 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. Increment locations will be provided in the SSAPs prepared for each AOI.

Triplicates (three sets of ten increment samples) will be collected for at least two AOI sampling areas. Preliminary AOIs in the vicinity of elevated dioxin concentrations in right-of-ways (see Figure 3 in the RI work plan) are anticipated to have the highest contamination and therefore the most variability across replicates (HDOH, 2011). Triplicate sampling at nearby AOIs selected for assessment will provide a conservative measure of ISM variability at other areas of the OPP. Three sets ("A," "B," and "C") of ten locations each will be assigned for collection of three ISM samples "A," "B," and "C." AOI sampling areas selected for triplicate analysis will be identified in the SSAPs.

Discrete samples from 0.5 to 1 foot bgs will also be collected to evaluate the vertical extent of dioxin contamination in AOIs. A stainless steel soil core sampler or hand auger will be used to collect samples from AOIs near previous right-of-way sample locations (SS-43, SS-44, SS-47, SS-48, SS-49 and SS-57) at which dioxin levels were detected above the Method B soil cleanup level (see Figure 3 in the RI work plan). A total of six discrete AOI samples will be collected. Discrete AOI sample locations will be identified in the SSAPs.

Finally, surface (zero to 0.5 foot bgs) and subsurface (0.5 to 1 foot bgs) discrete samples will be collected at several locations to further define impacts to right-of-ways, if any. These discrete samples will be collected in right-of-ways where visual surveys determine significant differences between the AOIs and the adjacent right-of-ways (e.g., dividing structures, substrate and topographic differences), as well as along Division St., where historical truck traffic leaving the LRIS was most prominent. Subsurface right-of-way samples will be archived and analyzed only if impacts to the corresponding surface sample are determined. A stainless steel soil core sampler or hand auger will be used to collect the samples. The locations and number of right-of-way discrete samples will be identified in the SSAPs.

The following procedures for collecting, handling, and analyzing soil will be carried out:

- Samplers will wear clean, disposable gloves while collecting samples. Gloves will be changed between AOI sampling areas and collection of discrete samples.
- Field activities and conditions and sampling data (e.g., sample description) will be recorded in a field notebook. Any deviations from the sampling protocol will be noted on field records and will be brought to the attention of the project manager. General soil observations will be recorded, such as description of surface materials (e.g., grass, gravel), soil type and variability within sampling areas, and any staining or discoloration.
- Collected soil samples will be placed in glass jars. Samples will be labeled, stored in iced shipping containers with chain-of-custody (COC) documentation, and transported to the contract laboratory.

- Each soil sample will be analyzed for dioxins and total organic carbon (TOC), using U.S. Environmental Protection Agency (USEPA) Method 1613B and PSEP/SM Method 5310B, respectively. Subsurface right-of-way samples will be archived and analyzed only if impacts to the corresponding surface sample are determined. Laboratory test methods, QA/QC procedures, and data validation and reporting procedures are further described below.

3.2 Positioning

A differential global positioning system will be used to locate the sampling position for each sampling location identified in the SSAP. Sample locations will be located to an accuracy of ±1 meter. Horizontal coordinates will be referenced to the Washington South State Plane HARN (NAD83).

3.3 Equipment Decontamination

The objective of decontamination is to reduce the likelihood of sample cross-contamination. Sampling equipment and reusable materials that contact soil will be decontaminated between AOI sampling locations. Decontamination will consist of the following:

- Distilled-water rinse
- Nonphosphate detergent wash consisting of a dilute mixture of Liqui-Nox and distilled-water (visible soil to be removed by scrubbing)
- Distilled-water rinse
- Methanol solution rinse (1:1 solution with distilled water)
- Final distilled-water rinse

The thoroughness of equipment decontamination will be verified by collection and analysis of equipment rinsate samples. Liquid generated by decontamination will be properly handled, according to procedures specified in Section 3.4.

3.4 Management of Investigation-Derived Waste

Excess soil following sampling will be replaced in the soil boring and covered with vegetation removed, if any. Decontamination fluids will be collected and stored in sealed plastic buckets and disposed of through a permitted service provider. Personal protective equipment will be disposed of in a sanitary landfill.

3.5 Field QA/QC Samples

QC samples will be collected to ensure that field samples and quantitative field measurements are representative of the media collected. Field QA/QC samples and collection frequency are as follows:

- **Equipment Rinsate Blanks—**To ensure that decontamination procedures are sufficient, an equipment rinsate blank will be collected when non-dedicated equipment is used. For every 20 samples collected, at least one equipment rinsate blank will be collected by passing laboratory-provided deionized/distilled water through or over sampling equipment. The rinsate blank results will be evaluated during data quality review.
- **Field Replicates—**Field replicates are collected to measure sampling and laboratory precision. Triplicates (three sets of ten increment samples) will be collected for at least two AOI sampling areas (see Section 3.1). The field replicate results will be evaluated during data quality review (see Section 4.3). One field duplicate will be collected for the deeper (0.5 to 1 foot bgs) discrete sample analysis.

3.6 Work Documentation

Field notes will be maintained during sampling. At a minimum, the following information will be included:

- Sampler's name
- Weather conditions
- Sample name
- Sample location
- Sampling date and time
- Representative photographs with sample location ID
- Problems encountered with equipment or methods
- Physical description of samples, consistent with the Unified Soil Classification System
- Any deviation from this Ecology-approved SAP
- Other field observations

3.7 Sample Containers, Preservation, and Handling

Sample-container, preservation, and handling requirements are summarized in Table 1. All soil samples will be collected in glass jars. Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. Samples will be uniquely identified with a sample identification that, at a minimum specifies sample name, sample location, and sample date/time. Sample containers, sample coolers, and packing materials will be supplied by the laboratory. The laboratory will maintain documentation certifying the cleanliness of containers provided. The samples will be stored in iced coolers at 4° $\pm$ 2 Celsius.

3.8 Sample Custody, Packaging, and Shipping

Sample custody will be tracked from point of origin through final analysis and disposal, using a COC form, which will be filled out with the appropriate sample and analytical information as soon as possible after samples are collected. For purposes of this work, custody will be defined as follows:

- In plain view of MFA field representatives
- Inside a cooler that is in plain view of MFA field representatives
- Inside any locked space such as a cooler, locker, car, or truck to which the MFA field representatives have the only available key(s)

After sample containers have been filled, they will be packed on ice in coolers, and then transported to the laboratory in iced shipping containers (with a custody seal affixed).

COC procedures will begin in the field and will track delivery of the samples to the laboratories. Specific procedures are as follows:

- Samples will be packaged and shipped in accordance with U.S. Department of Transportation regulations as specified in 49 Code of Federal Regulations (CFR) 173.6 and 49 CFR 173.24.
- Individual sample containers will be packed to prevent breakage.
- A sealed envelope containing COC forms will be enclosed in a plastic bag inside the cooler.
- Signed and dated COC seals will be placed on all coolers before shipping.

Upon transfer of samples to the laboratory, the COC form will be signed by the persons transferring custody of the coolers. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the condition of the samples will be recorded by the receiver. Copies of the COC will be included in laboratory reports and data validation memoranda.

4 LABORATORY MEASUREMENTS, ANALYTICAL PROCEDURES, AND QUALITY CONTROL

Soil samples will be collected and submitted for laboratory analyses. Laboratory methods are described below.

4.1 Laboratory Test Methods and Reporting Limits

Soil samples will be analyzed for dioxins and TOC at the Ecology-accredited Apex Laboratories of Tigard, OR, and Maxaam Analytics of Mississauga, Ontario. Analytical procedures are described below. Test methods and reporting limits are summarized in Table 2. Reporting limits shown in Table 2 are achievable in clean matrices; reporting limits in environmental samples may be affected by soil moisture or matrix interference. Dioxin analysis will be closely coordinated with the laboratory to minimize estimated maximum possible concentration data qualifiers (e.g., potentially adding additional cleanup steps when appropriate).

Samples submitted for chemical ISM analysis will be processed consistent with the ISM Standard Operating Procedure provided as the appendix. Each sampling area will have equal mass collected from its ten increments (approximately 200 grams wet weight per increment). As discussed above, the approximately equal mass collected from each increment will be field consolidated to generate a sample of at least 2 kilograms (wet weight) representative of each sampling area.

The laboratory will air dry each sample at room temperature and visible organic matter will be removed. The entire volume of each sample will be chopped and sieved to facilitate obtaining a representative subsample and improving analyte extraction efficiency. The sample will be sieved using an ASTM (American Society for Testing and Materials) No. 10 (2 millimeter) sieve.

Once the sample is dried and sieved, the laboratory will perform the "1-dimensional slabcake" subsampling procedure on 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 will be ground prior to analysis.

Each sub-aliquot will be placed in its own, single-sample container consistent with the volume and preservation requirements indicated in Table 1. The final mass of the sample must be sufficient to run the requested analyses and attain the requested reporting limit. Please note that sufficient sample volume must be composited by the laboratory to create a laboratory duplicate sample and matrix spike and matrix spike duplicate, where applicable.

The remaining volume of the ISM samples will be archived at the laboratory at -18 degrees Celsius.

4.2 Laboratory Instrumentation

Laboratory QA/QC will be 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). Table 2 presents the data quality objectives of solid-phase testing for precision, accuracy, and completeness, while Table 3 summarizes general laboratory QA/QC procedures.

4.2.1 Preventive Maintenance

Preventive maintenance of laboratory equipment will be the responsibility of the laboratory personnel and analysts. This maintenance includes routine care and cleaning of instruments, and inspection and monitoring of carrier gases, solvents, and glassware used in analyses. The preventive-maintenance approach for specific equipment will follow the manufacturers' specifications and good laboratory practices.

Precision and accuracy data will be examined for trends and excursions beyond control limits to identify evidence of instrument malfunction. Maintenance will be performed when an instrument begins to change, as indicated by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet any of the QC criteria.

4.2.2 Laboratory QA/QC Checks

QC samples and procedures verify that the instrument is calibrated properly and remains in calibration throughout the analytical sequence, and that the sample preparation procedures have been effective and have not introduced contaminants into the samples. Additional QC samples are used to identify and quantify positive or negative interference caused by the sample matrix. The following laboratory QC procedures are required for most analytical procedures:

- **Calibration Verification—**Initial calibration of instruments will be performed at the start of the project or sample run, as required, and when any ongoing calibration does not meet control criteria. The number of points used in the initial calibration is defined in the analytical method. Continuing calibration will be performed as specified in the analytical method to track instrument performance. If a continuing calibration does not meet control limits, analysis of project samples will be suspended until the source of the control failure is either eliminated or reduced to within control specifications. Any project samples analyzed while the instrument was outside of control limits will be reanalyzed.

- **Method Blanks—**Method blanks are used to assess possible laboratory contamination of samples associated with all stages of preparation and analysis of samples and extracts. The laboratory will not apply blank corrections to the original data. A minimum of one method blank will be analyzed for every sample extraction group, or one for every 20 samples, whichever is more frequent.

- **Laboratory Control Samples (LCSs)—**LCSs are fortified with target analytes to provide information on analysis accuracy. Analyses of LCSs will be performed by the lab at a frequency that satisfies the analytical method's requirements.

- **Laboratory Duplicates—**Laboratory duplicates are used to assess laboratory batch precision associated with all stages of preparation and analysis of samples and extracts. Laboratory duplicates will be analyzed according to method frequency requirements.

- **Surrogate Spike Compounds—**Surrogate spikes are used to evaluate the recovery of an analyte from individual samples. All project samples to be analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined in the analysis method, i.e., carbon-13 labeled internal standards for the dioxin method. Recoveries determined using these surrogate compounds will be reported by the laboratory; however, the laboratory will not correct sample results using these recoveries.

4.3 Data Reduction, Validation, and Reporting

The analytical laboratory will submit analytical data packages that include laboratory QA/QC results to permit independent and conclusive determination of data quality. MFA will determine the data quality, using the data evaluation procedures described in this section. The results of the MFA evaluation will be used to determine if the project data quality objectives are met.

Field Data Reduction

Daily internal QC checks will be performed for field activities. Checks will consist of reviewing field notes and field activity memoranda to confirm that the specified measurements and procedures are being used. The need for corrective action will be assessed on an ongoing basis, in consultation with the project manager.

Laboratory Evaluation

Initial data reduction, evaluation, and reporting at the analytical laboratory will be carried out as described in USEPA SW-846 manuals for organic analyses (USEPA, 1986), as appropriate. Additional laboratory data qualifiers may be defined and reported to further explain the laboratory's QC concerns about a particular sample result. All additional data qualifiers will be defined in the laboratory's case narrative reports associated with each case.

4.3.1 Data Deliverables

Laboratory data deliverables are listed below. Electronic deliverables will contain the same data that are presented in the hard-copy report.

- Transmittal cover letter
- Case narrative
- Analytical results
- COC
- Surrogate recoveries
- Method blank results
- LCS results
- Laboratory duplicate results

4.3.2 Data QA/QC Review

MFA will evaluate the laboratory data for precision, completeness, accuracy, and compliance with the analytical method. Dioxin data will be reported consistent with recent dioxin data treatment guidance (Ecology, 2013). The data review will include an assessment of laboratory performance criteria and will be consistent with the USEPA national functional guidelines (USEPA, 2011). Results of the data review will be provided as a memorandum to be included with the data report and lab result sheets. Ecology will be notified before development of the data review memorandum if laboratory results indicate any significant data quality issues.

Data qualifiers, as defined by the USEPA, are used to classify sample data according to their conformance to QC requirements. The most common qualifiers are listed below:

- J—Estimate, qualitatively correct but quantitatively suspect.
- R—Reject, data not suitable for any purpose.

- U—Not detected at a specified reporting limit.

Poor surrogate recovery, blank contamination, or calibration problems, among other things, can cause the sample data to be qualified. Whenever sample data are qualified, the reasons for the qualification will be stated in the data evaluation report.

QC criteria not defined in the guidelines for evaluating analytical data are adopted, where appropriate, from the analytical method.

The following information will be reviewed during data evaluation, as applicable:

- Sampling locations and blind sample numbers
- Sampling dates
- Requested analysis
- COC documentation
- Sample preservation
- Holding times
- Method blanks
- Surrogate recoveries
- Laboratory duplicates (if analyzed)
- Field replicates
- Field blanks
- LCSs
- Method reporting limits above requested levels
- Any additional comments or difficulties reported by the laboratory
- Overall assessment

The results of the data evaluation review will be summarized for each data package. Data qualifiers will be assigned to sample results on the basis of USEPA guidelines, as applicable.

4.3.3 Evaluation of ISM Replicates

Field QC sampling will include the collection of triplicate samples. The relative standard deviation (RSD) of the analytical results for triplicate samples will be calculated to measure data precision. The RSD is calculated using the following equation:

$$RSD\% = \frac{100\% \text{ X Standard Deviation}}{\text{Average}}$$

Lower RSD values are desirable, as the lower the RSD, the greater the confidence that the average approximates a normal distribution and that the average contaminant concentrations are adequately representative of the sampling areas (HDOH, 2009). It is assumed that data normally distributed have an RSD of 30 percent or less (ADEC, 2009). Acceptability of the calculated RSD percent will be evaluated in the context of such considerations as analytical results at or near the method reporting limit, which may exhibit a greater level of variability and, therefore, an elevated RSD (ADEC, 2009).

4.3.4 Data Management and Reduction

MFA uses EQuIS environmental data management software to manage all laboratory data. The laboratory will provide the analytical results in electronic EQuIS-deliverable format. Following data evaluation, data qualifiers and analytical results will be entered into the EQuIS database. Data will also be entered into Ecology's Environmental Information Management (EIM) database. Consistent with WAC 173-340-840(5) and Ecology Toxics Cleanup Program Policy 840 (Data Submittal Requirements), data will be submitted simultaneously in both written and electronic formats.

Data may be reduced to summarize particular data sets and to aid interpretation of the results. Statistical analyses may also be applied to results. Data reduction QC checks will be performed on all hand-entered data, any calculations, and any data graphically displayed. Data may be further reduced and managed using one or more of the following computer software applications:

- Microsoft Excel (spreadsheet)
- EQuIS (database)
- Ecology's EIM (database)
- AutoCad and/or ArcGIS (graphics)
- USEPA ProUCL (statistical software)

5 SITE-SPECIFIC SAMPLING AND ANALYSIS PLANS

A SSAP will be prepared for each AOI and will be approved by Ecology prior to sampling activities. SSAPs will be concise and will contain the following:

- A description of the AOI, including parcel ID(s), property tenant/owner, and yard area.
- Reference to procedures described in this SAP.
- A figure showing sampling locations for the AOI. Sampling locations will be identified through procedures described in Section 3.1 and may be adjusted based on information gathered during RI activities (see the RI work plan).
- A graphical CSM developed as part of RI activities (see the RI work plan).
- Description of any site-specific conditions that may require a change to the procedures specified in this SAP.

6 REPORTING

After data collection, validation, evaluation, and reduction have been completed, the data will be incorporated into reports and uploaded to EIM. Copies of the reports will be kept in MFA's main project files, submitted to the Port for review, and then submitted to Ecology. The results of sampling will be used to delineate nature and extent of soil contamination, support a human health risk assessment, and inform any necessary remedial design effort, in consultation with Ecology.

LIMITATIONS

The services undertaken in completing this plan 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 plan is solely for the use and information of our client unless otherwise noted. Any reliance on this plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this plan 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 plan.

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TABLES

Table 1
Container Requirements, Holding Times, and Preservation
Off-Property Portion
Former PWT Site
Ridgefield, Washington

Parameter	Sample Size*	Container Size and Type	Hold Time for Analysis	Preservation
Dioxins (ISM Sample)	2.0 kg	1-gallon jar (protect from light)	30 days	4°C
			1 year	-18°C
Total organic carbon (ISM Sample)			28 days	4°C
			6 months	-18°C
Dioxins (Discrete Sample)	+10 g	8 ounce jar	30 days	4°C
			1 year	-18°C
Total organic carbon (Discrete Sample)	50 g	8 ounce jar	28 days	4°C
			6 months	-18°C

NOTES:
°C = degrees Celsius.
g = grams.
kg = kilograms.
PWT = Pacific Wood Treating Co.
*Sample size is for each sampling unit. Approximately 200 g will be collected for each sub-aliquot.

Table 2
Sampling Parameters, Analytical Methods, and Data Quality Objectives
Off-Property Portion
Former PWT Site
Ridgefield, Washington

Analyte	Analytical Method	Units	Practical Quantitation Limit	Level of Detection*	Precision	Laboratory Control Sample Accuracy	Internal Standard Accuracy	Completeness
Dioxins								
2,3,7,8-TCDF	USEPA 1613B	ng/kg	1.0	0.09	NA	75-158% R	24-169% R	100%
2,3,7,8-TCDD	USEPA 1613B	ng/kg	1.0	0.06	NA	67-158% R	25-164% R	100%
1,2,3,7,8-PeCDF	USEPA 1613B	ng/kg	5.0	0.08	NA	80-134% R	24-185% R	100%
2,3,4,7,8-PeCDF	USEPA 1613B	ng/kg	5.0	0.05	NA	68-160% R	21-178% R	100%
1,2,3,7,8-PeCDD	USEPA 1613B	ng/kg	5.0	0.15	NA	70-142% R	25-181% R	100%
1,2,3,4,7,8-HxCDF	USEPA 1613B	ng/kg	5.0	0.08	NA	72-134% R	26-152% R	100%
1,2,3,6,7,8-HxCDF	USEPA 1613B	ng/kg	5.0	0.07	NA	84-130% R	26-123% R	100%
2,3,4,6,7,8-HxCDF	USEPA 1613B	ng/kg	5.0	0.09	NA	70-156% R	28-136% R	100%
1,2,3,7,8,9-HxCDF	USEPA 1613B	ng/kg	5.0	0.08	NA	78-130% R	29-147% R	100%
1,2,3,4,7,8-HxCDD	USEPA 1613B	ng/kg	5.0	0.08	NA	70-164% R	32-141% R	100%
1,2,3,6,7,8-HxCDD	USEPA 1613B	ng/kg	5.0	0.07	NA	76-134% R	28-130% R	100%
1,2,3,7,8,9-HxCDD	USEPA 1613B	ng/kg	5.0	0.11	NA	64-162% R	NA	100%
1,2,3,4,6,7,8-HpCDF	USEPA 1613B	ng/kg	5.0	0.12	NA	82-122% R	28-143% R	100%
1,2,3,4,7,8,9-HpCDF	USEPA 1613B	ng/kg	5.0	0.13	NA	78-138% R	26-138% R	100%
1,2,3,4,6,7,8-HpCDD	USEPA 1613B	ng/kg	5.0	0.12	NA	70-140% R	23-140% R	100%
OCDF	USEPA 1613B	ng/kg	10.0	0.20	NA	63-170% R	NA	100%
OCDD	USEPA 1613B	ng/kg	10.0	0.16	NA	78-144% R	17-157% R	100%

Table 2
Sampling Parameters, Analytical Methods, and Data Quality Objectives
Off-Property Portion
Former PWT Site
Ridgefield, Washington

Analyte	Analytical Method	Units	Practical Quantitation Limit	Level of Detection*	Precision	Laboratory Control Sample Accuracy	Internal Standard Accuracy	Completeness
Physical Parameters								
Total organic carbon	PSEP/SM 5310B	%	0.02	0.01	+/- 20% RPD	85-115% R	NA	90%

NOTES:

NA = not applicable.

ng/kg = nanograms per kilogram (parts per trillion).

PSEP = Puget Sound Estuary Program.

PWT = Pacific Wood Treating Co.

R = recovery.

RPD = relative percent difference.

USEPA = U.S. Environmental Protection Agency.

*Level of detection for USEPA 1613B is based on method detection limits from Maxxam Analytics. Results will be reported as estimated detection limits, which may change, depending on matrix conditions and laboratory discretion.

Table 3
Analytical Methods and Quality Control Requirements
Off-Property Portion
Former PWT Site
Ridgefield, Washington

Analysis Type	Initial Calibration	Ongoing Calibration	Labeled Analogs	Batch Duplicates	Matrix Spikes	LCS/OPR	Method Blanks	Surrogate Spikes	Equipment Rinsate Blank	ISM Field Triplicates	Discrete Field Duplicates
Dioxins	As required by USEPA Method 1613B	Every 12 hours	Every sample	NA	NA	1 per 20 samples	1 per 20 samples	Every sample	1 per 20 samples	2	1
Total organic carbon	As required	1 per 15 samples	NA	1 per 10	NA	1 per 20 samples	1 per 20 samples	NA	NA	2	1

NOTES:
ISM = incremental sampling methodology.
NA = not applicable.
LCS = Laboratory control sample.
OPR = ongoing precision and recovery sample (used for dioxin analysis).
PWT = Pacific Wood Treating Co.
USEPA = U.S. Environmental Protection Agency.

APPENDIX

ISM LABORATORY STANDARD OPERATING PROCEDURE

APEX LABORATORIES, LLC

STANDARD OPERATING PROCEDURE
APPROVAL SIGNATURE PAGE

SOP Title: **Incremental Sampling Methodology (ISM)**

SOP Number: **GS-103 R0 ISM**

Effective Date: June 3rd, 2011

Approval Signatures:

Technical Manager: David Jack — date: 6/3/11

QA Manager: Evan Holloway (Technical Review) — date: 6-3-11

1 INTRODUCTION

This SOP describes the policies and procedures of Apex Laboratories concerning the preparation of soil samples received from Incremental Sampling Methodology (ISM) events. ISM is a sampling procedure that relies on a large number of samples (typically greater than 30) being collected in a certain area and combined into a single sample, rather than a smaller number of discrete samples that are analyzed individually. This procedure involves preparation of the combined sample and differs from normal lab compositing.

2 SCOPE AND APPLICATION

This procedure is typically applicable for analysis of metals and non-volatile organics. Preservation of samples for volatile organic analysis (VOA) is performed in the field. Compositing of preserved ISM VOA samples is not covered by this version of this SOP, which will be revised as necessary. See ITRC guidance for further information on VOA sampling and compositing.

ISM is a very project specific procedure, and should be driven by the client's Sampling Analysis Plan. Contact with the client is essential prior to beginning ISM processing, as the end use of the data may significantly change the procedure used to composite the samples. This SOP is intended as guidance for the steps common for most ISM samples, and is not intended to supersede client instructions as to how their samples should be handled. Modifications will be documented on the ISM request form (example, Appendix A).

3 SUMMARY OF METHOD

The entire volume of each sample is used in this preparation. The samples are air dried, then sieved through a #10 (2 mm mesh) sieve and the material that does not pass through is discarded. The material is either extracted and analyzed as is or further prepared for metals extraction.

4 SAFETY AND ENVIRONMENTAL

4.1 Personal protective equipment (P.P.E.) such as lab coats, nitrile gloves, and safety glasses must be worn while working with samples. Dust masks are optional, but recommended.

4.2 All secondary containers used to store samples or solutions beyond immediate use require proper labeling.

4.3 All waste, rinsate, expired solutions and/or solvents generated by this method should be handled in accordance with Apex's hazardous waste procedures. Care should be taken not to discharge any potentially hazardous or unknown substances into the drains or sinks.

4.4 Any step that creates dust, such as sieving or grinding, must be performed in a fume hood.

5 APPARATUS AND MATERIALS

- #10, #20 or other sieves
- Stainless steel bowls and spoons
- Ceramic mortar and pestle, Automated or Manual
- Dish and Puck Mill
- Aluminum baking sheets
- Heavy duty aluminum foil
- Butcher's paper
- Flat metal spatulas
- Sieve cleaning brushes
- Lab grade acetone or methanol

6 PREPARATION FOR PROCESSING

6.1 CLIENT CONTACT

An ISM coordinator will be designated for each project. This person will be the main client contact at Apex for the duration of the ISM event, and will supervise and review all steps of the process that occur at Apex and any portions of the processing that are subcontracted.

The ISM coordinator MUST contact the client regarding appropriate sample handling procedures and fill out an ISM Request Form. This should be done significantly prior to samples being received at the laboratory to allow for modifications of the method or apparatus as necessary.

The client's Sampling and Analysis Plan (SAP), however named, and DQOs must also be received by the laboratory prior to sample processing.

The ISM coordinator will also generate a project specific ISM Worksheet (example, Appendix B) to use as a template for the ISM process. This spreadsheet will act as a guide for sample login by designating the appropriate log in procedure and will outline the steps required by the client's SAP.

Effective communication between the lab, the samplers, and the project team is essential to a successful ISM project.

6.2 SAMPLE RECEIPT

6.2.1 ISM samples will be received either in multitudes of individual soil jars (at least 30) or in multiple bags containing samples pulled from at least 30 sites. These containers will generally not be logged in to Element as being associated with the sample work order or sample number. The sample referenced by Apex for all analyses will be created by this procedure. Log samples in for the Incremental Sampling Methodology test code, and create empty sample jars with labels in accordance with the ISM worksheet.

6.2.2 Once the ISM procedure is complete, the jars will be returned to sample receiving and requested analysis can be added to the appropriate samples.

6.3 BLANK SAMPLE

6.3.1 A Blank sample consisting of Ottawa Sand will be processed through most steps of the ISM procedure along with the samples IF metals analysis is requested. It will be analyzed for metals only unless otherwise specified by the ISM worksheet. All references to a sample in the following steps will also include the Blank sample.

6.3.1.1 Due to volume restrictions, some steps of the process are not applicable to the blank. Note any steps not performed on the ISM worksheet. 1-D Japanese Slab Cake Subsampling is performed by default, 2-D Slab Cake is not applicable for the small volume used for the blank.

6.3.2 The Blank sample should be logged in as the last two samples on each work order where ISM will be performed. The first of the two Blanks will be processed as a sample by ISM. It will be provided to Sample Receiving in a 1 gallon plastic bag. The second will be analyzed as is in order to provide a baseline for metals analysis, and will be provided in a 4 oz jar.

6.3.3 Log in jars for the first of the two Blank samples according to the following table:

Jar A	Plastic Bag	Blank	<2mm	NA	No analysis
Jar B	4 oz jar	Metals analysis	Requested final grain size	> 15 g	Requested metals

6.4 EQUIPMENT CLEANING

6.4.1 All equipment and work spaces must be cleaned before and after each sample is processed in order to minimize the potential for cross contamination. The fume hood used for sieving and grinding must have its work surface and inside walls washed with soap and warm water and rinsed with acetone initially and between preparation of each composite batch of samples. All equipment should be washed with warm water and soap before and in between each sample batch, followed by a rinse with acetone.

6.4.2 Trays used for air drying, subsampling, etc. may be lined with new aluminum foil or butcher's paper prior to use instead of the above cleaning procedure.

6.4.3 All references to cleaned equipment indicate that one of these procedures should be followed before use.

7 SAMPLE PROCESSING

In order to reduce potential sources of error, this procedure processes the entire sample received at the laboratory through as many steps as possible. Unless otherwise specified, references to sample in this document refer to the total amount of sample received, or what is still defined as sample after prior processing steps. See the Quality Control section for a further discussion on sources of error and Data Quality Objectives (DQOs).

Each ISM sample will be different. The following steps are potential parts of any ISM processing, but may not be used for all samples. As such, the processing for each ISM sample will be driven by the SAP and the steps below should not be considered sequential requirements for all ISM projects. Refer to the SAP and the ISM worksheet for which steps are necessary for each sample. Steps not included in this SOP may be necessary. Details of these steps should be included in the ISM worksheet or other documentation.

7.1 SAMPLE IDENTIFICATION

ISM samples may include material that is not considered part of the analytical sample. Vegetation, oversized material, and decantable water are examples of material that may be requested to be removed before sample processing begins. The SAP should include detailed instructions as to what defines the analytical sample, and what to do with materials that are removed. This may include documenting their removal photographically, and potentially by weight.

7.2 PERCENT MOISTURE DETERMINATION

If as received percent moisture determination is requested on samples, it must be performed before samples are air dried. Samples will be homogenized as best as possible with field most samples, and a subsample aliquot taken as using the 2-D Japanese Slab Cake method. This may be done with or without wet sieving.

This result will be reported as the percent moisture. Dry weight analysis and correction will be performed on the prepared samples, but this result does not reflect the percent moisture of the sample as received.

7.3 SAMPLE SPLITTING/MASS REDUCTION

Splitting an ISM sample may be requested prior to other processing in order to have two separate sample processing paths for two different types of analysis, for sample mass reduction, or other reasons. This is not recommended due to potential increases in uncertainty of the data. Duplicate field samples are the preferred method for separate processing steps.

7.3.1 Three simple sample splitting techniques are available for use at Apex:

7.3.1.1 Alternate Shoveling divides the sample into two subsamples by placing alternate subsample scoops of the original sample into two separate sample containers.

7.3.1.2 Fractional Shoveling is similar to alternate shoveling except the sample is divided into three or more subsamples.

7.3.1.3 Cone and Quartering splits the sample into two subsamples by pouring the sample into a large cone, flattening the top and dividing into four sections. Opposite sections of the sample are then combined to form the two subsamples. This requires a flowable sample, and should be performed after samples are air dried and disaggregated. Therefore, this is only an option if both sample splits can be air dried.

7.4 SAMPLE CONDITIONING

Sample conditioning is usually necessary before homogenization or particle size reduction steps, in order to produce a flowable sample. Some sample conditioning steps may not be appropriate for some Chemicals of Concern (COCs), such as low boiling point SVOCs and Mercury. (See ITRC Table 6.1.) The SAP should address acceptable sample conditioning steps and how to process samples if conditioning is not acceptable.

Air drying at room temperature is the default sample conditioning step used by Apex if particle size reduction steps such as sieving are required. Other conditioning steps include drying at elevated temperature, freeze drying, and water addition. If these methods are requested, their procedure should be carefully specified in the SAP.

7.4.1 AIR DRY

7.4.1.1 Air dry the entire volume of all the sample containers by emptying them out on flat aluminum bakers sheets lined with heavy duty aluminum foil or butcher's paper and spread out to a depth of < 1 inch.

NOTE: Aluminum may not be an appropriate choice for samples where aluminum, chromium, or other compounds that may react with aluminum, are COCs. Paper or plastic maybe better choices in these cases. However, plastic must be avoided if phthalates or placsticizers are COCs, and paper cannot be used if organic carbon or other organics that may sorb to paper are COCs.

7.4.1.2 Place trays in bakery rack and allow to dry at ambient temperature in a low traffic area with sufficient air flow to carry away evaporated moisture, such as in or near a fume hood. 1-2 days are normally needed. Turning samples may be necessary to aid the drying process for wet samples, and layers of clay should be broken up in a mortar and pestle halfway through the drying process to avoid formation of bricks that are difficult to break apart after they are fully dried.

7.4.1.3 Samples should not be allowed to dry for more than three days, due to potential loss of more volatile analytes.

7.4.1.4 Record the air drying start and end times on the ISM worksheet.

7.4.1.5 After samples are dry, remove any visible sticks, rocks, vegetation, or other non-soil materials.

NOTE: If samples will be air dried, they do not need to be stored in the refrigerator. However, they most likely will be for ease of sample control. Ask the Sample Control department if questions arise about appropriate sample storage locations.

7.5 PARTICLE SIZE REDUCTION

For many projects, particle size reduction will be required in order to reduce the uncertainty associated with the data. Most samples will require that the particle size is less than 2 mm before analysis. This will ensure that a 10 to 30 gram aliquot will be enough sample volume to meet DQOs. For analyses that cannot use at least 10 grams of sample, (metals, cyanide, and other wet chem tests) grain size of less than 0.25mm must be achieved. Specific projects may require even finer grain sizes for these analyses.

If the ISM worksheet specifies that the sample will be processed to reduce particle size, there are many techniques that may be used. Automated mortar and pestle or dish and puck mill are two that are available to Apex. Depending on the COCs, these may not be appropriate, and SAP should specify which technique to use.

If a particle size reduction step is required, the entire sample should be ground so that it can pass through the sieve corresponding to the final grain size requested by the ISM worksheet. If multiple analyses are to be performed, this may require multiple samples to be taken in the field, or the sample to be split prior to processing.

7.5.1 SAMPLE SIEVING

7.5.1.1 Soil clumps should be broken up to allow them to pass through the sieve, and anything remaining in the sieve (stones, metal, glass) should be discarded and noted. Clay, wet, and/or rocky samples pose significant difficulties during this process. Breaking up dried clumps of dirt/clay and separating them from the material to be removed may be facilitated by grinding, pounding, tumbling or shaking samples by any available means. Record procedure used on ISM worksheet.

7.5.1.1.1 A sieve stack consisting of a lid, #4 and #10 sieves and a sieve pan may be loaded with sample and placed in to a sieve shaker for 5 to 10 minutes to breakup clumps without changing particle sizes.

7.5.1.1.2 A blender or coffee grinder may be used to disaggregate samples, but keep blending times low to reduce wear on blade, contamination of samples with blade material, and loss of analyte due to sample heating.

7.5.1.1.3 A mortar and pestle may be used, though this method can cause more particle size reduction than other methods.

7.5.2 MILLING/GRINDING

This step is often done on the sample that has passed through the #10 sieve. (Everything larger than 2mm is not defined as sample.)

7.5.2.1 Automated Mortar and Pestle:Using a cleaned mortar and pestle, grind the entire sample until it is fine enough to pass through the required sieve, as noted on the ISM worksheet. See instrument manual or Apex operating procedure for details.

NOTE: This can also me done manually, which is a very laborious process and should only be done for small samples with few particles greater than the required size.

7.5.2.2 Dish and Puck Mill: This may be appropriate for some projects where metals are not COCs. See instrument manual or Apex operating procedure for details.

7.5.3 Enter details of the operation, operator initials and date on the ISM worksheet.

7.6 HOMOGENIZATION

The sample mixing step specified here assumes that the sample has been sieved so that all particles are less than 2mm. If this is not the case, simply stirring the sample will be more likely to increase sample homogeneity than decrease it, due to particle size separation within the bowl. Tumbling the sample in a container with sufficient headspace to allow free movement, or placing the entire sample into a blender or mill are better options in the case of un-sieved samples.

7.6.0.1 Place the entire sample (minus any portions removed during the Air drying and Sieving steps, if performed) into a stainless steel bowl. Stir the sieved sample well (approximately 3 minutes) to homogenize.

7.6.0.2 If it is necessary to complete the compositing procedure at a later time, place the entire homogenized sample into the 1 gallon re-closeable plastic bag labeled A for storage.

7.6.1 Enter operator initials and date on the ISM worksheet.

7.7 SUBSAMPLING

There are many methods available for subsampling, some of which produce less error than others. Apex has available two simple incremental sampling methods. If other methods are required, Apex will procure the appropriate technology or subcontract this portion of the process.

If subsampling for an analytical aliquot, pay close attention to the ISM worksheet. The aliquots taken must be very close to the mass requirements, because the entire aliquot subsampled must be used for analysis.

If specified by the ISM worksheet, repeat this process as needed to provide sample volume for process duplicate or triplicate analyses.

7.7.1 1-D JAPANESE SLAB CAKE

7.7.1.1 Pour the entire sample into a line, using 20 or more passes along the line to distribute the sample. For samples where small analytical masses are required (e.g. metals, cyanide) a long thin line should be created.

7.7.1.2 Using a square scoop, cut across the line to create an aliquot. Combine as many of these aliquots as needed to create the analytical sample or mass reduction required. Repeat until all analytical aliquots have been created.

7.7.1.3 Place the aliquots into their respective containers, according to the ISM worksheet.

7.7.1.4 Place the remainder of the sample into the 1 gallon re-closeable plastic bag labeled A for storage.

7.7.2 2-D JAPANESE SLAB CAKE

7.7.2.1 Pour the entire sample into a cleaned aluminum tray and spread evenly. Use a pre-formed grid with 30 sections to divide the sample. Pull an equally sized aliquot of sample from each section of the grid and combine into the appropriate container for analysis. Be sure to scrape along the bottom of the tray in order to include a representative portion of all grain sizes present in the sample.

7.7.2.2 Pull an aliquot of sample from each section of the grid to ensure that the final sample size is close to the mass requested for analyses, typically 10-30 grams. Place the aliquots into their respective containers, according to the ISM worksheet.

7.7.2.3 Place the remainder of the sample into the 1 gallon re-closeable plastic bag labeled A for storage.

7.7.3 When subsampling is complete, roll the jar(s) for 1 minute to homogenize the sample. Initial and date the ISM worksheet.

7.8 DOCUMENTATION:

7.8.1 Create a batch in Element for the ISM test code, add the samples processed as a batch, and print out the bench sheet. Set sample status to Needs Review, attach the completed ISM worksheet and submit for review and scanning.

7.8.2 Return jars to Sample Receiving for completion of log in.

7.9 LOG IN

7.9.1 After samples are returned from ISM processing, analysis test codes can be added to the samples.

7.9.2 Be sure to add comments indicating the use for each jar in accordance with the ISM worksheet. Because one jar will be created per analysis, duplicate, and MS/MSD, there will be a large number of containers for some samples. The container comments should match the ISM worksheet, and the work order should be reviewed carefully by the person coordinating the ISM project.

7.10 ANALYSIS

Each aliquot for analysis has been pulled during sample processing and placed into a separate container. Use the ISM worksheet and the analysis comments to find which container is designated for your analysis. Be sure to use the entire amount of the aliquot provided, and rinse the container into the extraction vessel. Check the sample comments for sample specific instructions (e.g. MS/MSD, etc).

8 QUALITY CONTROL

8.1 FUNDAMENTAL ERROR

The steps in this procedure are designed to ensure that the fundamental error (FE) associated with the sample is below 15% in the final aliquot used for extraction and analysis. This FE measure has been determined to be the primary lab DQO.

Fundamental Error is calculated using the following equation:

FE = Square Root((20 * d^3)/m)

Where:

20 = sampling constant
d = maximum sample grain size (cm)
m = sample mass used for extraction and analysis (g)

For samples taken from the - #10 sieve fraction, d = 0.2, m = 10 and FE = 12.6%
d = 0.2, m = 20 and FE = 8.9%

For samples taken from the milled fraction, d = 0.0850, m = 1 and FE = 11.1 or
d = 0.0250, m = 1 and FE = 1.8%

8.2 CONVENTIONS

8.2.1 Samples will be reported on a dry weight basis. The reported dry weight result will reflect the moisture left in the sample after air drying.

8.3 QUALITY CONTROL SAMPLES

8.3.1 Blank: A blank using Ottawa sand is processed and analyzed along with samples tested for metals to verify that no contamination is being added by processing the samples. This will be done as requested for other classes of COCs.

8.3.1.1 The Ottawa sand will have to be tested before and after processing to compare levels of metals present, as no known clean matrices for metals exist.

8.3.2 Process Replicates: Whether process replicates will be analyzed should be determined by the client on a project basis. They may request that one or two replicates be performed per project, per batch, or per sample.

8.3.2.1 Aliquots may be pulled and designated to be analyzed as batch duplicates in the same manner as sample aliquots. This should be specified on the ISM worksheet, as a separate container will have to be created for them.

8.3.3 Matrix Spikes: Apex will not evaluate spike samples through the entire ISM process unless requested. If required to do so by a client, the client should specify or provide a standard reference material suitable for ISM processing.

9 REFERENCES

9.1 Hawai'i Department of Health *Technical Guidance Manual for the Implementation of the Hawai`i State Contingency Plan*, Section 4, November 12, 2008.

9.2 Alaska Department of Environmental Conservation Division of Spill Prevention and Response Contaminated Sites Program *Draft Guidance on Multi-Increment Soil Sampling,* March 2009.

9.3 EPA Method 8330B Appendix A Revision 2 October 2006.

9.4 Interstate Technology Regulatory Council *Technical and Regulatory Guidance: Incremental Sampling Methodology*, March 2011 (Draft)

Appendix A – Example ISM Request Form

Client:

Project:

Client Contact:

# of Decision Units:

# of Increments / Unit:

Notes:

Analysis: Note any that require subcontracting or small sample size (e.g. Metals)

Which ISM guidance document is being used for this project?

Alaska Hawaii EPA 8330A Appendix A ITRC Draft ISM Guidance

When will the Sampling and Analysis Plan be completed?
A copy must be provided to Apex before the project begins.

Project Specific Data Quality Objectives and procedures.
Apex follows the ITRC Draft guidance where possible. The following categories are procedural steps that are likely to have project specific goals. Our standard procedure is listed under the Apex heading, followed by specific requirements from the guidance documents. Each sampling event is unique, and modifications from our default procedure are expected. These differences should be noted.

Sample Storage:

Apex: Store refrigerated until air drying, room temperature thereafter.

Client request?

Air Drying:

Apex/ITRC: Air dry samples to help with sieving and grinding. Consider potential effects on volatile Contaminates of Concern (COCs) such as SVOCs and Mercury.

AK: Air dry only if necessary to sieve to < 2mm. May not be appropriate for Pesticides and PAHs.

HI: Air dry for all non-volatile analytes.

Client request?

Dry Weight:

Apex/ITRC: Samples are air dried, sieved, and then subsampled. That subsample is tested for most analysis and for dry weight. Results are reported on a dry weight basis, corrected to the air dried sample. If field percent moisture is requested, then a separate aliquot must be made prior to air drying.

HI: Air dried = dry weight, no further correction needed.

Client request?

Appendix A – Example ISM Request Form

Fundamental Error / Sample size:

Apex: Our goal is to have less than 15% Fundamental Error at all steps. Our particle size and sample mass requirements are chosen to meet this goal for each analysis.
We use at least 10 grams and generally ~20 for most tests, with a particle size smaller than 2 mm.
We try to use at least 1 grams for Metals and other limited volume tests, with a particle size less than 250 µm.

AK: Requires at least 30 grams of sample, particle size smaller than 2 mm.

HI: At least 10 grams for most tests, particle size smaller than 2 mm.
At least 1 gram for Metals and other limited volume tests, particle size less than 250 µm.

ITRC: Somewhat contradictory. Generally, 10 grams for <2 mm fraction, 2 grams for < 0.25 mm.

Client request?

Project Specific Fundamental Error (FE) goal?

Laboratory Replicate Samples:

Apex: Per client SAP.

ITRC: Field and lab triplicates are recommended for most projects.

Client request?

Blank:

Apex/ITRC: We have a blank sand matrix go through all steps of the analysis to ensure that metals are not added by the ISM process. Other analysis can be performed on the blank at additional cost. Matrix spikes are performed on a batch basis, per analysis.

Matrix Spikes:

ITRC: Suggests that processing standard reference materials may be appropriate for some projects and COCs.

Notes:

Appendix B – ISM Worksheet

Batch ______________

Sample Log in

Each sample created by the ISM procedure will be logged in with the containers and comments specified below. If samples will be treated differently, multiple sections will need to be created.

Sample IDs: ______________

	Container	Use/Analysis	Particle size	Weight Needed	Comments
Jar A	Plastic Bag	Composite	<2mm	NA	No analysis
Jar B	4 oz jar				
Jar C					
Jar D					
Jar E					
Jar F					
Jar G					

Air Dry

Sample ID	Analyst	# of Containers to Composite	Air Dry Start Time	Air Dry End Time	Comments (Note sticks, rocks, etc removed.)

#10 Sieve

Sample ID	Date	Analyst	Homogenized?	Comments

Appendix B – ISM Worksheet

Splitting or Subsampling

This section may be needed multiple times for each sample. Modify worksheet to include this section for each step.

Method Used: 1-D Japanese Slabcake | 2-D Japanese Slabcake | Alternate Shoveling | Fractional Shoveling | Cone and Quarter | Other:

Sample ID	Date	Analyst	Replicates?*	Weight Obtained**	Homogenized?	Comments

*Indicate use for Replicates (Dry Weight, Duplicate analysis, etc)

**Total weight minus tare. (8 oz jar tare weight is 215g, 4 oz jar tare weight is 130g)

Grinding

This section may be needed for only a portion of each sample. Ensure that the proper container is noted.

Method Used: Automated Mortar and Pestle | Manual Mortar and Pestle | Dish and Puck Mill

Sample ID	Jar	Date	Analyst	Sieve size	Homogenized?

Sieve Size Chart

#10	2 mm
#20	850 µm
#40	425 µm
#60	250 µm
#100	150 µm
#140	106 µm
#200	75 µm

Comments:

APPENDIX B

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

OFF-PROPERTY PORTION REMEDIAL INVESTIGATION
FORMER PACIFIC WOOD TREATING CO. SITE
FACILITY ID 1019, CLEANUP SITE ID 3020

Prepared for

PORT OF RIDGEFIELD

March 9, 2015

Project No. 9003.01.39

MAUL
FOSTER
ALONGI

Prepared by

Maul Foster & Alongi, Inc.

400 E Mill Plain Blvd., Suite 400, Vancouver WA 98660

HEALTH AND SAFETY PLAN
OFF-PROPERTY PORTION REMEDIAL INVESTIGATION
FORMER PACIFIC WOOD TREATING CO. SITE
FACILITY ID 1019, CLEANUP SITE ID 3020

The material and data in this plan were prepared under the supervision and direction of the undersigned.

MAUL FOSTER & ALONGI, INC.

Madi Novak
Senior Environmental Scientist

Thomas Ashton
Health and Safety Coordinator

CONTENTS

CONTENTS (CONTINUED)

1 NEAREST HOSPITAL/EMERGENCY MEDICAL CENTER

1.1 Nearest Hospital

Legacy Salmon Creek Medical Center

2211 NE 139th Street, Vancouver, WA 98686

Phone: (360) 487-1000

Distance: 10.7 mi.

Travel Time: 17 min.

1.2 Route to Hospital from Site

See map on first page of this document.

1.2.1 Driving Directions to Hospital from Site

1. Head east on W Division St toward N Railroad Ave (0.1 mi)
2. Take the third right onto N Main Ave (0.2 mi)
3. Take the third left onto Pioneer St (2.1 mi)
4. At the traffic circle, take the second exit onto NW 269th St/Pioneer St (0.6 mi)
5. At the traffic circle, take the second exit and stay on NW 269th St/Pioneer St (0.2 mi)
6. Take the interstate 5 S ramp to Portland (0.3 mi)
7. Merge onto I-5 S (5.9 mi)
8. Keep right at the fork to continue on I-205 S, follow signs for Salem (0.6 mi)
9. Take exit 36 for NE 134th St toward WSU/Vancouver (0.2 mi)
10. Turn left onto NE 134th St (signs for WSU Vancouver) (0.1 mi)
11. Turn left at the first cross street onto NE 20th Ave (0.3 mi)
12. Take the second right onto NE 39th St (0.1 mi)

1.3 Emergency Phone Numbers

Ambulance, Police, Fire	**Dial 911**
Madi Novak Project Manager	Phone: (503) 501-5212 Cell: (971) 227-1060
Steve Taylor Project Director	Phone: (360) 433-0220 Cell: (503) 680-5315
Thomas Ashton Health and Safety Coordinator	Phone: (503) 501-5204 Cell: (503) 944-9715

2 PLAN SUMMARY

This health and safety plan (HASP) was developed to describe the procedures and practices necessary for protecting the health and safety of Maul Foster & Alongi, Inc. (MFA) employees conducting activities at the off-property portion (OPP) of the former Pacific Wood Treating Co. (PWT) site. Other employers, including contractors and subcontractors, are expected to develop and implement their own HASPs to manage the health and safety of their personnel.

MFA personnel conducting activities at the site are responsible for understanding and adhering to this HASP. Before fieldwork begins, a site safety officer (SSO) who is familiar with health and safety procedures and with the site will be designated by the on-site personnel. Safety deficiencies should be immediately communicated to the SSO and, if necessary, to MFA's health and safety coordinator (HSC).

All contractors and subcontractors have the primary responsibility for the safety of their own personnel on the site. All personnel on the site have "stop work" authority if they observe conditions that they believe create an imminent danger.

If MFA employees work on the site for more than a year, this HASP will be reviewed at least annually. The plan will be updated as necessary to ensure that it reflects the known hazards, conditions, and requirements associated with the site.

MFA personnel who will be working on the site are required to read and understand this HASP. MFA personnel entering the work area must sign the personnel acknowledgment sheet (Section 16), certifying that they have read and that they understand this HASP and agree to abide by it.

3 KEY PROJECT PERSONNEL

Name	Responsibility
Steve Taylor	Project Director
Madi Novak	Project Manager
Phil Wiescher	Field Personnel
Michael Murray	Field Personnel
Thomas Ashton	Health and Safety Coordinator

4 SITE DESCRIPTION AND BACKGROUND

4.1 Type of Site

This site is residential.

4.2 Building/Structures

Buildings consist of privately owned ranch-style and two-story homes.

4.3 Topography

The OPP is relatively flat, with a slight downward slope from east to west. The elevation ranges from approximately 78 feet National Geodetic Vertical Datum (NGVD) at the eastern extent to approximately 50 feet NGVD at the western extent.

4.4 General Geologic/Hydrologic Setting

OPP soils are classified as Hillsboro silt loam and are well drained. There is substantial development and minimal viable ecological habitat on the OPP. No water wells were identified on the OPP or immediately downgradient, based on the Clark County MapsOnline database. The city draws drinking water from wells located approximately 2,500 feet (0.5 mile) upgradient of the OPP, in Abrams Park.

4.5 Site Status

Dioxins (measured as the toxicity equivalent [TEQ]) were detected above the Model Toxics Control Act (MTCA) Method B soil cleanup level (CUL) in portions of the OPP. Under MTCA, the default soil Method B CUL for unrestricted property, based on direct contact, is 13 nanograms per kilogram (ng/kg) dioxin TEQ. Dioxin TEQ concentrations in surface soil ranged from 0.49 ng/kg to 57 ng/kg in rights-of-way (ROWs), and the median dioxin TEQ is 5.2 ng/kg. ROW composite soil samples from 0 to 6 feet below ground surface were generally below the Method B CUL, with the exception of one sample at location SS-47. Soils more representative of potential human health exposure points in this area (i.e., soil concentrations in yards) have not been characterized.

4.6 General Site History

The OPP is east and upgradient of the Lake River Industrial Site (LRIS). The Port owns the approximately 40-acre LRIS, which PWT leased from approximately 1964 to 1993. PWT's operations involved pressure-treating wood products with oil-based treatment solutions containing creosote, pentachlorophenol, and water-based mixtures of copper, chromium, arsenic, and/or zinc. PWT filed for bankruptcy in 1993 and abandoned the LRIS. The OPP includes sample locations at which dioxins were found at concentrations exceeding MTCA Method B CULs during previous remedial investigations.

5 HAZARD EVALUATION

5.1 Site Tasks and Operations

MFA has completed job hazard analyses (JHAs) for specific tasks that could be completed on the site, depending on the scope of work. These JHAs are provided in Appendix A. The following list generally summarizes planned tasks and operations:

- Collecting soil samples on private residential properties
- Working in and near the public ROW, i.e., near vehicle traffic

The control measures that field personnel must use to eliminate or minimize these hazards, such as air monitoring, personal protective equipment (PPE), and decontamination procedures, are detailed in the JHAs and in later sections of this plan.

5.2 Chemical Hazard Evaluation

Chemicals of potential concern (COPCs) and detected concentrations on the site are summarized in Appendix B. Based on site conditions, air monitoring is not anticipated; however, air monitoring equipment will be accessible in case workers encounter conditions, such as unusual odors, that indicate the presence of unexpected contamination.

5.3 Physical Hazards

The specific physical hazards and associated controls for work on the site are described in Appendix A, JHAs.

6 HEALTH AND SAFETY TRAINING

MFA personnel who are working on site and who could be exposed to COPCs will have completed training consistent with the HAZWOPER requirements in 29 Code of Federal Regulations (CFR) 1910.120(e). The training will include:

- Identity of site safety and health personnel
- Safety and health hazards identified on the site
- Proper use of required PPE
- Safe work practices required on the site, e.g., fall protection, confined space entry procedures, hot work permits, general safety rules
- Safe use of engineering controls and equipment on the site
- Medical surveillance requirements, including the recognition of signs and symptoms that might indicate overexposure to hazards
- The site emergency response plan/spill containment plan

The HSC will oversee training for site personnel. Training records, including an outline, sign-offs, and competency records, will be maintained by the HSC.

7 SAFETY EQUIPMENT

7.1 Personal Protective Equipment

PPE must be worn by individuals on the site to protect against physical hazards. PPE required on the site is modified Level D, which consists of:

- High-visibility vest
- Work boots
- Safety glasses with side shields
- Nitrile gloves or equivalent when handling known or potentially impacted media
- Work gloves (if handling materials that that might have sharp edges, protrusions, or splinters)

Additional PPE may be necessary for specific tasks with additional hazards. The SSO will be responsible for designating additional PPE for specific tasks. Depending on the activity, additional PPE may include:

- Type-1 hard hat
- Hearing protection (during high-noise tasks)
- Chemical-resistant clothing, e.g., Tyvek® coveralls
- Chemical-resistant boots
- Chemical-resistant goggles
- Chemical-resistant gloves
- Faceshield
- Respiratory protection

Additional PPE may be required if workers discover unexpected contamination. Characteristics of unexpected contamination include unusual odors, discolored media, a visible sheen, etc. The SSO and, if necessary, the HSC will be contacted as soon as possible after the discovery of unexpected contamination, and the SSO and/or the HSC will determine the need for additional controls and/or training.

PPE used at the site must meet the requirements of recognized consensus standards (e.g., American National Standards Institute, National Institute for Occupational Safety and Health [NIOSH]), and respiratory protection shall comply with the requirements set forth in 29 CFR 1910.134.

Project personnel are not permitted to reduce the level of specified PPE without approval from the SSO or the HSC.

7.2 Safety Equipment

The SSO will be responsible for ensuring that the following safety equipment is available on site and is properly inspected and maintained:

- Soap and water for decontamination
- Caution tape, traffic cones, and/or barriers
- First-aid kit
- Fire extinguisher
- Fluids for hydration, e.g., drinking water or sports drink

7.3 Air Monitoring Equipment

Based on site conditions, air monitoring is not anticipated; however, air monitoring equipment will be accessible in case workers encounter conditions, such as unusual odors, that indicate the presence of unexpected contamination.

- Photoionization detection instrument

- Flame ionization detector
- Colorimetric indicator tubes (e.g., Dräger tubes)
- Confined-space gas monitor (e.g., for detecting oxygen, lower explosive limit [LEL], carbon monoxide, hydrogen sulfide)
- Dust meter

7.4 Communications Equipment

MFA personnel should have a mobile phone or a radio available in case of emergency.

8 DECONTAMINATION PROCEDURES

MFA employees will implement the following decontamination procedures when moving between properties on the site:

- Wash, rinse, and wipe the sampling probe and any other potentially contaminated sampling equipment. All potentially contaminated materials will be discarded in a container labeled for disposable items.
- Remove outer gloves. Inspect them and, if they are ripped or otherwise damaged, discard in a container labeled for disposable items.

MFA employees will use the following decontamination procedures when leaving the site, e.g., at the end of the work shift:

- Remove outer and inner gloves and deposit in a container labeled for disposable items.
- Remove work boots without touching exposed surfaces, and put on street shoes. Consider using new, clean, disposable gloves to remove work boots. Place work boots in a plastic bag or container for later reuse.
- Wash hands and face with soap and water.
- Shower as soon after the work shift as practicable.

9 MEDICAL SURVEILLANCE

MFA will ensure that its employees who meet the following criteria are enrolled in a medical surveillance program consistent with 29 CFR 1910.120(f):

- The employees are, or may be, exposed to hazardous substances or health hazards at or above established permissible exposure limits for 30 or more days per year.
- The employees are required to wear a respirator for 30 or more days per year.

MFA employees who exhibit signs or symptoms consistent with overexposure to site contaminants will be offered medical surveillance consistent with Washington Administrative Code 296-843-21005.

MFA will ensure that its employees who are authorized to wear respirators are medically evaluated consistent with the respiratory protection standard (29 CFR 1910.134). The HSC or administrative designee (e.g., human resources manager) will maintain medical evaluation records.

10 AIR MONITORING

Based on site conditions, air monitoring is not anticipated; however, air monitoring equipment will be accessible in case workers encounter conditions, such as unusual odors, discolored media, or a visible sheen, that indicate the presence of unexpected contamination. If such conditions are discovered, workers will exit the area and contact the SSO and, as needed, the HSC. If necessary, MFA will use the air monitoring equipment to evaluate the conditions and determine if additional controls and/or training are required.

Air monitoring, if conducted, must be performed by individuals familiar with the calibration, use, and care of the required instruments. Measurements shall be documented, and the records should include the following information:

- The name of the person conducting the measurements
- The identity of workers, if any, who have exposure indicated by the measurement result
- Information about the instrument, e.g., type, make, model, serial number
- The location of the measurement
- The measurement date and start/stop time
- Conditions represented by the measurement, including applicable activities, work practices, weather conditions, site conditions, and controls in place
- Measurement results
- Other relevant observations or notes

10.1 Air Monitoring Action Levels

If air monitoring is conducted, the results will be compared to air monitoring action levels that have been established to comply with OSHA Permissible Exposure Levels, American Conference of Governmental Industrial Hygienists threshold limit values, and NIOSH recommendations for the chemicals that may be encountered on the site.

10.2 Explosion Hazard Action Levels

MFA employees working on site will take measurements when working near known or suspected sources of explosive gases or vapors. The instrument alarm should be set to sound at 10 percent of the LEL. When measurements exceed this level, MFA employees on site will:

1. Extinguish ignition sources and shut down powered equipment in the work area.
2. Move personnel at least 100 feet away from the work area.
3. Contact the SSO and the HSC.
4. At the instruction of the HSC and after waiting 15 minutes for explosive gases to dissipate, the SSO may use the combustible gas meter to approach the worksite to measure combustible gases in the work area. The SSO shall not enter (or allow any personnel to enter) any area where the combustible gas meter readings exceed the explosivity action level, nor shall the SSO approach if there is a potential for fire or explosion.
5. The SSO may authorize personnel to reenter the work area after the source of the combustible gases has been identified and controlled.

10.3 Instrument Calibrations

Instruments shall be calibrated consistent with manufacturers' recommendations. Calibrations shall be coordinated by the SSO. Calibration and monitoring records shall be maintained by the SSO and/or the project manager.

11 SITE CONTROL MEASURES

MFA will coordinate with property owners to gain access to each property. MFA will ensure that only authorized personnel are allowed access to site properties.

12 EMERGENCY RESPONSE / SPILL CONTAINMENT / CONFINED SPACE

MFA employees on site will follow the emergency response, spill response, and confined space procedures described in the MFA Health and Safety Manual. Incidents will be documented on the incident report form included as Appendix C.

13 PRE-ENTRY BRIEFING

MFA employees on site will conduct pre-entry briefings, e.g., tailgate meetings, before starting work on the site and/or as the scope of work changes throughout the project to ensure that employees are familiar with the HASP and that the plan is being followed. Attendance and discussion topics will be documented on sign-in sheets, which will be maintained by the SSO.

14 PERIODIC EVALUATION

The project manager or designee will periodically (at least annually) evaluate the effectiveness of this HASP. HASP updates will include input from project staff who have been involved with the project within the last year. The project manager or designee will track ongoing feedback from field personnel regarding the effectiveness of this HASP. This feedback will be reviewed and incorporated into either immediate or annual updates of this HASP. Updating the plan as necessary ensures that it reflects the known hazards, conditions, and requirements associated with the site.

15 SAFE WORK PRACTICES

The following safe work practices are provided to supplement the other information included with this HASP.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in areas with potentially contaminated materials.
2. Whenever practicable, field personnel will remain upwind of drilling rigs, open excavations, and other site-disturbing activities.

3. Subsurface work shall not be performed at any location until the area has been confirmed by a utility-locator firm to be free of underground utilities or other obstructions.

16 ACKNOWLEDGMENT

MFA cannot guarantee the health or safety of any person entering the site. Because of the potentially hazardous nature of visits to active sites, it is not possible to discover, evaluate, and provide protection against all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at the site. The health and safety guidelines in this plan were prepared specifically for the site and should not be used on any other site without prior evaluation by trained health and safety personnel.

MFA personnel who will work at the site are to read, understand, and agree to comply with the specific practices and guidelines described in this HASP regarding field safety and health hazards.

This HASP has been developed for the exclusive use of MFA personnel. MFA may make this plan available for review by contracted or subcontracted personnel for information only. This plan does not cover the activities performed by employees of any other employer on the site. All contracted or subcontracted personnel are responsible for implementing their own health and safety program, including generating and using their own plan.

I have read and I understand this HASP and all attachments, and agree to comply with the requirements described herein:

Name	Title	Date

APPENDIX A

JOB HAZARD ANALYSES

SOIL SAMPLING

<table>
<tr><th colspan="3">Site-Specific Job Hazard Analysis</th></tr>
<tr><td>JHA Number:
1</td><td>Task/Operation
Soil and Groundwater Sampling</td><td>Location Where Task/Operation Performed
Port of Ridgefield—Off-property yard sampling</td></tr>
<tr><td>Date(s) this JHA Conducted:
11/25/2014</td><td colspan="2">Employee Certifying this JHA:
Emily Curtis</td></tr>
<tr><td></td><td colspan="2">Print Name: Signature</td></tr>
<tr><th colspan="3">Chemical Hazards</th></tr>
<tr><td colspan="3">See table of chemicals of potential concern for specific chemicals and concentrations.

Wear the appropriate personal protective equipment (PPE), including nitrile gloves, during sampling to prevent direct contact with contaminants in soil. Use of a half-face respirator may be necessary.

Triple-rinse sampling equipment, using distilled or deionized water and Alconox for first rinse and distilled water for second and third rinses. Always clean materials between locations at the site to avoid cross-contamination. Do not bring equipment back to the office without proper decontamination.</td></tr>
<tr><th colspan="3">Biological Hazards</th></tr>
<tr><td colspan="3">No unique source of biological hazards warranting specific controls. However, check immediate area for the presence of biological hazards such as insects, poison ivy, spiders, and snakes. Use bug repellent and sunscreen as necessary. Use snake chaps or shin guards when working in grass above the ankle. Use a bar to clear spiders and snakes from objects and/or vegetation (don't use your hands or feet).</td></tr>
<tr><th colspan="3">Physical Hazards</th></tr>
<tr><td>Name of Physical Hazard</td><td>Source</td><td>Comments</td></tr>
<tr><td>Impact—eyes</td><td>Debris and spills</td><td>Wear eye protection.</td></tr>
<tr><td>Injuries caused by improper lifting</td><td>Equipment, core sampler, sample coolers</td><td>Use proper bending/lifting techniques by bending and lifting with legs and not with back. Do not twist at the waist when turning the core sampler. Use buddy system for heavy objects.</td></tr>
<tr><td>Accidents with equipment/tools</td><td>Sample collection equipment/tools</td><td>Use an equipment checklist to verify that you have the appropriate equipment/tools for your tasks. Consult appropriate JHAs. Stow all tools in vehicle properly; use appropriate cases and bags. Secure equipment in vehicle with netting or straps; do not leave loose. It can cause property damage or serious injuries to yourself and others.</td></tr>
<tr><th colspan="3">Control Measures Used</th></tr>
<tr><td colspan="3">Engineering Controls: No engineering controls specified.</td></tr>
<tr><td colspan="3">PPE: Hard hat; work boots; high-visibility vest; safety glasses with side shields; nitrile gloves; hearing protection if sampling using a drill rig.</td></tr>
</table>

WORKING NEAR TRAFFIC

<table>
<tr><th colspan="3">Site-Specific Job Hazard Analysis</th></tr>
<tr><td>JHA Number:
2</td><td>Task/Operation
Working near traffic</td><td>Location Where Task/Operation Performed
Port of Ridgefield—Off-property yard sampling</td></tr>
<tr><td>Date(s) this JHA Conducted:
11/25/2014</td><td colspan="2">Employee Certifying this JHA:
Emily Curtis</td></tr>
<tr><td></td><td>Print Name:</td><td>Signature</td></tr>
<tr><th colspan="3">Chemical Hazards</th></tr>
<tr><td colspan="3">See table of chemicals of potential concern for specific chemicals and concentrations.

Exposure to chemical hazards is unlikely unless personnel perform tasks that involve direct contact with contaminated materials. Tasks that involve direct contact will be evaluated with additional JHAs.</td></tr>
<tr><th colspan="3">Biological Hazards</th></tr>
<tr><td colspan="3">No unique source of biological hazards warranting specific controls.</td></tr>
<tr><th colspan="3">Physical Hazards</th></tr>
<tr><td>Name of Physical Hazard</td><td>Source</td><td>Comments</td></tr>
<tr><td>Impact—body</td><td>Vehicles moving on or around site</td><td></td></tr>
<tr><td>Impact—eyes</td><td>Debris from vehicle movement</td><td></td></tr>
<tr><td>Impact—head</td><td>Vehicles moving on or around site</td><td></td></tr>
<tr><td>Impact—feet</td><td>Vehicles moving on or around site</td><td></td></tr>
<tr><td>Penetration—feet</td><td>Sharp objects that could be stepped on</td><td></td></tr>
<tr><td>Noise</td><td>Vehicles moving on or around site</td><td></td></tr>
<tr><th colspan="3">Control Measures Used</th></tr>
<tr><td colspan="3">Engineering Controls: No engineering controls specified.</td></tr>
<tr><td colspan="3">Work Practices: Personnel will stay upwind and out of heavy traffic areas, if feasible. Cones, signage, barrier tape, or other, equivalent, methods will be used to establish traffic control patterns, if feasible. Personnel should monitor traffic hazards before entering locations with potential vehicle movement.</td></tr>
<tr><td colspan="3">PPE: Hard hat; work boots; high-visibility vest; safety glasses with side shields; hearing protection, i.e., earplugs or earmuffs.</td></tr>
</table>

APPENDIX B

CHEMICALS OF POTENTIAL CONCERN

Table
Chemical Hazards

Chemical	Soil Range (ng/kg)		OSHA PEL (TWA)	ACGIH TLV (TWA)	NIOSH IDLH	LEL (%)	IP (eV)	Other Hazard
	Low	High						
Dioxins								
Dioxin TEQ (Mammal)	0.49	57	NE	NE	NE	NA	NA	C, P
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	0.13 U	230	NE	NE	NE	NA	NA	C, P
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	31	11000 J	NE	NE	NE	NA	NA	C, P
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	0.65 U	190	NE	NE	NE	NA	NA	C, P
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	4.2 U	1400	NE	NE	NE	NA	NA	C, P
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.12 U	13	NE	NE	NE	NA	NA	C, P
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.072 U	50	NE	NE	NE	NA	NA	C, P
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.091 U	14	NE	NE	NE	NA	NA	C, P
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.09 U	31 U	NE	NE	NE	NA	NA	C, P
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.11 U	72	NE	NE	NE	NA	NA	C, P
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.081 U	13	NE	NE	NE	NA	NA	C, P
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	0.077 U	34	NE	NE	NE	NA	NA	C, P
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.088 U	7.6	NE	NE	NE	NA	NA	C, P
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.077 U	8.2	NE	NE	NE	NA	NA	C, P
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.068 U	27	NE	NE	NE	NA	NA	C, P
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.11 U	23	NE	NE	NE	NA	NA	C, P
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.12 U	3.1	NE	NE	NE	NA	NA	C, P
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.11 U	4.5	NE	NE	NE	NA	NA	C, P

NOTES:

IDLH values taken from http://www.cdc.gov/niosh/idlh/intridl4.html.

ACGIH = American Conference of Governmental Industrial Hygienists.®

C = carcinogen.

IDLH = immediately dangerous to life and health.

IP (eV) = ionization potential.

J = estimated value (value used in calculations).

LEL = lower explosive limit.

Table
Chemical Hazards

ng/kg = nanograms per kilogram.
NA = not available.
NE = not established.
NIOSH = National Institute for Occupational Safety and Health.
OSHA = Occupational Safety and Health Administration.
P = poison.
PEL = permissible exposure level.
TEQ = toxicity equivalent.
TLV = threshold limit value.
TWA = time-weighted average.
U = not detected (one-half the reported concentration used in dioxin TEQ).

APPENDIX C
INCIDENT REPORT FORM

MAUL FOSTER & ALONGI, INC.

HEALTH AND SAFETY INCIDENT REPORT

THIS REPORT MUST BE COMPLETED IN FULL AND SUBMITTED WITHIN 24 HOURS TO THE MFA HEALTH AND SAFETY COORDINATOR

Project Name: ______________________

Project Number: ______________________

Date of Incident: ______________________

Time of Incident: ______________________

Location: ______________________

____

TYPE OF INCIDENT (Check all applicable items)

☐ Illness ☐ Fire, explosion, flash

☐ Injury ☐ Unexpected exposure

☐ Property Damage ☐ Vehicular Accident

☐ Health & Safety Infraction ☐ Electrical Shock

☐ Other (describe)

____

DESCRIPTION OF INCIDENT (Describe what happened and the possible cause of the incident. Identify individual(s) involved, witnesses, and their affiliations. Describe emergency or corrective action taken. Attach additional sheets, drawings, or photographs as needed.)

____

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____

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____

____

Incident Reporter:

Print Name	Signature	Date

Site Safety Officer must deliver this report to the Health & Safety Coordinator within 24 hours.

Reviewed by: ______________________________ ______________________

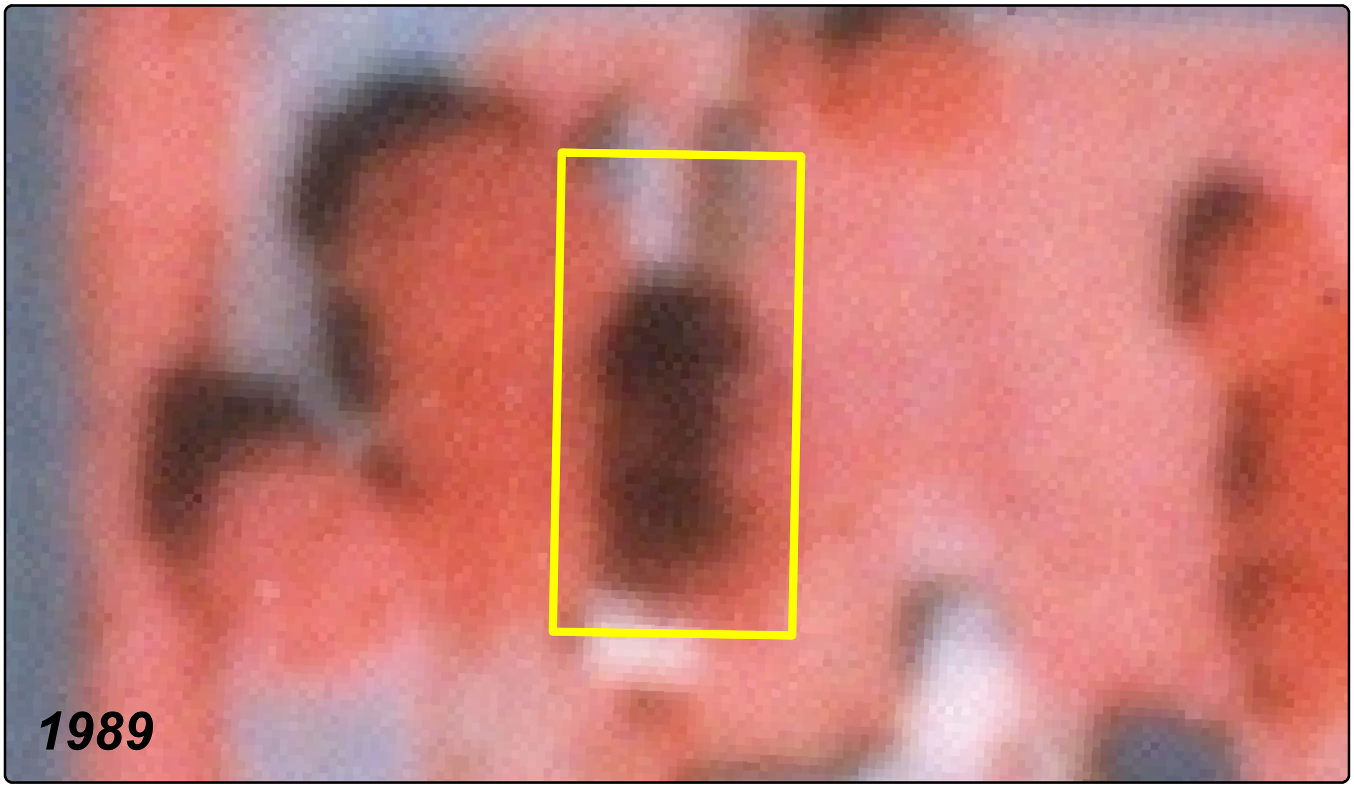
MFA Health & Safety Coordinator Date

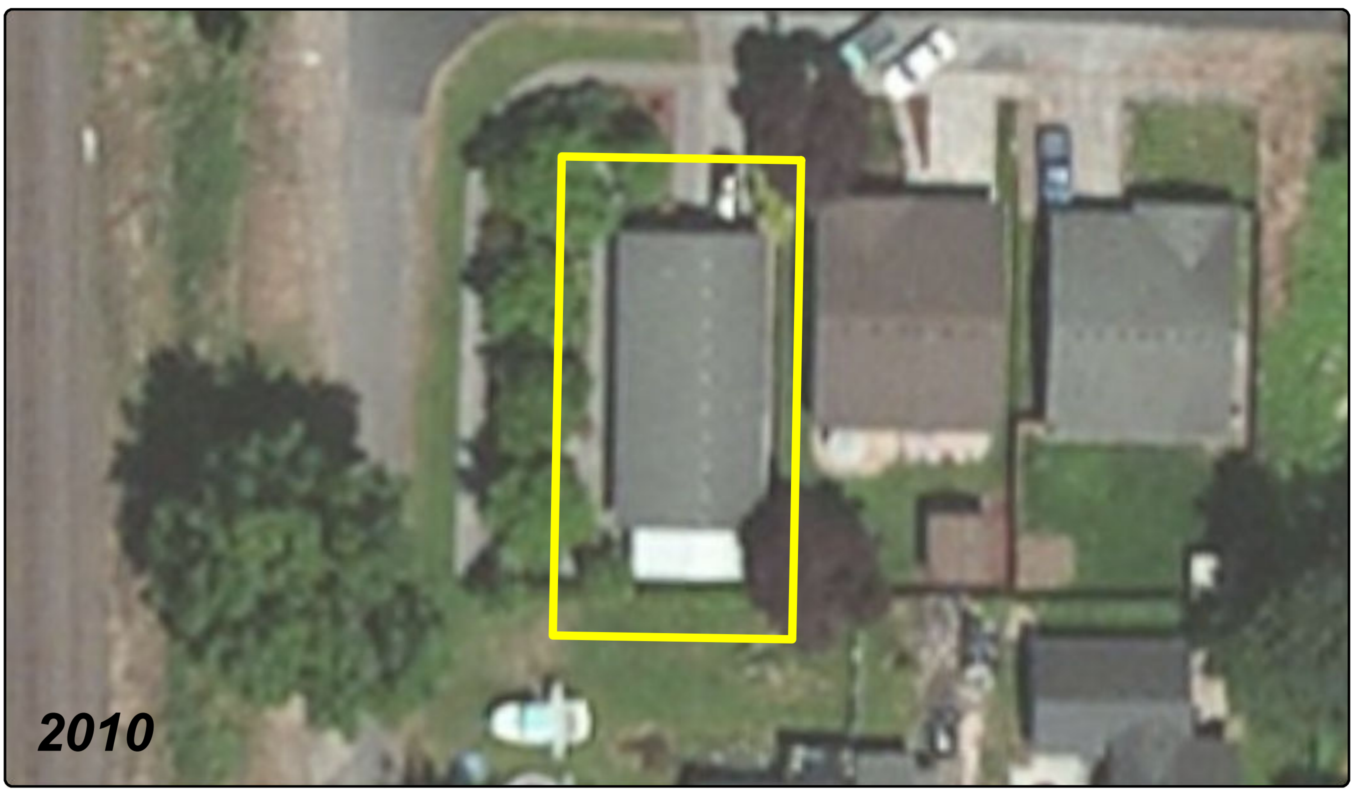
APPENDIX C

OFF-PROPERTY PORTION DATABASE

Property ID Number	Parcel Number	Site Address	Area (Sq Ft.)	Owner Name	Owner Address	Year Built	Most Recent Sale	Property Type Description	Issued Permits	Phone Number	3/4/15 Knock n Talks
001	69314000	512 RAILROAD AVE, RIDGEFIELD, 98624	4,988	DAVIDSON DONALD L	PO BOX 10, RIDGEFIELD WA, 98642	1994	2004	HOUSE	NA	887-2017	Talk
002	69312000	5 MAPLE ST, RIDGEFIELD, 98642	3,649	BRICE DONALD C	PO BOX 261, RIDGEFIELD WA, 98624	1996	1994	HOUSE	NA		
	69310000	NA	1,345	BRICE DONALD C	PO BOX 261, RIDGEFIELD WA, 98624	NA	1994	NO BUILDING	NA		
003	69297000	7 MAPLE ST, RIDGEFIELD, 98642	5,021	RUSSELL BRADLEY & RUSSELL TANYA M	7 MAPLE ST, RIDGEFIELD WA, 98642	1993	2013	HOUSE	NA		
004	69292000	NA (EMPTY LOT)	9,982	PUTNAM VICKIE & OLDFIELD VALORIE DARLING	15404 NE 39TH ST, VANCOUVER WA, 98682	NA	2013	NO BUILDING	NA		
005	69315000	4 W DIVISION ST, RIDGEFIELD, 98642	7,482	BURTON AKERS LLC (VACANT)	3287 S 10TH WAY, RIDGEFIELD WA, 98642	1925	2013	HOUSE	NA		
006	69298000	8 DIVISION ST, RIDGEFIELD, 98642	4,952	HARRIS SEAN I	8 DIVISION ST, RIDGEFIELD WA, 98642	1915	2008	HOUSE	NA	360-904-5321	Talk
007	69316000	14 DIVISION ST, RIDGEFIELD, 98642	6,315	DOUGLAS JAMES & DOUGLAS PATRICIA	155 NE WHITNEY ST, CAMAS WA, 98607	1912	1998	HOUSE	NA		
008	69324000	512 N 1ST AVE, RIDGEFIELD, 98642	8,201	PEARSON STEVEN M	PO BOX 1192, RIDGEFIELD WA, 98642	1930	1997	HOUSE	NA		
	69322000	NA	1,799	PEARSON STEVEN M	PO BOX 1192, RIDGEFIELD WA, 98642	NA	1997	NO BUILDING	NA		
009	69319000	515 N MAIN AVE, RIDGEFIELD, 98642	4,859	KEARNS SEAN A	515 N MAIN AVE, RIDGEFIELD WA, 98642	2004	2005	HOUSE	NA	608-7235	Talk
010	69318000	511 N MAIN AVE, RIDGEFIELD, 98642	5,142	ESTOOS FAMILY REVOCABLE TRUST	PO BOX 1556, RIDGEFIELD WA, 98642	1920	2013	HOUSE	NA		
011	69326000	NA	3,752	MARTIN ERIC A	PO BOX 904, RIDGEFIELD WA, 98642	NA	2005	NO BUILDING	NA		Talk
	69328000	100 DIVISION ST, RIDGEFIELD, 98642	3,746	MARTIN ERIC A	PO BOX 904, RIDGEFIELD WA, 98642	1988	2005	HOUSE	NA		
012	69330000	503 N MAIN AVE, RIDGEFIELD, 98642	7,493	ONEAL THOMAS R III AND CRUMPTON JANICE K	PO BOX 1117, RIDGEFIELD WA, 98642	1901	2008	HOUSE	NA	360-356-6799	Talk
013	69416000	5 DIVISION ST, RIDGEFIELD, 98642	6,297	DAVIS DEBORAH L	PO BOX 822, RIDGEFIELD WA, 98642	1913	1996	HOUSE	NA		Talk
014	69378000	413 N 1ST AVE, RIDGEFIELD, 98642	6,300	LUTES AMBER M & LUTES ANDREW	413 N 1ST AVE, RIDGEFIELD, 98642	1920	2013	HOUSE	2013 - Fire review and inspection		
015	69414000	410 RAILROAD AVE, RIDGEFIELD, 98642	4,994	VAN VLYMEN ASHLEY NICOLE	410 RAILROAD AVE, RIDGEFIELD, 98642	1920	2014	HOUSE	NA		Talk
016	69380000	409 N 1ST AVE, RIDGEFIELD, 98642	5,001	THOMAS BRIAN R & THOMAS VINE JEAN	PO BOX 57, RIDGEFIELD WA, 98642	1920	2011	HOUSE	NA		
017	69410000	6 ASH ST, RIDGEFIELD, 98642	10,001	BROWN MICHAEL JOHN & BROWN HALEE R	6 ASH ST, RIDGEFIELD WA, 98642	1913	2012	HOUSE	NA		
018	69382000	405 N 1ST AVE, RIDGEFIELD, 98642	5,036	PROUDFOOT STEPHANIE & WENTZEL FRANCO	405 N 1ST AVE, RIDGEFIELD WA, 98642	1920	2012	HOUSE	NA		
	69384000	NA	4,960	PROUDFOOT STEPHANIE & WENTZEL FRANCO	405 N 1ST AVE, RIDGEFIELD WA, 98642	1990	2012	DETACHED GARAGE	NA		
019	69348000	412 N 1ST AVE, RIDGEFIELD, 98642	6,301	JOHNSON JODIE	PO BOX 691, RIDGEFIELD WA, 98642	1991	2004	HOUSE	NA		Talk
020	69350000	NA	5,001	KENWORTHY STEPHEN V	PO BOX 533, RIDGEFIELD WA, 98642	NA	1996	NO BUILDING	NA		
	69340000	411 N MAIN AVE, RIDGEFIELD, 98642	11,301	KENWORTHY STEPHEN V	PO BOX 533, RIDGEFIELD WA, 98642	1911	Unknown	HOUSE	2008 - Fire review and inspection		
021	69352000	406 N 1ST ST, RIDGEFIELD, 98642	10,002	FRANK DAVID E	406 N 1ST ST, RIDGEFIELD, 98642	1950	1996	HOUSE	NA		
		102 ASH ST, RIDGEFIELD, 98642									
022	69344000	403 N MAIN AVE, RIDGEFIELD, 98642	5,002	WATERFALL INVESTMENTS LLC	PO BOX 2239 KALAMA WA, 98625	1990	2013	HOUSE	NA		
	69346000	405 N MAIN AVE, RIDGEFIELD, 98642	5,001	WATERFALL INVESTMENTS LLC	PO BOX 2239 KALAMA WA, 98625	NA	2013	NO BUILDING	NA		Talk
023	69406000	5 ASH ST, RIDGEFIELD, 98642	4,913	MCCABE DOUGLAS (VACANT)	PO BOX 14593, SCOTTSDALE AZ, 85267	1920	2002	HOUSE	NA		
	69407000	NA	5,088	MARKET ASSET GROUP	PO BOX 14593, SCOTTSDALE AZ, 85267	2005	2003	DETACHED GARAGE	NA		
	69402000	NA	4,926	MCCABE DOUGLAS	PO BOX 14593, SCOTTSDALE AZ, 85267	NA	2002	NO BUILDING	NA		
024	69386000	327 N 1ST AVE, RIDGEFIELD, 98642	10,001	MEADE CRAIG T & RICHARDS SHANNON R	PO BOX 1641, RIDGEFIELD WA, 98642	1927	2009	HOUSE	NA		
025	69390000	319 N 1ST AVE, RIDGEFIELD, 98642	5,002	LASPA OSSIAN A & LASPA ROARK L	932 N MAIN, RIDGEFIELD WA, 98642	1920	2012	HOUSE	NA		
026	69401000	314 N RAILROAD AVE, RIDGEFIELD, 98642	4,621	LEE RICHARD T & LEE MERRILEE A	314 N RAILROAD AVE, RIDGEFIELD WA, 98642	1995	2011	HOUSE	NA		Talk
027	69392000	315 N 1ST AVE, RIDGEFIELD, 98642	5,000	WAITE TERESA J	315 N 1ST AVE, RIDGEFIELD, 98642	1925	2004	HOUSE	NA		Talk
028	69394000	311 N 1ST AVE, RIDGEFIELD, 98642	9,305	BENEDICT DENNIS & BENEDICT JANET	PO BOX 473, RIDGEFIELD WA, 98642	1918	Unknown	HOUSE	NA		
029	69400000	NA	6,386	NAUD WILLIAM & NAUD ERLEE ETAL	2704 NE 161ST ST, RIDGEFIELD WA, 98642	NA	2010	NO BUILDING	NA		Talk
	69398000	305 N 1ST AVE, RIDGEFIELD, 98642	5,959	NAUD WILLIAM & NAUD ERLEE ETAL	2704 NE 161ST ST, RIDGEFIELD WA, 98642	1940	2010	HOUSE	NA		
030	69375000	101 ASH ST, RIDGEFIELD, 98642	5,005	R & J DIVERSIFIED SERVICES LLC	6538 NE 239TH ST, BATTLE GROUND WA, 98604	1980	2006	HOUSE	NA		
031	69356000	105 ASH ST, RIDGEFIELD, 98642	5,000	BURTON JOEY L & BURTON KATHY A	PO BOX 1161, RIDGEFIELD WA, 98642	1985	2005	HOUSE	NA		Talk
032	69374000	322 N 1ST AVE, RIDGEFIELD, 98642	4,998	LAYCOE JASON	322 N 1ST AVE, RIDGEFIELD, 98642	1920	2014	HOUSE	NA		Talk
033	69358000	319 N MAIN AVE, RIDGEFIELD, 98642	4,792	TWISS DALE (C/B)	PO BOX 475, RIDGEFIELD WA, 98642	Unknown	2004	Unknown	NA		
		321 N MAIN AVE, RIDGEFIELD, 98642									
		323 N MAIN AVE, RIDGEFIELD, 98642									
034	69372000	318 N 1ST AVE, RIDGEFIELD, 98642	4,988	LAYCOE BRYAN & LAYCOE DIANE TRUSTEE	21112 NW 53RD AVE, RIDGEFIELD WA, 98642	1993	2003	HOUSE	NA		
035	69362000	313 N MAIN AVE, RIDGEFIELD, 98642	4,995	PFEIFER RHONDA L	PO BOX 1145, RIDGEFIELD WA, 98642	1993	2003	HOUSE	NA		
036	69370000	314 N 1ST AVE, RIDGEFIELD, 98642	7,194	COLE JONATHAN	314 N 1ST AVE, RIDGEFIELD, 98642	1920	2006	HOUSE	NA		Talk
037	69364000	309 N MAIN AVE, RIDGEFIELD, 98642	4,997	DOTTL DANA E	PO BOX 1062, RIDGEFIELD WA, 98642	1940	1999	HOUSE	NA		
038	69368000	304 N 1ST AVE, RIDGEFIELD, 98642	8,164	CAMPBELL RYANN I	304 N 1ST AVE, RIDGEFIELD WA , 98642	1925	2013	HOUSE	NA		
039	69366000	305 N MAIN AVE, RIDGEFIELD, 98642	10,145	SERFACE JUSTIN T & SERFACE RENEE M	3150 S 10TH WAY, RIDGEFIELD WA, 98642	1940	2006	HOUSE	NA		

APPENDIX D
HISTORICAL AERIAL ANALYSIS





Source: Aerial photograph (2010) obtained from Esri ArcGIS Online. Historical infrared aerial photograph (1989) obtained from Army Corps of Engineers.

Note: Red areas in the 1989 aerial photograph indicate presence of vegetation (absence of structures)

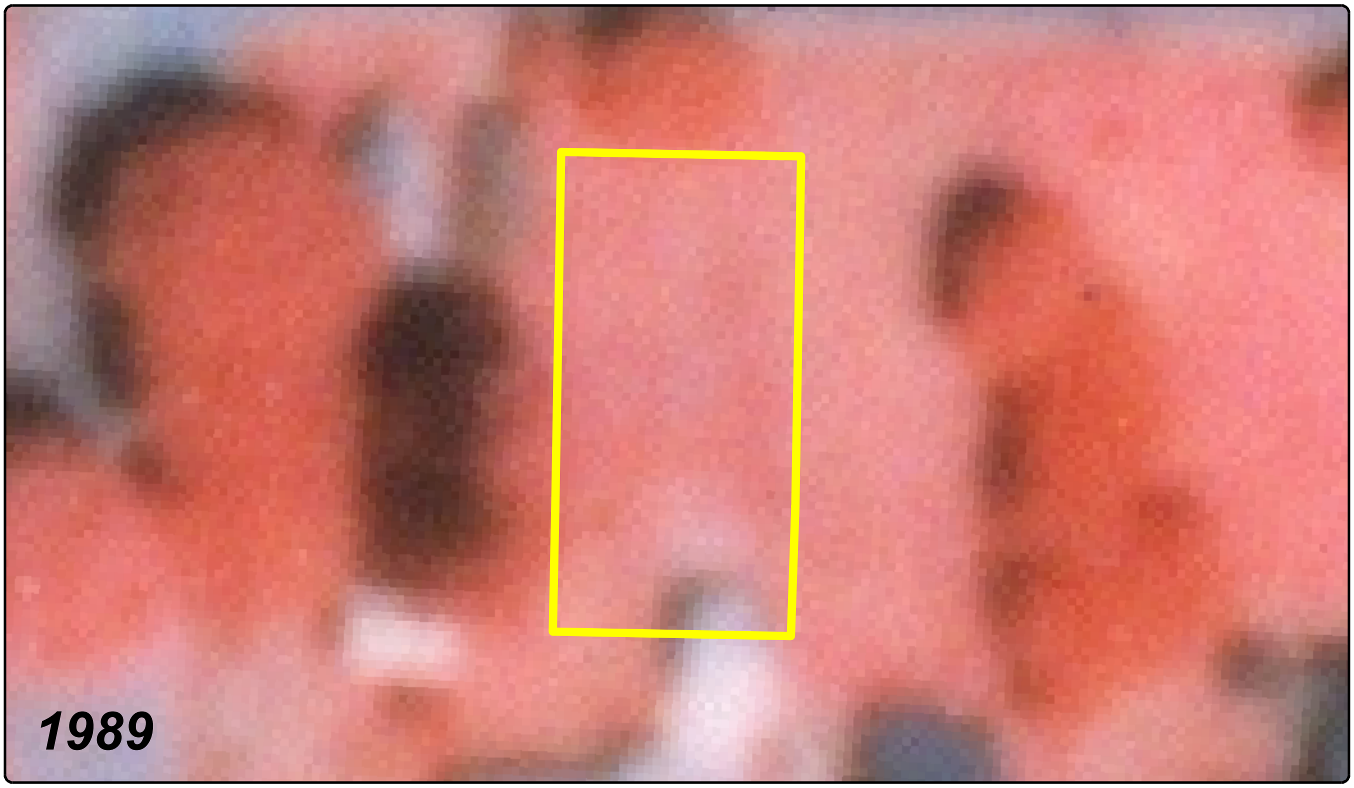
Figure (001)
Aerial Imagery Analysis
512 Railroad Avenue

Former PWT Site
Ridgefield, Washington

0 20 40
Feet

MAUL FOSTER ALONGI
p. 971 544 2139 | www.maulfoster.com

Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig_Aerial Imagery Analysis_001.mxd
Print Date: 1/7/2015
Approved By:
Produced By: jschane
Project: 9003.01.39



Source: Aerial photograph (2010) obtained from Esri ArcGIS Online. Historical infrared aerial photograph (1989) obtained from Army Corps of Engineers.

Note: Red areas in the 1989 aerial photograph indicate presence of vegetation (absence of structures)

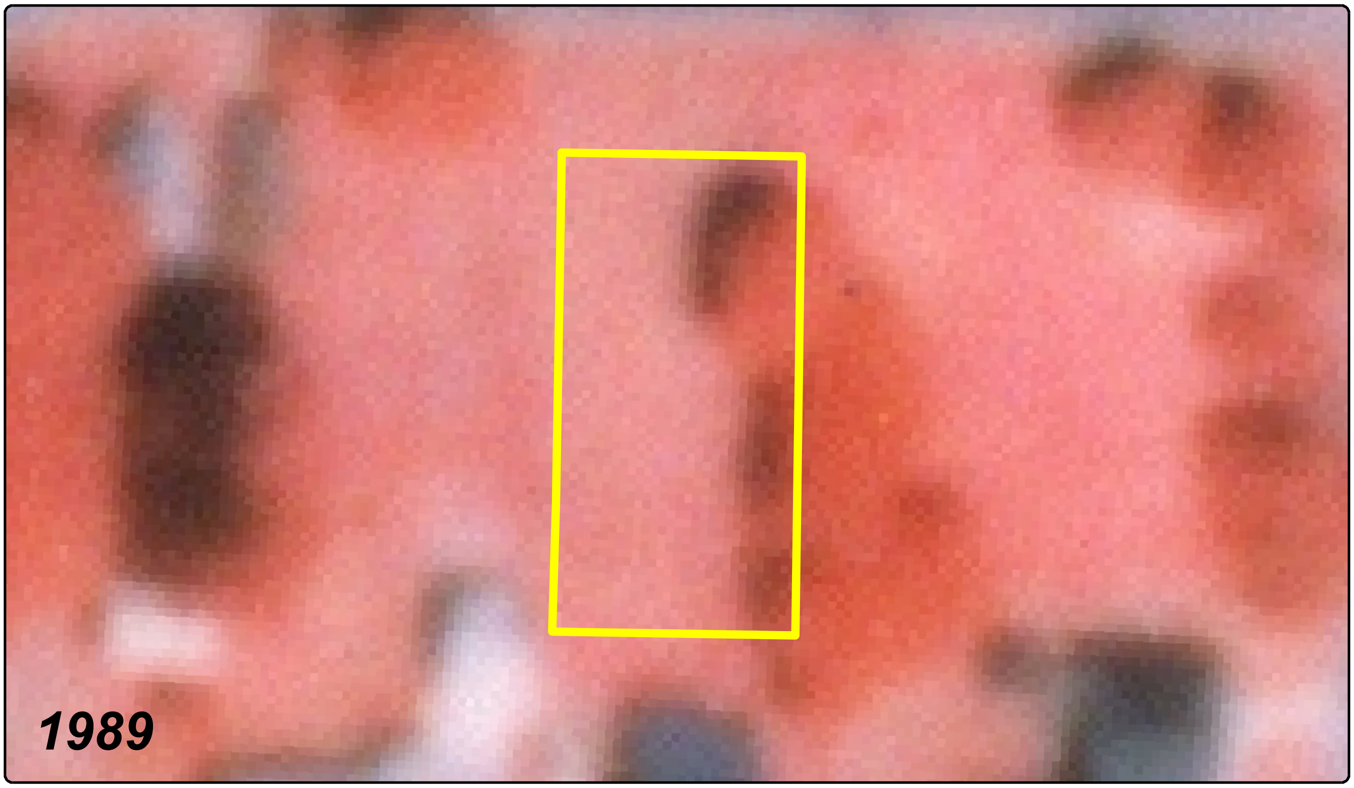
Figure (002)
Aerial Imagery Analysis
5 Maple Street

Former PWT Site
Ridgefield, Washington

0 20 40
Feet

MAUL FOSTER ALONGI
p. 971 544 2139 | www.maulfoster.com

Project: 9003.01.39 Produced By: jschane Approved By: Print Date: 1/7/2015 Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig_Aerial Imagery Analysis_002.mxd



Source: Aerial photograph (2010) obtained from Esri ArcGIS Online. Historical infrared aerial photograph (1989) obtained from Army Corps of Engineers.

Note: Red areas in the 1989 aerial photograph indicate presence of vegetation (absence of structures)

Figure (003)
Aerial Imagery Analysis
7 Maple Street

Former PWT Site
Ridgefield, Washington

0 20 40
Feet

MAUL FOSTER ALONGI
p. 971 544 2139 | www.maulfoster.com

Project: 9003.01.39 Produced By: jschane Approved By: Print Date: 1/7/2015 Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig_Aerial Imagery Analysis_003.mxd

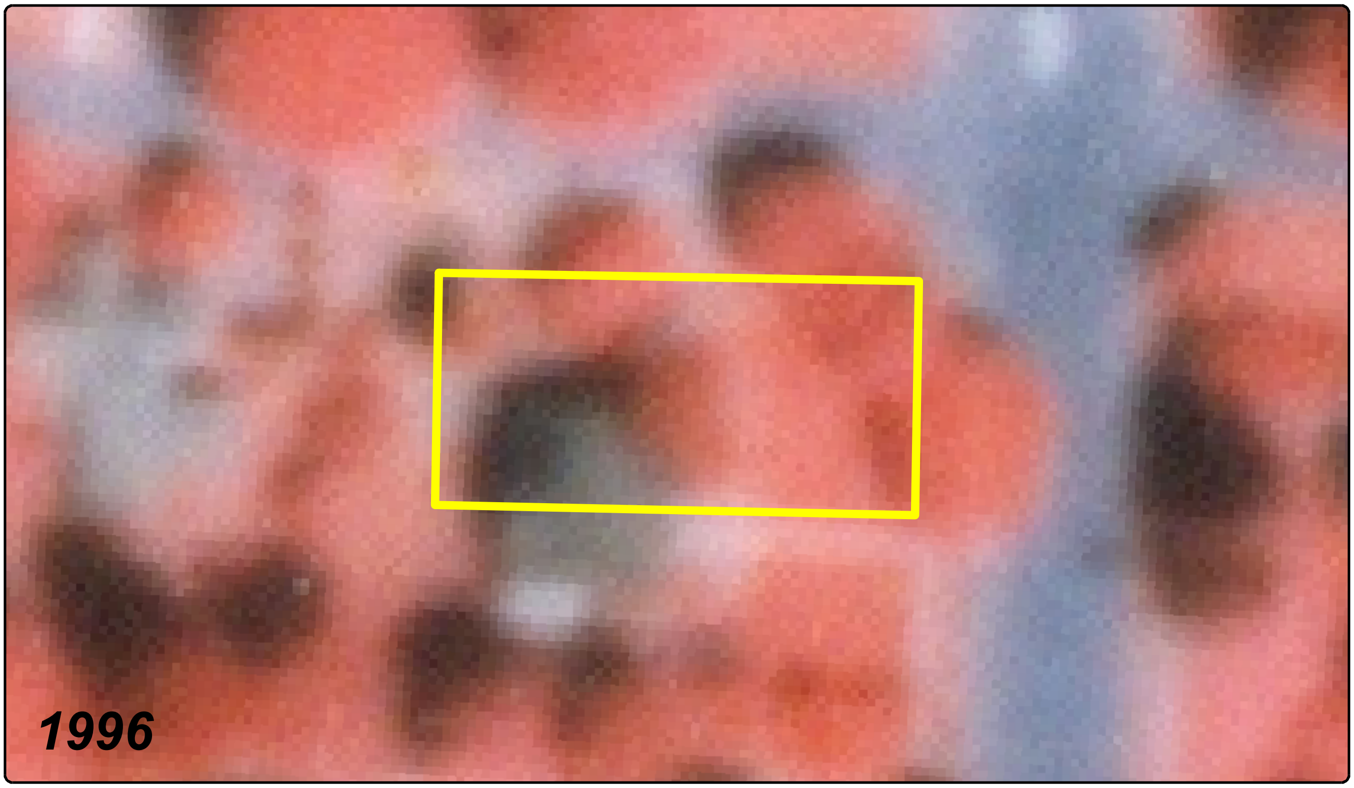
Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig_Aerial Imagery Analysis_009.mxd

Print Date: 1/7/2015

Approved By:

Produced By: jschane

Project: 9003.01.39



Source: Aerial photograph (2010) obtained from Esri ArcGIS Online. Historical infrared aerial photograph (1996) obtained from Army Corps of Engineers.

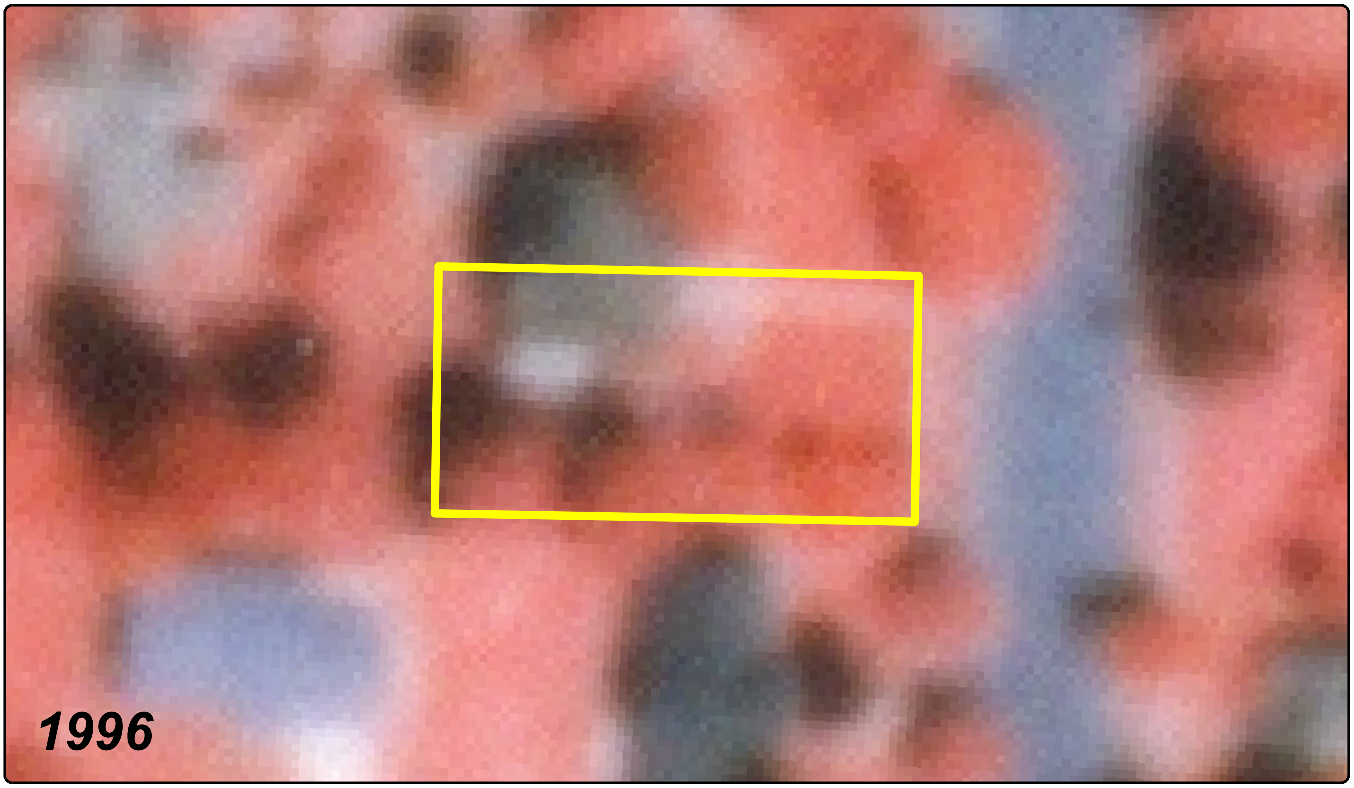
Note: Red areas in the 1996 aerial photograph indicate presence of vegetation (absence of structures). Historical structure removed and new structures built in approximately 2005.

Figure (009)
Aerial Imagery Analysis
515 North Main Avenue

Former PWT Site
Ridgefield, Washington

0 20 40
Feet

MAUL FOSTER ALONGI
p. 971 544 2139 | www.maulfoster.com



Source: Aerial photograph (2010) obtained from Esri ArcGIS Online. Historical infrared aerial photograph (1996) obtained from Army Corps of Engineers.

Note: Red areas in the 1996 aerial photograph indicate presence of vegetation (absence of structures). Historical structure removed and new structures built in approximately 2005.

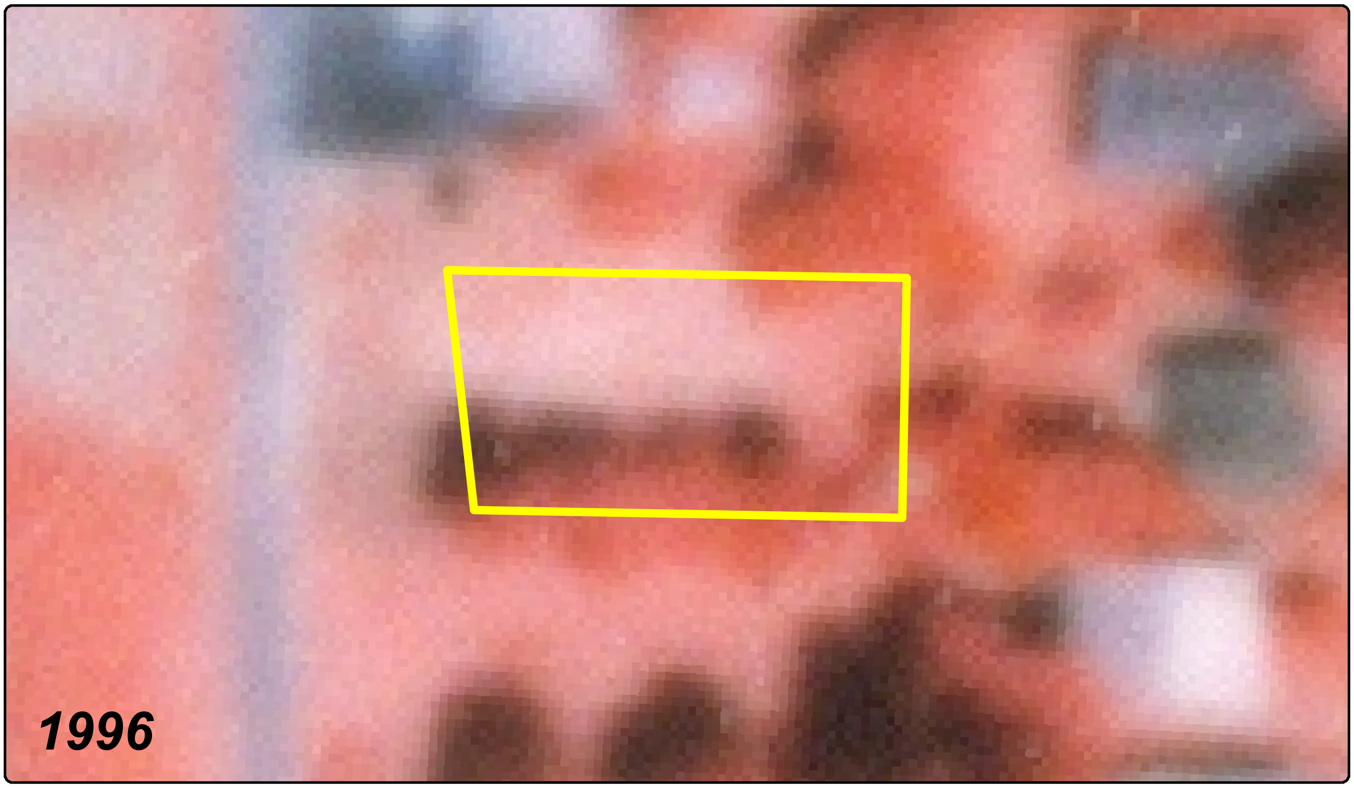
Figure (010)
Aerial Imagery Analysis
511 North Main Avenue

Former PWT Site
Ridgefield, Washington

0 20 40
Feet

MAUL FOSTER ALONGI
p. 971 544 2139 | www.maulfoster.com

Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig_Aerial Imagery Analysis_010.mxd
Print Date: 1/7/2015
Approved By:
Produced By: jschane
Project: 9003.01.39



Source: Aerial photograph (2010) obtained from Esri ArcGIS Online. Historical infrared aerial photograph (1996) obtained from Army Corps of Engineers.

Note: Red areas in the 1996 aerial photograph indicate presence of vegetation (absence of structures)

Figure (026)
Aerial Imagery Analysis
314 North Railroad Avenue

Former PWT Site
Ridgefield, Washington

0 20 40
Feet

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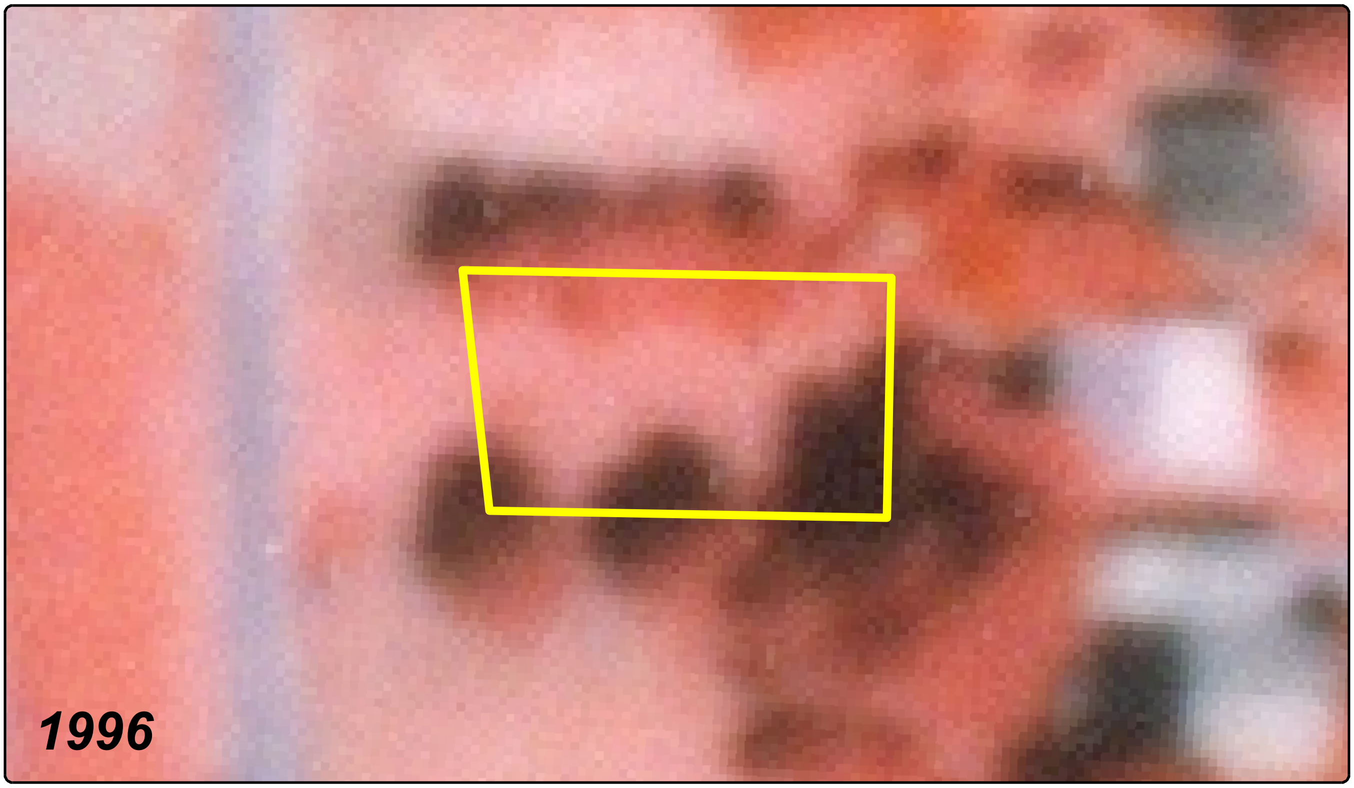
Project: 9003.01.39 Produced By: jschane Approved By: Print Date: 1/7/2015 Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig_Aerial Imagery Analysis_026.mxd



Source: Aerial photograph (2010) obtained from Esri ArcGIS Online. Historical infrared aerial photograph (1996) obtained from Army Corps of Engineers.

Note: Red areas in the 1996 aerial photograph indicate presence of vegetation (absence of structures)

Figure (028A)
Aerial Imagery Analysis
311 North 1st Avenue

Former PWT Site
Ridgefield, Washington

0 20 40
Feet

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Path: X:\9003.01 Port of Ridgefield\39\Off-Property Yard Sampling\Projects\Fig_Aerial Imagery Analysis_028A.mxd
Print Date: 1/7/2015
Approved By:
Produced By: jschane
Project: 9003.01.39

APPENDIX E
PROPERTY SURVEY FORM

PROPERTY SURVEY FORM

Date:	Date
Project No.	9003.01.39
Property Owner:	Name
Parcel ID:	Number
Property located at:	Address

Weather Conditions: ______________________________

____

General yard landscape (front-, side-, backyard present): ______________________________

____

Landscape conditions (lawn, planters, pavement, etc.): ______________________________

____

Approximate yard area (front-, side-, backyard): ______________________________

____

Potential yard impacts (burn areas, spills/staining, etc.): ______________________________

____

Probable high-use areas (play features, planter beds, etc.): ______________________________

____

Other features of interest: ______________________________

____

____

Comments: ______________________________

____

Survey date and time: ______________________________

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PHOTOGRAPHS

Survey completed by: ____

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APPENDIX F
TENANT/OWNER QUESTIONNAIRE

PROPERTY QUESTIONNAIRE

Date:
Property Owner:
Parcel ID:
Property located at:

1. Tenant Contact Information:

a. Name:______________________________

b. Phone (work/home/cell [circle preferred contact number]): ____________

____

c. Email:______________________________

d. Mailing Address:______________________________

____

2. Owner Contact Information:

a. Name:______________________________

b. Phone (work/home/cell [circle preferred contact number]): ____________

____

c. Email:______________________________

d. Mailing Address:______________________________

____

3. General House and Yard Information:

a. About when was your house built?

____

b. About how long have you owned/lived at the property?

____

c. Do you have a:

front-yard___________

side-yard____________

back-yard___________

d. When was the current lawn and landscaping installed (approximately)?

____

4. Yard Characteristics

a. Please describe the general state of the yard (for example, is it mostly grasses, bare soil or gravel, are there flower/vegetable beds, etc.?).

b. Please describe any significant yard modifications since about 1993 (e.g., installation of sod, fill/soil material placement, construction).

c. Besides your house, what buildings do you have on your property (like a shed/deck etc.) and about when were they built?.

d. Is a large portion of the yard covered (for example, by concrete, pavers, decks/patio, etc.)?

e. Does the yard contain underground storage tanks? If so, what, if any, product is stored?

f. Are any underground sprinkler systems present?

5. **Yard Uses** (note: for informational purposes only. Answers will be used only to guide sampling efforts and will not be used to make determinations regarding environmental conditions on the property).

   a. Please describe the general uses of the yard (play areas, gardening/vegetable areas, storage, and other high-use areas).

   b. Have any burning activities been conducted in the yard?

   c. Is there evidence of burning activities (old burn pits, etc.)?

   d. Has fireplace ash ever been disposed of in the yard?

   e. Have any pesticides been used in your yard? Which chemicals?

f. Is there any treated lumber in the yard (e.g., planter boxes or foundation material)?

g. Is there any evidence of spills/staining in the yard?

6. Future yard use

a. Do you have any plans to make any changes to the yard (landscaping, remove structures or trees, install deck or patio, etc.)

7. General Comments

a. Can you think of any other activities that may have influenced the soil quality in your yard (e.g. has there been treated wood in your yards that was removed, are you aware of active burning, wood preserving or pesticide use by a neighbor)?

Survey Date and Time:

Survey completed by:

APPENDIX G
ACCESS AGREEMENT FORM

Date:

CONSENT FOR ACCESS TO PROPERTY

Property Owner: ______________________________

Tenant (if applicable): ______________________________

Property located at: ______________________________
Ridgefield, Washington

Lot number: ______________________________

Mailing Address: ______________________________

Phone (work/home/cell): ______________________________

Email: ______________________________

If you are an owner or tenant, we need to have your permission to enter the property to do our work. The purpose of this form is to show that we have received your permission and can have temporary access to the property to take soil samples. The following paragraphs explain what we will do while on site and what it may mean to you. Please contact the Washington Department of Ecology if you have any questions at:

Diana Smith
Public Involvement Coordinator
(360) 407-6255
Diana.Smith@ecy.wa.gov

Please send or e-mail the completed form to:

Maul Foster & Alongi, Inc.
400 E Mill Plain Blvd, Suite 400
Vancouver, WA 98660
KLafave@maulfoster.com

AGREEMENT

By signing this agreement, you are saying the following:

I am the holder of either a legal or equitable interest, either as the owner or legal agent for the owner of the property identified above or as a tenant of the real property identified above, and I have legal authority to and hereby give either on behalf of all owners or on behalf of all tenants my permission for officers, employees, authorized representatives and those persons acting at the request of the Washington Department of Ecology (Ecology) to temporarily enter the identified real property and take soil samples to be submitted for laboratory analysis.

I understand that the data collected from the property are subject to public disclosure under the Public Record Act or the Freedom of Information Act. I understand that the data collected will be part of a public database. Upon receipt of a public records request, the Port of Ridgefield and Department of Ecology is required by law to provide the data, which may include my name and address. I further understand that if I sell this property I may have to disclose data collected from my property on the Real Property Transfer Disclosure Statement required by Chapter 64.06 of the Revised Code of Washington unless a qualified statutory exemption makes that unnecessary.

I agree to hold harmless the employees, agents, and representatives of the Port of Ridgefield and their consultant Maul Foster & Alongi from any and all liability arising directly or indirectly from the sampling, testing, evaluation, and disclosure related to the subject property.

This written permission is given by me voluntarily with knowledge of my right to refuse. No one has made any promises or threats of any kind to induce me either to give my permission or to enter into this agreement.

Sampling will be performed by Maul Foster & Alongi, Inc. (MFA). Upon completion of sampling, all material and equipment will be removed by MFA, and the property will be restored (as nearly as practicable) to its original condition.

Property Access (circle one): Sample anytime / Schedule an appointment: ____________

____

Dogs: Yes/No **Locked Gates:** Yes/No **Septic:** Yes/No **Underground Utilities:** Yes/No

Safety Hazards: Are there any unsafe areas we should stay away from? Please describe:

____

____

Access Authorization

________________________________	________________________________
Signature(s) of Owner/Co-Owners/Tenant	Printed Name(s)
________________________________	________________________________
Company Name	Date