Reichhold/SSA Containers Facility

Cleanup Action Plan Amendment

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Acronym/ Abbreviation	**Definition**
AO	Agreed Order
ARAR	Applicable or Relevant and Appropriate Requirement
ARI	Analytical Resources, Inc.
bgs	Below ground surface
bogs	Below original ground surface
CAMU	Corrective Action Management Unit
CAP	Cleanup Action Plan
CD	Consent Decree
CMCP	Compliance Monitoring and Contingency Plan

Acronym/ Abbreviation	Definition
COC	Contaminants of concern
CPOC	Conditional point of compliance
CUL	Cleanup level
DCA	Disproportionate Cost Analysis
DWM	Dangerous Waste Management
Ecology	Washington State Department of Ecology
ERM	ERM-West, Inc.
FFS	Focused Feasibility Study
FRI	Focused Remedial Investigation
GETS	Groundwater Extraction and Treatment System
MTCA	Model Toxics Control Act
PCP	Pentachlorophenol
pg/g	Picograms per gram
pg/L	Picograms per liter
PMI	Port Maritime and Industrial
RCRA	Resource Conservation and Recovery Act
Reichhold	Reichhold, Inc.
SAP/QAPP	Sampling and Analysis Plan and Quality Assurance Project Plan
SFFS	Supplemental Focused Feasibility Study
SFRI	Supplemental Focused Remedial Investigation
Site	Reichhold/SSA Containers Facility
SSA	SSA Tacoma, Inc.
TCDD	Tetrachlorodibenzo-p-dioxin
TEQ	Toxic equivalent
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

1.0 Introduction

This document presents the Cleanup Action Plan (CAP) Amendment for the Reichhold/SSA Containers Facility (the Site), a former chemical manufacturing plant located at 3320 Lincoln Avenue East in Tacoma, Washington (Figure 1.1). SSA Tacoma, Inc. (SSA), as the current owner of the facility and performing party, has assumed the environmental responsibilities of the previous owner and previous performing party, Reichhold, Inc. (Reichhold). This CAP Amendment has been prepared in accordance with the First Amendment to Consent Decree (CD) No. 08-2-15781-0 (Ecology 2015), which amended the December 30, 2008, CD, Pierce County Case No. 08-2-15781-0, between Washington State Department of Ecology (Ecology) and SSA (Ecology 2008a). The 2008 CD and CAP are being amended because Washington State Department of Ecology (Ecology) has determined that conditions at the Site, not known at the time of entry of the CD, present a previously unknown threat to human health or the environment.

1.1 PURPOSE OF REPORT

Subsequent to its 2006 purchase of the property, SSA performed a focused remedial investigation (FRI; CH2M HILL 2006) and focused feasibility study (FFS; Floyd|Snider 2008a), and worked with Ecology to prepare a CAP (Ecology 2008b) for the Site. Both documents were reviewed and approved by Ecology. In 2008, Ecology and SSA entered into the CD to implement the CAP for the Site, consistent with the requirements of Washington Administrative Code (WAC) 173-340-360 and WAC 173-340-380. The CD and CAP defined the final site remedy, including cleanup actions for in situ soil. The in situ soil cleanup action activities were conducted from September 1 through October 2, 2009. In December 2009, a Construction Completion Report was submitted by SSA, and was approved by Ecology on September 30, 2010.

In April 2014, as part of a due diligence assessment for a potential property transfer, ERM-West, Inc. (ERM) collected soil and groundwater samples throughout the Site. These data confirmed that the Site is in compliance with the cleanup levels (CULs) for the Site contaminants of concern (COCs) defined in the CD and CAP, with a few outlier exceedances that are insufficient to constitute an issue in terms of the Site cleanup standards. However, the ERM sampling identified the presence of dioxins/furans in soil at concentrations greater than the Model Toxics Control Act (MTCA) Method C Industrial Criterion and a potential concern regarding dioxins/furans in groundwater.

SSA and Ecology determined that these dioxin/furan data and the requirements of the CD warranted further action. Specifically, SSA prepared a Supplemental Focused Remedial Investigation (SFRI) Work Plan (Floyd|Snider 2014) and implemented an investigation to delineate the extent of dioxin/furan contamination present at the Site. In September 2015, the CD was amended to require a SFRI and Supplemental Focused Feasibility Study (SFFS) and an amendment to the CAP. The SFRI/SFFS was prepared and submitted to Ecology on November 25, 2015.

Under MTCA and the terms of the CD, the CAP must be amended if factors not known at the time of entry of the CD are discovered and present a previously unknown threat to human health or the environment. Ecology has determined that the recent discovery of dioxins/furans on the Site at concentrations greater than the applicable criterion present a previously unknown threat to human health or the environment, requiring amendment of the 2008 CAP. This CAP Amendment provides information on the Site history, nature and extent of dioxins/furans contamination, cleanup standards, proposed cleanup actions and justification for the Proposed Cleanup Action, and implementation schedule and next steps.

1.2 OWNERSHIP REVIEW AND CURRENT PROPERTY USE

Reichhold formerly owned the subject property and used it for chemical manufacturing. On July 27, 2006, SSA Containers, Inc., a subsidiary of SSA Marine, Inc., purchased the property from Reichhold and became the owner and operator of the facility. SSA Containers, Inc., as the new owner of the facility assumed the responsibilities of Agreed Order (AO) Nos. 1577 (Ecology 2006) and 1578 (Ecology 2008c), transferred the Dangerous Waste Management (DWM) Permit into its name, and assumed current and future responsibility for addressing environmental conditions. On December 30, 2008, the property was transferred to SSA Tacoma, Inc., another entity owned by SSA Marine, Inc., and it, in turn, became the responsible performing party under AO Nos. 1577 and 1578 and the DWM Permit.

Currently SSA does not conduct any industrial activities on the Site. Portions of the property are subleased on a month-to-month basis for industrial use. The current tenants and approximate acreage leased under license agreements with SSA include the following:

- Totem Ocean Trailer Express has access to 7 acres for parking empty trailers.
- Calhoun Tank has access to 1,000 square feet of office space, 4,800 square feet of shop space, and 3 acres of graveled yard space for the inspection and repair of Washington State Department of Transportation–rated propane and other tank trailers.
- Spirit Transport Systems parks up to 20 commercial trailers overnight.
- Lynden Transport has access to 2 acres for the storage of commercial trailers.
- Shippers Transport Express (an SSA Marine, Inc., company) parks up to five employee cars (daytime) and up to five commercial tractors (nighttime).

2.0 Site Description and History

This section provides a description of the physical characteristics and regulatory history of the property.

2.1 PHYSICAL SETTING

The property comprises approximately 52 acres in the Commencement Bay industrial area of Tacoma, Washington, between the Hylebos and Blair Waterways. The property is located on relatively flat terrain with generally less than 5 feet of topographic relief. This area was constructed in the early 1950s by filling the then-existing salt marsh with dredge spoils from adjacent waterways (CH2M HILL 2006). The property is currently zoned for industrial use. The Site's current zoning classification is Port Maritime and Industrial (PMI).

2.1.1 Geology

The Site is located in the Tacoma Tideflats, an area of unconsolidated sediment from the Puyallup River Valley, which extends from Commencement Bay to the south flank of Mount Rainier, more than 45 miles to the east. Sediment deposited at the mouth of the Puyallup River built a large estuarine delta into Commencement Bay. The delta consisted of a tidal flat that merged landward with complex tidal marshes and sinuous tidal channels that, in turn, merged with the Puyallup River Valley floor.

2.1.2 Hydrogeology

The Site is underlain by three near-surface aquifers and two near-surface aquitards, or confining layers. The three aquifers, which are brackish and nonpotable, are referred to as the Shallow, Intermediate, and Deep Aquifers. The two aquitards are referred to as the upper and lower aquitards.

The Tacoma Tideflats constitute a regional groundwater discharge area. Groundwater flows from recharge areas at higher elevations toward discharge areas along Commencement Bay and its adjacent waterways, such as the Blair Waterway. Because of this, the vertical groundwater gradient direction is typically upward from the Deep Aquifer to the Intermediate Aquifer.

The Shallow Aquifer consists of fine to medium sand and silty sand that is primarily dredge spoils from the Hylebos and Blair Waterways that were deposited as fill in the 1950s. The Shallow Aquifer is unconfined and ranges in saturated thickness from 0 to 10 feet above the upper aquitard with significant seasonal variability. Groundwater flow direction in the Shallow Aquifer at the Site is generally radial from the interior of the property toward the previously existing shallow interceptor drain and drainage ditches at the perimeter of the property as described in Section 2.1.3. The Shallow Aquifer is not tidally influenced and does not experience reversals in groundwater flow direction.

The upper aquitard is the uppermost native formation, considered to represent the former ground surface of the salt marsh that existed prior to filling. The unit ranges in thickness from 1 to 20 feet and consists primarily of silt, organic silt, and clayey silt, with zones of peat.

The Intermediate Aquifer consists primarily of fine to medium sand and silty sand, with zones of interbedded sand, silty sand, and silt. The Intermediate Aquifer is confined and ranges in thickness from 4 to approximately 31.5 feet. Groundwater elevation data indicate that groundwater in the Intermediate Aquifer generally flows from east to west across the eastern portion of the property, toward the Blair Waterway and Commencement Bay. The Intermediate Aquifer is tidally influenced and experiences short-term, transient reversals in the groundwater flow direction in areas near the Blair Waterway, which is the closest marine waterway to the Site. However, the net groundwater flow direction is toward the Blair Waterway, and the transient reversals in the groundwater flow direction do not prevent groundwater discharge to the waterway.

The lower aquitard separates the Intermediate and Deep Aquifers at the property. This unit consists of silt, organic silt, and clayey silt, with occasional very fine sandy silt interbedded with peat and zones of organic material. The lower aquitard ranges in thickness from approximately 5.5 to 18 feet.

The Deep Aquifer consists primarily of alternating fine to medium sand and silty sand, with occasional silt interbeds. The total thickness of the Deep Aquifer is unknown; regional studies indicate that the sand might reach a thickness of 80 feet or more in the vicinity of the Site (Walters and Kimmel 1968). Groundwater flow in the Deep Aquifer occurs under confined conditions, with the potentiometric surface approximately 20 to 30 feet above the top of the unit. Groundwater flow in the Deep Aquifer is generally to the southwest toward the Blair Waterway. The Deep Aquifer is tidally influenced like the Intermediate Aquifer and also experiences transient, localized reversals in the groundwater flow direction in areas near the Blair Waterway. The net groundwater flow direction in the Deep Aquifer is toward the Blair Waterway.

Underlying the three uppermost aquifers is up to 400 feet of generally fine-grained marine sediments. These fine-grained sediments provide a low-permeability base that separates the three uppermost aquifers beneath the Site from the underlying deep regional aquifer, a glacially derived unit of alternating layers of fine- and coarse-grained materials (Walters and Kimmel 1968).

2.1.3 Surface Water

The surface water features in the immediate vicinity of the Site are the Blair Waterway, the Lincoln Avenue Ditch, the North Ditch, and the South Ditch (Figure 2.1). The Site is located approximately 800 feet northeast of the Blair Waterway, which was created by the excavation of sediment from the Puyallup River Delta at the head of Commencement Bay. The North Ditch is a man-made industrial drainage ditch that runs along the northern SSA property boundary and carries stormwater runoff from the property and other adjacent properties to the Lincoln Avenue Ditch, which runs along the northwestern property boundary. The Lincoln Avenue Ditch, which receives runoff from several industrial and urban properties northeast of the property, enters a concrete culvert adjacent to the property that conveys runoff to the Blair Waterway. The South Ditch is located along a portion of the southern property boundary and also enters a corrugated metal culvert conveying runoff northwest to the Lincoln Avenue Ditch and the Blair Waterway. The North and South Ditches flow only when precipitation runoff or high groundwater levels discharge into them; typically, they either dry up or cease to flow and become stagnant during dry summer conditions.

In 2007, a portion of the Blair Waterway was widened by the Port of Tacoma in the vicinity of the Site. This new cutback decreased the distance from the property to the Blair Waterway by approximately 200 feet.

2.2 HISTORICAL PROPERTY USE AND CLEANUP ACTIONS

From 1956 to 1990, Reichhold produced chemical and chemical-related products, including pentachlorophenol (PCP), urea-formaldehyde resins, calcium chloride solution, treated fiber products, and a formaldehyde catalyst. Reichhold worked extensively with Ecology and the U.S. Environmental Protection Agency (USEPA), Region 10, beginning in 1986 to investigate, begin remediation, and permit the property for further cleanup action. Reichhold completed Resource Conservation and Recovery Act (RCRA) corrective actions, including a “facility assessment” and a “facility investigation” prior to the ownership transfer to SSA.

2.3 REGULATORY HISTORY

Reichhold, and then SSA, worked extensively with the USEPA Region 10 and Ecology since 1986 to investigate and remediate the Site.

On June 30, 1986, Reichhold entered into a Consent Agreement and Order (No. 1086-04-33-3008; referred to as the 1986 Order) with USEPA Region 10 and Ecology to undertake an investigation to characterize site soils and hydrogeology and to research and identify areas at the facility that would correspond to RCRA-regulated units, solid waste management units, and Areas of Concern. In July 1987, USEPA performed a RCRA Facility Assessment to identify areas that could potentially require corrective actions. In 1988, USEPA issued a RCRA storage and corrective action permit, effective December 4, 1988 (referred to as the 1988 RCRA Permit). The 1988 RCRA Permit replaced the 1986 Order.

Under the 1986 Order and the 1988 RCRA Permit, Reichhold conducted numerous investigations between 1986 and 2006, including a RCRA Facility Investigation (CH2M HILL 1987). After the basic site characterization work was completed in the late 1980s, Reichhold conducted several corrective actions at the property, addressing the primary source areas of contamination. Reichhold also installed several interim measures including extraction, containment, and treatment systems for groundwater in the Shallow and Intermediate Aquifers.

On October 20, 2000, Reichhold submitted an application for the designation of a Corrective Action Management Unit (CAMU) at the property (State of Washington 2006a). Ecology determined that the application was substantially complete. Reichhold updated the application document in November 2001 and March 2004.

Effective July 30, 2004, under Ecology's authorization to satisfy the RCRA corrective action requirements through Washington's MTCA, Ecology issued Reichhold a DWM Permit for Corrective Action (No. WAD009252891; referred to as the DWM Permit). The DWM Permit established AO Nos. 1577 and 1578. AO No. 1577 included requirements for a FRI/FFS, the preparation of a draft CAP, and the continued operation of interim measures/cleanup actions, while corrective actions elements were completed at the property. AO No. 1578 described the continued use of the CAMU at the property and provided requirements for construction and operation of the on-site soil treatment cells to allow soil to be biologically treated on-site and for the treated soil to be placed within an approved laydown area within the CAMU. The DWM Permit and associated AOs replaced the 1988 RCRA Permit.

In April 2006, Reichhold completed an Ecology-approved FRI report for the facility (CH2M HILL 2006). The FRI completed activities that had been identified in the Ecology-approved FRI Work Plan for the facility (CH2M HILL 2005).

In July 2006, SSA Containers, Inc. purchased the property. To facilitate transfer of the DWM Permit, SSA Containers, Inc., as the new owner of the property and performing party, agreed to assume certain environmental responsibilities of the previous owner and performing party, Reichhold. AO Nos. 1577 and 1578 were amended to be between Ecology and SSA Containers, Inc. (State of Washington 2006a and 2006b).

SSA Containers, Inc. subsequently prepared a FFS defining final cleanup actions for the property, which was approved by Ecology (Floyd|Snider 2008a). The FFS updated the site-specific surface water criteria, soil CULs, groundwater remediation levels, soil treatment levels, and the list of COCs at the property based on current site conditions and an updated review of applicable laws and regulations. The FFS identified the remediation technologies for the treatment of soils exceeding the calculated soil CULs, evaluated the phased shutdown of off-site extraction wells, and evaluated the options for achieving hydraulic control of contaminated groundwater.

The Ecology-approved CAP defined a comprehensive site-wide remedy that is protective of both human health and the environment (Ecology 2008b). The final cleanup action alternative for in situ soil included the site-specific soil CULs and necessary cleanup actions for the four remaining areas of concern. The remedy also included a groundwater cleanup action designed to prevent COCs from reaching nearby surface water bodies and on-going biological treatment of soil within the soil treatment cells.

The CAP included a Compliance Monitoring and Contingency Plan (CMCP; Floyd|Snider 2008b), which identified the process for conducting compliance monitoring of the groundwater to ensure that monitored natural attenuation was occurring and that groundwater CULs were being met at the off-site conditional point of compliance.

When the property was transferred from SSA Containers, Inc. to SSA, CD No. 08-2-15781-0 (Ecology 2008a), was executed on December 30, 2008, to replace AO No. 1577. The CD required SSA to undertake the cleanup actions included in the final CAP and identified the selected cleanup actions for the facility and an implementation schedule.

In 2009, SSA completed a Work Plan describing the in situ soil cleanup actions to take place at the property in accordance with the FFS (Floyd|Snider 2008a) and the CAP (Ecology 2008b). The in situ soil cleanup action activities were conducted at the property in accordance with the Work Plan following its approval by Ecology, and a *Remedial Actions Construction Completion Report* describing the in situ soil cleanup action activities was submitted to, and approved by, Ecology following the completion of the cleanup action activities (Floyd|Snider 2009).

In accordance with the CAP, three additional work plans were submitted to Ecology in 2010 to: detail the procedures required to meet all CAMU closure requirements; shut down the groundwater extraction and treatment system; and decommission and close the treatment cells present at the property. All work related to these three work plans has been completed and approved by Ecology.

Annual Remedial Action Reports are prepared and submitted to Ecology that describe any cleanup actions that have occurred on the property, and provide an updated schedule for the remaining environmental obligations.

On-going groundwater monitoring and reporting under the CMCP and renewal of the DWM Permit had been the only remaining environmental obligation occurring at the facility until the recent identification of dioxins/furans at levels of concern.

2.4 DIOXINS/FURANS

Dioxins/furans are an impurity created during the manufacturing process of PCP. None of the other chemicals produced on-site has an association with dioxins/furans. Technical-grade PCP, which was the type of PCP historically manufactured at the Site, is approximately 86 percent pure with the remaining percentage typically containing impurities such as lesser chlorinated phenols, dioxins (particularly tetra-, hexa-, and octochlorodibenzo-p-dioxin) and hexachlorobenzene as manufacturing byproducts (Extoxnet 1996).

A dioxin/furan congener evaluation, described in the SFRI Work Plan (Floyd|Snider 2014), was conducted using the available dioxin/furan data to confirm that the dioxins/furans present at the Site are associated with the historical PCP production.

Primary PCP manufacturing activities were limited to the central area of the Site around the former PCP Plant. Based on historical documentation, PCP manufacturing occurred aboveground on concrete flooring, and the PCP manufacturing materials and waste were not stored at depth. PCP manufacturing waste materials were transported off-site for disposal at a RCRA hazardous waste disposal facility, and anything solid that came into contact with PCP in any form required off-site disposal (CH2M Hill 1987).

The majority of the soils excavated for corrective action were placed in on-site treatment cells and treated by means of a proprietary amendment-enhanced biodegradation process that successfully decomposed the PCP and other organic COCs but did not decompose some other compounds such as polychlorinated biphenyls and dioxins/furans. Upon treatment of each soil horizon, the soil was analyzed to ensure that it met the treatment levels for the site COCs. If the soil met the treatment levels, it was approved by Ecology for removal from the treatment cells and placed as fill in the approved Treated Soil Laydown Area of the property. Because dioxins/furans were not a COC, the treated soil was not tested for dioxins/furans; therefore, the treated soil placed in the laydown area might contain dioxins/furans. It is believed that the majority of soils currently containing dioxins/furans at the Site are these soils.

In April 2014, on behalf of the potential purchaser of the Site, ERM collected soil and groundwater samples. The samples were submitted to Test America and analyzed for dioxins/furans per the methods described in ERM's scope of work (ERM 2014). The ERM soil samples indicated dioxin/furan concentrations in several locations with exceedances of the MTCA Method C Industrial Criterion for dioxins/furans of 1,680 picograms per gram (pg/g). Groundwater was analyzed for dioxins/furans in three wells installed in April 2014 by ERM. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) was not detected in any groundwater samples collected from wells EMW-7, EMW-9, or EMW-19.

To verify the contaminant concentrations and to assist in filling data gaps to delineate the extent of contamination, Floyd|Snider, on behalf of SSA, requested that all of the remaining soil volume be transferred from Test America to Analytical Resources, Inc. (ARI) for dioxin/furan analysis. On June 6, 2014, all of the remaining soil volume was transferred to ARI according to a standard chain-of-custody procedure. To establish a more complete data set and verify the sampling results, the samples analyzed under ERM's direction that contained concentrations of dioxins/furans in excess of the criterion were reanalyzed. In addition, at the direction of Floyd|Snider, select soil samples with remaining volume that were not originally analyzed for dioxins/furans by Test America were analyzed for dioxins/furans by ARI.

To further delineate the nature and extent of dioxins/furans in soil at concentrations greater than the CULs and evaluate the potential concern regarding dioxins/furans in groundwater, SSA prepared a SFRI Work Plan and submitted it to Ecology in July 2014 (Floyd|Snider 2014). It was approved by Ecology in September 2014, and the investigation was conducted later that month. A SFRI/SFFS was prepared and submitted to Ecology (Floyd|Snider 2015).

As described in Section 4.1 of the SFRI Work Plan, the SFRI/SFFS covered two primary areas of concern:

- Area A, which is the core area of the Site where primary historical activities associated with PCP production and storage took place, including areas of previous corrective actions for PCP
- Area B, which is the area where treated soil from the treatment cells was placed and several corrective actions occurred

The remaining areas of the Site were not characterized because they are outside the areas of primary historical industrial activities associated with PCP production and treated soil laydown; therefore, they were not expected to contain dioxin/furan contamination at levels of concern.

The nature and extent of soil contamination in Areas A and B are discussed in Section 3.2.

3.0 Nature and Extent of Contamination and Cleanup Standards

3.1 CLEANUP STANDARDS

This section presents the cleanup standards for dioxins/furans at the Site for surface water, groundwater, and soil. The development of these cleanup standards is consistent with the logic presented in previous documents including the 2008 CAP (Ecology 2008b). In accordance with the MTCA regulation (WAC 173-340-700), the cleanup objectives used at the facility are the most protective for human health and the environment and remain protective of the surface water in the nearby ditches and the Blair Waterway. Although there are no sediments on-site, the cleanup standards developed for surface water are protective of exposure pathways for sediments. The cleanup standards include concentrations that protect human health and the environment for each constituent by medium, the points of compliance at which these concentrations must be achieved, and any additional regulatory requirements that apply to a cleanup action (WAC 173-340-200). The Applicable or Relevant and Appropriate Requirements (ARARs) are provided in Table 3.1.

3.1.1 Surface Water

Surface water is present at the Site only in perimeter ditches that convey groundwater and stormwater to the Blair Waterway. These ditches contain water only intermittently, during the rainy periods of the year and during storm events. Surface water is not a contaminated medium at the Site; however, in order to establish groundwater concentrations that are protective of surface water, it is necessary to define concentrations in surface water that are protective of human health and aquatic species and then establish groundwater concentrations that are protective of these surface water concentrations.

Because the development of appropriate groundwater cleanup standards is intrinsically linked to the selection of surface water quality standards, surface water quality standards are discussed in further detail in Section 3.1.3.

3.1.2 Groundwater Point of Compliance

The location of and rationale for the determination of the groundwater CPOC described herein is consistent with the process used in the development of the cleanup standards presented in the 2008 CAP (Ecology 2008b). Groundwater must be protective of surface water and must meet the surface water standards at the point where groundwater enters the surface water. For the Site, Shallow Aquifer groundwater enters surface water at the perimeter ditches, and Intermediate Aquifer groundwater enters surface water at the Blair Waterway. The CULs for this facility are equivalent to the surface water standards and must be achieved at the points of compliance. With no on-site exposure to groundwater, the off-property CPOC for the Shallow Aquifer is located at the perimeter ditches and the off-property CPOC for the Intermediate Aquifer is located at the Blair Waterway.

The off-property CPOC at the Blair Waterway is consistent with WAC 173-340-720(8)(d)(ii) for properties near, but not abutting, surface water. A deed restriction will be placed on the property in perpetuity, prohibiting the use of groundwater at the facility. Additionally, SSA and the owners of the property between the SSA property and the Blair Waterway (the Puyallup Tribe of Indians) have agreed in writing to the use of the off-property CPOC.

In order to ensure that the cleanup standards are met at the CPOC, source area target concentrations have been established at the Shallow Aquifer monitoring wells, approximately 40-feet in proximity to the North and South Ditches, in the 2008 FFS for other Site COCs. Because all the soil containing dioxin/furans at levels of concern are within the perimeter of the Shallow Aquifer compliance monitoring wells, the 40-foot distance from the wells to the surface water features is still appropriate. In order to develop a source area target concentration to be compared to at the Shallow Aquifer monitoring wells, source area target concentrations were developed using the same methodology in the 2008 FFS for dioxins/furans.

Source area target concentrations were developed through attenuation and degradation modeling that represent the maximum allowable concentrations that, based on modeling and empirical evidence, will naturally attenuate between the compliance monitoring wells and the CPOC so as to meet the CULs as described in WAC 173-340-720(8)(e). These source area target concentrations provide the same function as remediation levels, as described in WAC 173-340-355, and constitute the values to be met for the Shallow Aquifer compliance monitoring well network at the property boundary.

3.1.3 Groundwater Cleanup Levels

The rationale and the development process for the groundwater source area target concentrations presented herein are consistent with the process used in the development of the cleanup standards presented in the 2008 FFS (Floyd|Snider 2008a) and CAP (Ecology 2008b). Because groundwater at the facility is non-potable, the risk of exposure to COCs in groundwater is limited to that associated with any contact with groundwater that has discharged into surface water within the perimeter ditches and the Blair Waterway. Therefore, because the groundwater enters the surface water, it must meet the relevant surface water criteria.

In 2008, source area target concentrations were developed for the Site using the Ecology-approved BIOSCREEN model. The surface water criteria were back-calculated for the identified COCs to determine maximum concentrations in groundwater at the Site's boundary that would naturally attenuate to meet the surface water criteria as the groundwater enters the respective water bodies.

Similar to 2008, the BIOSCREEN model was used to identify the maximum concentration of dioxins/furans in groundwater that is protective of surface water. Source area target concentrations were developed using the following steps:

1. **Determine the potential exposure pathways and receptors (WAC 173-340-708).** Because the groundwater in the area is nonpotable, the highest beneficial use of groundwater at the Site is the protection of surface water.

   Ecological receptors for surface water include aquatic and avian species. Because of the ecological risk exclusion provision in WAC 173-340-7491, an evaluation of ecological exposure was not required. The Site meets the requirements of this provision based on the corrective actions completed to date and the requirements of the cleanup actions developed in this document. No terrestrial ecological exposure to groundwater or surface water exists at the Site.

   Human receptors for surface water include maintenance workers and recreational swimmers who could be exposed to COCs by means of incidental ingestion (although the Blair Waterway is an industrial/commercial shipping channel and restricted in terms of recreational swimming) and recreational and subsistence anglers who could be exposed to COCs by means of fish consumption.

2. **Determine relevant surface water criteria protective of potential human and ecological receptors.** Per the MTCA Surface Water Cleanup Standards (WAC 173-340-730), the selected surface water criteria must be at least as stringent as the concentrations established under applicable state and federal laws and protective of human and ecological receptors. Per the federal Clean Water Act, Section 304, the most stringent dioxin/furan surface water criterion for the protection of human health via the consumption of organisms is 0.0051 picograms per liter (pg/L) for 2,3,7,8-TCDD.

3. **Calculate the source area target concentrations that would meet the selected surface water criteria.** Once the surface water criterion was determined, the transport and attenuation of dioxins/furans from the Site to surface water was calculated using the BIOSCREEN model. Due to the strong tendency for dioxins/furans to adsorb to soils and attenuate at a rapid rate, the BIOSCREEN model was used to determine that even at 2,3,7,8-TCDD concentrations greater than 1×10^{54} milligrams per liter (mg/L) in a perimeter monitoring well, the groundwater concentration at the CPOC would still be less than the surface water criterion of 0.0051 pg/L. All the results for 2,3,7,8-TCDD at the Site were nondetections at values of 1 to 2 pg/L, and groundwater at the Site is not a concern. The process and results of the numerical modeling is described in the SFRI/SFFS.

Based on the results of the modeling, a source area target concentration was impractical to calculate. Dioxin/furan concentrations are predicted to attenuate rapidly as the groundwater moves through soil and are not likely to reach surface water at concentrations greater than the surface water quality criterion. Dioxins/furans will continue to be monitored in groundwater as described in the CMCP Amendment (Appendix A).

3.1.4 Soil Point of Compliance

The location of and rationale for the determination of the soil point of compliance described herein is consistent with the process used in the development of the cleanup standards presented in the CAP. The MTCA standard point of compliance for soil, based on the direct contact exposure pathway, is throughout the Site, from the ground surface to a depth of 15 feet below ground surface (bgs) (WAC 173-340-740(6)(d)). For cleanup actions that involve containment of hazardous substances, the soil cleanup levels will typically not be met at the standard point of compliance. However, under the procedures specified in WAC 173-340-740(6)(f) these kinds of cleanup actions may be determined to comply with cleanup standards provided they are: (1) permanent, (2) protective of human health, (3) protective of terrestrial ecological receptors, (4) complemented by institutional controls, (5) monitored for compliance with cleanup levels, and (6) described in the CAP with respect to the kind, distribution, and concentration of hazardous substances and the measures that will be used to prevent migration. For this Site, the selected cleanup action involves consolidation and containment of hazardous substances, and institutional controls, which prohibit or control activities that could interfere with the long-term integrity of the containment system.

The point of compliance for soil based on the potential for leaching of dioxins/furans from soil to groundwater is throughout the Site from the ground surface to the depth of the upper aquitard, approximately 7 to 10 feet bgs.

3.1.5 Soil Cleanup Levels

The rationale and development process for the soil CUL in the source area is consistent with the process used in the development of the cleanup standards described in the CAP. The soil CUL is the lower of the MTCA requirements for a maintenance worker’s exposure to soil by direct contact and incidental ingestion and the risk-based concentration of dioxins/furans that leach to groundwater (Ecology’s three-phase model calculations [Ecology 2014]). Because the Site meets the criteria for an industrial site (WAC 173-340-745) and will continue to do so, the MTCA Method C Industrial Criterion for dioxins/furans (1,680 pg/g) has been identified as the appropriate CUL for industrial use and worker exposure by direct contact. To protect groundwater, the BIOSCREEN modeling demonstrated that on-site soil containing dioxins/furans may remain on-site at distances greater than 10 feet from the surface water features without posing a risk of exposure to adjacent surface waters. Consequently, it was determined that a dioxin/furan toxic equivalent (TEQ) concentration of 1,680 pg/g is the appropriate soil CUL for the Site.

3.2 NATURE AND EXTENT OF CONTAMINATION

3.2.1 Soil

The sampling approach for Areas A and B is described in detail in Section 5.1.2 of the SFRI/SFFS (Floyd|Snider 2015).

Within Area A, six areas were identified with dioxin/furan TEQ concentrations that exceed the soil CUL. Five of the areas are approximately 20-by-20 feet, and the other area is approximately 30-by-30 feet. The vertical extent of contamination in these areas ranged between 2 and 6 feet dependent upon the area.

Within Area B, most of the soil in areas that did not contain treated soil was determined to be in compliance with the cleanup standards. Areas with treated soil at the surface have dioxin/furan TEQ concentrations greater than the CUL from the surface to 2 feet below original ground surface (bogs). Below 2 feet bogs, contaminated soil concentrations greater than the CUL were present only in two locations. Based on the soil borings, topography, and soil analytical data, approximately 56,000 cubic yards of contaminated soil with concentrations greater than the CUL is present within Area B.

In Areas A and B, the soil sampling locations and areas with soil containing dioxins/furans at concentrations exceeding the CUL are shown on Figure 3.1.

3.2.2 Groundwater

Groundwater at the Site was determined to be in compliance for dioxins/furans, as 2,3,7,8-TCDD was not detected in any groundwater samples.

4.0 Proposed Cleanup Action

4.1 CLEANUP ACTION CRITERIA

Cleanup action objectives are determined to specifically identify objectives that should be accomplished in order to ensure compliance with ARARs. The following objectives are defined for the Site:

- Protect human and ecological receptors from exposure to dioxin/furan contamination that exceeds applicable CULs.
- Remove unacceptable human health and ecological risk resulting from direct contact with contaminated soil.
- During implementation of cleanup actions, ensure that migration of dioxins/furans does not occur.
- During implementation of cleanup actions, protect human receptors from exposure to noxious vapors and odors released from contaminated soil that may cause health impacts.

Each cleanup action alternative proposed will be evaluated for its ability to accomplish the objectives listed above.

4.2 DESCRIPTION OF PROPOSED CLEANUP ACTION

The Proposed Cleanup Action from the SFRI/SFFS is selected to amend the CAP and, by supplementing the originally selected cleanup action, provides a comprehensive remedy for the Site that complies with all the applicable requirements for remedy selection under MTCA. The Proposed Cleanup Action has been determined to be permanent to the maximum extent practicable using the procedures in WAC 173-340-360, and has been determined to be protective of human health and terrestrial ecological receptors.

The Proposed Cleanup Action (Figure 4.1) would remediate soil at the Site using the following technologies:

- Implementation of the Area A Pre-Excavation Extent Investigation Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) after its approval by Ecology. The Area A Pre-Excavation Extent Investigation SAP/QAPP is provided as Appendix B. The results of the samples collected during this investigation would be presented to Ecology in an Area A Cleanup Action Work Plan, which would identify the horizontal and vertical extents of the Area A excavations.
- Excavation of the contaminated soil in the six hot-spot locations in Area A and consolidation of that soil in the portion of Area B to be capped. The excavated areas in Area A would then be backfilled with clean soil and compacted.

- Regrading of a 317,000-square-foot portion of Area B to a relatively flat area that is suitable for both temporary use of the area (parking for cars/trucks) and future development. Once regraded, the area would be capped with a surface that would prevent direct contact for humans and also prevent terrestrial ecological exposure. The cap design would not need to be impervious and could allow for infiltration of stormwater. Due to the potential of future development, the construction of the final cap has several possibilities. The cap proposed is a geotextile or GeoGrid indicator layer placed below a minimum 12-inch-thick cap of compacted crushed rock surfacing. This cap design would allow for infiltration of stormwater and would prevent any stormwater that does not infiltrate from contacting any contaminated soil. A cross-section of the cap is shown in Figure 4.2.

  Future development of the Site may include placement of asphalt or concrete pavements, buildings and stormwater controls in the capped area within Area B. Both asphalt or concrete pavement and building slab surfaces would prevent direct contact for humans and also prevent terrestrial ecological exposure. If these alternative surfaces are proposed to be installed in lieu of the crushed rock cap described above, plans would be presented to Ecology for their approval.

- Institutional controls would be implemented in the form of the designation of a new CAMU for the permanent management of dioxin/furan-contaminated soil (A CAMU application is included as Appendix C), a deed restriction in the form of a restrictive covenant that would require maintenance and monitoring of the cap surface through compliance with a Cap Inspection and Maintenance Plan. The restrictive covenant will meet the requirements of WAC 173-340-440(8), (9), and (10), Chapter 64.70 RCW (Uniform Environmental Covenants Act), and the Toxics Cleanup Program's Procedure 440A (Establishing Environmental Covenants under the Model Toxics Control Act).

  The Cap Inspection and Maintenance Plan included as Appendix D specifies soil management procedures for future excavation work within the capped areas and identifies health and safety requirements for subsurface work. Consistent with WAC 173-340-440, it includes requirements for repair if the cap is disturbed or removed and maintenance requirements for the inspection and repair of the cap. These procedures would be applicable to any future site redevelopment or maintenance that involves removal or disturbance of subsurface material within the capped areas. The Cap Inspection and Maintenance Plan would include specific requirements to protect the direct contact and erosion pathways if subsurface soil is excavated and relocated or exposed. The Cap Inspection and Maintenance Plan includes specifications for the following:

  - Health and safety requirements for working in and during handling of site soils.
  - Best Management Practices for soil stockpiling, dust control, and erosion control. Requirements for off-site disposal and associated recordkeeping.
  - Requirements for Ecology notification and reporting.

- Compliance monitoring would include protection monitoring during construction activities, performance monitoring to ensure remedy construction in accordance with the project plans and design, and confirmation monitoring following remedy completion to confirm the long-term effectiveness of the remedy. These are described below.
    - Protection monitoring would be conducted during both remedy construction and operation and maintenance activities to confirm the protection of human health and the environment. Protection monitoring requirements would be described in Health and Safety Plans addressing worker activities during remedy construction. Protection monitoring is also described in the Cap Inspection and Maintenance Plan regarding future operations and maintenance associated with constructed remedy (Appendix D). Any activities conducted at the Site following remedy implementation that have the potential to disturb capped areas would require adherence to the Cap Inspection and Maintenance Plan.
    - Performance monitoring activities would be conducted during remedy construction. Performance monitoring would consist of the following:
        - Implementation of an Ecology-approved Area A Pre-Excavation Extent Investigation SAP/QAPP. The results of the samples collected during this investigation would be presented to Ecology in an Area A Cleanup Action Work Plan, which would identify the horizontal and vertical extents of the Area A excavations.
        - Quality control monitoring for construction activities.
        - Monitoring during cap placement to confirm the constructed caps meet design requirements.
    - Confirmation monitoring activities would be conducted following completion of the remedy. Confirmation monitoring would consist of the following:
        - Following remedy completion, semi-annual groundwater monitoring would be conducted for 3 years to verify that 2,3,7,8-TCDD groundwater concentrations continue to be in compliance with cleanup standards. Compliance monitoring of groundwater would be conducted in the shallow aquifer perimeter wells directly downgradient of the capped area. Groundwater monitoring is described in the Compliance Monitoring and Contingency Plan Amendment included as Appendix A.
        - Long-term maintenance would be conducted to ensure stability and effectiveness of the constructed cap. Maintenance would include regular observation for any problems or damage to the cap. Long-term maintenance in capped areas will be conducted for as long as contamination at concentrations greater than the CUL is present at the Site. This is detailed in the Cap Inspection and Maintenance Plan included as Appendix D.

Together, the individual technologies manage the exposure pathways to dioxin/furan contamination at the Site. The Proposed Cleanup Action Alternative supports current operations and is compatible with anticipated future development at the Site.

4.2.1 Compliance Monitoring Requirements

Compliance monitoring requirements associated with remedy implementation consist of protection monitoring during construction activities, performance monitoring to ensure remedy construction in accordance with the project plans and design, and confirmation monitoring after remedy completion to confirm the long-term effectiveness of the remedy.

4.2.1.1 Protection Monitoring

Protection monitoring would be conducted during both remedy construction and operation and maintenance activities to confirm the protection of human health and the environment. Protection monitoring requirements would be described in Health and Safety Plans addressing worker activities during remedy construction and in the Cap Inspection and Maintenance Plan related to future operations and maintenance associated with the constructed remedy. Any activities conducted at the Site after remedy implementation that have the potential to disturb the capped areas would require adherence to the Cap Inspection and Maintenance Plan.

4.2.1.2 Performance Monitoring

Performance monitoring activities would be conducted during remedy construction. Performance monitoring would consist of the following:

- Implementation of an Ecology-approved Area A Pre-Excavation Extent Investigation SAP/QAPP. The results of the samples collected during this investigation would be presented to Ecology in an Area A Cleanup Action Work Plan, which would identify the horizontal and vertical extents of the Area A excavations.
- Quality control monitoring for construction activities.
- Monitoring during cap placement to confirm the constructed caps meet the design requirements.

4.2.1.3 Confirmation Monitoring

Confirmation monitoring activities would be conducted after the completion of the remedy. Confirmation monitoring would consist of the following:

- Following remedy completion, semi-annual groundwater monitoring would be conducted for 3 years to verify that the concentrations of 2,3,7,8-TCDD in groundwater continue to comply with the cleanup standards. Compliance monitoring of groundwater would be conducted in the Shallow Aquifer monitoring wells downgradient of the capped area. The CMCP Amendment is included as Appendix A.

- Long-term maintenance would be conducted to ensure stability and effectiveness of the constructed cap. Maintenance would include regular observation for any problems or damage to the cap. Long-term maintenance in capped areas will be conducted for as long as contamination at concentrations greater than the CUL is present at the Site. This is detailed in the Cap Inspection and Maintenance Plan, which is included as Appendix D.

4.2.2 Ownership, Access, and Institutional Controls

Implementation of institutional controls and implementation of the Cap Inspection and Maintenance Plan to manage contaminated soil remaining beneath capped areas would be conducted by the property owner.

The Proposed Cleanup Action includes institutional controls to manage contamination left on-site. Institutional controls at the Site would include the following:

- Designation of a new CAMU for the permanent management of dioxin/furan-contaminated soil. A CAMU application has been prepared in accordance with the CAMU regulations as identified in WAC 173-303-64650 and WAC 173-303-64660 and is included as Appendix C of this document. If approved, the CAMU will remain in perpetuity and will be subject to 5-year reviews.
- A deed restriction in the form of a restrictive covenant limiting the Site to industrial or other use that is consistent with Site CULs, prohibiting groundwater withdrawal for beneficial uses, and including a map showing the nature and extent of residual contamination at concentrations greater than CULs. This is consistent with the existing deed restriction already in place on the Site. The restrictive covenant will meet the requirements of WAC 173-340-440(8), (9), and (10), Chapter 64.70 RCW (Uniform Environmental Covenants Act), and the Toxics Cleanup Program's Procedure 440A (Establishing Environmental Covenants under the Model Toxics Control Act).
- Implementation of an Ecology-approved Cap Inspection and Maintenance Plan specifying soil management procedures for future excavation and health and safety requirements for subsurface work. The Cap Inspection and Maintenance Plan includes requirements for repair if the cap is disturbed or removed and maintenance requirements for the inspection and repair of the cap consistent with WAC 173-340-440. These procedures would be applicable to any future site redevelopment or maintenance that involves removal or disturbance of subsurface material within the capped areas. The Cap Inspection and Maintenance Plan includes specific requirements to protect the direct contact and erosion pathways if subsurface soil is excavated and relocated or exposed. The Cap Inspection and Maintenance Plan has been prepared with Ecology's approval and includes the following:
    - Health and safety requirements for working in and during handling of site soils and groundwater.

- Best Management Practices for soil stockpiling, dust control and erosion control. Requirements for off-site disposal and associated recordkeeping.
- Requirements for Ecology notification and reporting.

4.3 JUSTIFICATION FOR SELECTION OF PROPOSED CLEANUP ACTION

4.3.1 Model Toxics Control Act Threshold Requirements

The Proposed Cleanup Action meets the minimum requirements for selection of a cleanup action under MTCA WAC 173-340-360(2)(a) because it is protective of human health and the environment, complies with cleanup standards, complies with applicable state and federal laws, and provides for compliance monitoring. These requirements are met in the following ways:

- **Protect Human Health and the Environment.** The Proposed Cleanup Action would be protective of human health and the environment through excavation, capping, and institutional controls. The direct contact and surface soil to surface water pathways would be addressed through capping or protective barrier (asphalt or buildings) and through institutional controls requiring maintenance in perpetuity. The Cap Inspection and Maintenance Plan includes requirements to protect these pathways if subsurface soil is excavated and relocated to another area. Risks would be immediately reduced as a result of capping. Groundwater monitoring would be conducted to ensure that dioxin/furan concentrations continue to be protective of human health and the environment.

- **Comply with Cleanup Standards.** The Proposed Cleanup Action complies with all MTCA cleanup standards through containment and isolation of dioxins/furans that remain on-site at levels greater than the CUL.

- **Comply with Applicable State and Federal Laws.** The Proposed Cleanup Action complies with all applicable state and federal laws outlined in Section 6.2 and in Table 6.1 through excavation, capping, and institutional controls. Chemical-specific ARARs are met through compliance with applicable CUL criteria. Location-specific ARARs are met through compliance with all applicable state, federal, and local regulations in place for the physical location of the Site. Applicable action-specific ARARs would be met through implementation of construction activities in compliance with all applicable construction-related requirements such as health and safety restrictions, site use, and other local permits.

- **Provide for Compliance Monitoring.** The Proposed Cleanup Action meets the requirements for compliance monitoring by conducting protection monitoring during implementation, performance monitoring following completion of capping, and confirmation monitoring for groundwater compliance following remedy implementation.

4.3.2 Other Model Toxics Control Act Requirements

Cleanup alternatives that meet the threshold requirements must also satisfy other MTCA requirements described in WAC 173-340-360(2)(b):

- **Use Permanent Solutions to the Maximum Extent Practicable.** The Proposed Cleanup Action would not be as protective, permanent, or effective over the long term as the full removal alternative; however, the cost of the full removal alternative would be 20 times the cost of the Proposed Cleanup Action, making it disproportionate in cost based on the total benefit scores and the cost per unit benefit ratios.
- **Provide for a Reasonable Restoration Time Frame.** The time frame necessary to reduce the risk for direct contact exposure and erosion pathways in soil would be immediate, after remedy implementation.
- **Consideration of Public Concerns.** This requirement would be satisfied during the public comment period.

4.3.3 Model Toxics Control Act Disproportionate Cost Analysis

The results of the Disproportionate Cost Analysis (DCA), which are discussed in Section 8.0 of the SFRI/SFFS, indicate that the Proposed Cleanup Action is the remedy with the lowest cost per unit benefit ratio while also meeting the MTCA requirements for the DCA (Floyd|Snider 2015).

4.3.4 Compliance with Cleanup Action Objectives

The Proposed Cleanup Action would comply with all of the cleanup action objectives by (1) protecting human receptors from exposure to dioxin/furan contamination that exceeds the CUL by capping or protective barrier (asphalt or buildings) and removing the direct contact exposure pathway, (2) ensuring that migration of dioxins/furans does not occur, and (3) by remediating dioxins/furans using a method that does not interfere with or restrict proposed site development and future use plans.

5.0 Cleanup Action Plan Schedule

It is anticipated that in February 2016, a Second Amendment to the CD and associated documents will be released for public comment. Upon execution of the Second Amendment to the CD, the following implementation steps would be conducted. The estimated completion dates are provided for discussion and planning purposes.

Implementation Step	**Estimated Completion Date**
Execute Second Amendment to the CD	April 2016
Construct Remedy	May to July 2016
Prepare Cleanup Action Completion Report and Initiate Compliance Groundwater Monitoring	August 2016
Receive Ecology Approval Cleanup of Action Completion Report	September 2016
Complete Compliance Groundwater Monitoring	January 2019

6.0 References

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Reichhold/SSA Containers Facility

Cleanup Action Plan Amendment

Table

Table 3.1
Applicable or Relevant and Appropriate Requirements

Standard, Requirement, or Limitation	Description	Applicability
Constituent-Specific ARARs		
General Requirements		
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and National Oil and Hazardous Substances Pollution Contingency Plan (42 USC 9601 et seq. and 40 CFR 300)	Establishes federal administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances are located.	USEPA CERCLA requirements: although the Site is located within the USEPA Commencement Bay Nearshore/Tideflats Superfund site, it has been "deferred" to the RCRA/HWMA corrective action process for cleanup. However, because CERCLA remains applicable, the cleanup must be sufficiently protective in order to not require any further action under CERCLA.
Resource Conservation and Recovery Act (RCRA) (40 CFR 239 through 282)	RCRA, an amendment to the Solid Waste Disposal Act, was enacted in 1976 to address the huge volumes of municipal and industrial solid waste generated nationwide. RCRA has been amended and revised since; however, the goals remain: • Protect human health and the environment from the potential hazards of waste disposal, • Conserve energy and natural resources, • Reduce the amount of waste generated, and • Ensure that wastes are managed in an environmentally sound manner. CERCLA is a related statute that deals with cleaning up inactive and abandoned hazardous waste sites. RCRA, on the other hand, deals with active industrial sites and materials that are destined for disposal or recycling.	This is a RCRA Facility, delegated to Washington State for implementation of final corrective actions.
Surface Water Requirements		
Model Toxics Control Act (MTCA) (WAC 173-340)	Establishes Washington State administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances are located.	Facility is regulated under MTCA and must meet MTCA cleanup requirements.
Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A)	The Surface Water Standards establish water quality standards for surface waters of Washington State. Water quality standards require that toxic substances not be introduced beyond the mixing zone in concentrations that have the potential to adversely affect characteristic water users, cause acute or chronic toxicity to the most sensitive biota, or adversely affect public health.	Applicable at the Blair Waterway and ditches that discharge into the Blair Waterway.
Clean Water Act (CWA) (33 USC 1251 et seq.)	Section 401 of the CWA requires the establishment of guidelines and standards to control the direct or indirect discharge of pollutants to the waters of the United States. Section 402 establishes the National Pollutant Discharge Elimination System (NPDES), which provides for the issuance of permits to regulate discharges to navigable waters.	Section 401 is applicable. Requirements under Section 402 are discussed under action-specific ARARs for NPDES issues related to construction.
National Recommended Water Quality Standards (40 CFR 131)	These water quality standards define the water quality goals of the water body by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States adopt water quality standards to protect public health or welfare, enhance the quality of water, and serve the purposes of the CWA.	Applicable at the Blair Waterway and ditches that discharge into the Blair Waterway.

Table 3.1
Applicable or Relevant and Appropriate Requirements

Standard, Requirement, or Limitation	Description	Applicability
Constituent-Specific ARARs (cont.)		
Groundwater Requirements		
Washington Water Pollution Control Law (RCW 90.48; WAC 173-220)	Washington State has been delegated authority to issue NPDES permits. CWA Sections 301, 302, and 303 require states to adopt water quality standards. The Washington Water Pollution Control Law and regulations address this requirement.	Substantive requirements are applicable for NPDES requirements and stormwater management under action-specific ARARs. MTCA cleanup actions are exempt from the procedural requirements of this law but must comply with the substantive requirements.
Model Toxics Control Act (MTCA) (WAC 173-340)	Establishes Washington State administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances are located.	Facility is a RCRA Facility delegated to Washington State for implementation of final corrective actions. That work is regulated under MTCA and must meet MTCA standards. Cleanup levels must consider beneficial use of groundwater, which is impact on surface water.
Drinking Water Standards—State Maximum Contaminant Levels (WAC 246-290-310)	Establishes standards for contaminant levels in drinking water for water system purveyors.	No drinking water supplies are impacted by the facility; therefore, these standards are not applicable.
Water Quality Standards for Groundwaters of the State of Washington (WAC 173-200)	Implements the Water Pollution Control Act and the Water Resources Act of 1971 (90.54 RCW).	Not applicable at sites operating under Consent Decree with USEPA or Ecology.
Soil Requirements		
Model Toxics Control Act (MTCA) (WAC 173-340)	Establishes Washington State administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances are located.	Facility is a RCRA Facility delegated to Washington State for implementation of final corrective actions. Facility is regulated under MTCA and must meet MTCA standards. The standards include requirements for alternative selection, cleanup standards, monitored natural attenuation, and restoration time frame.
Location-Specific ARARs		
Shoreline, Wetlands, and Other Critical Areas		
Washington Shoreline Management Act (RCW 90.58; WAC 173-14) Tacoma Municipal Code, Chapter 13.10—Shoreline Management	The Washington Shoreline Management Act, authorized under the federal Coastal Zone Management Act, establishes requirements for substantial development occurring within the waters of Washington State or within 200 feet of a shoreline.	Not applicable; the facility is more than 200 feet from the shoreline.

Table 3.1
Applicable or Relevant and Appropriate Requirements

Standard, Requirement, or Limitation	Description	Applicability
Location-Specific ARARs (cont.)		
Shoreline, Wetlands, and Other Critical Areas (cont.)		
Tacoma Municipal Code Chapter 13.11—Critical Areas Preservation	Critical areas include critical aquifer recharge areas, fish and wildlife habitat conservation areas, flood hazard areas, geologically hazardous areas, stream corridors, wetlands, and any buffer zones. The criteria and standards provided in this chapter are intended to secure the public health, safety, and welfare by: • Protecting members of the public and public resources from damage or injury due to slope failures, erosion, landslides, and seismic or volcanic hazards, • Maintaining a healthy functioning ecosystem, • Preventing impacts on streams, fish and wildlife habitats, and water quality, • Providing open space and aesthetic value, • Providing migratory pathways for fish and birds, and • Giving special consideration to conservation efforts.	Substantive requirements may be applicable based on specific actions and locations. MTCA cleanup actions are exempt from the procedural requirements of this law but must comply with the substantive requirements.
Executive Order 11990, Protection of Wetlands (40 CFR 6, Appendix A)	Executive Order 11990, Section 7, requires measures to minimize the destruction, loss, or degradation of wetlands. Requires no net loss of remaining wetlands.	Only applicable if alternative impacts wetlands.
Floodplain Management (40 CFR 6, Appendix A; 10 CFR 1022	In 100-year floodplains, actions must be taken to reduce the risk of flood loss, minimize the impact of floods on human safety, and restore and preserve the natural beneficial values of floodplains.	Substantive requirements may be applicable based on specific actions and locations. MTCA cleanup actions are exempt from the procedural requirements of this law but must comply with the substantive requirements.
Washington Floodplain Management Plan (RCW 68.16; WAC 173-158)	An advisory standard pertaining to wetlands management that suggests local governments, with technical assistance from Ecology, institute a program that can identify and map critical wetland areas located within base floodplains.	
Tribal and Cultural Protections		
Native American Graves Protection and Repatriation Act (25 USC 3001 through 3113; 43 CFR 10) and Washington's Indian Graves and Records Law (RCW 27.44)	These statutes prohibit the destruction or removal of Native American cultural items and require written notification of inadvertent discovery to the appropriate agencies and Native American tribe. These programs are applicable to the cleanup action if cultural items are found. The activities must cease in the area of the discovery, a reasonable effort must be made to protect the items discovered, and notice must be provided.	Because of the facility's industrial history, Native American protections are likely not an issue; however, the National Historic Preservation Act is applicable.
Archaeological Resources Protection Act (16 USC 470aa et seq.; 43 CFR 7)	This program sets forth requirements that are triggered when archaeological resources are discovered. These requirements apply only if archaeological items are discovered during implementation of the proposed cleanup action.	Because of the facility's industrial history, Native American protections are likely not an issue; however, the Archaeological Resources Protection Act and the National Historic Preservation Act are applicable.
National Historic Preservation Act (16 USC 470 et seq.; 36 CFR 60, 63, and 800)	This program sets forth a national policy of historic preservation and provides a process that must be followed to ensure that impacts of actions on archaeological, historic, and other cultural resources are protected.	

Table 3.1
Applicable or Relevant and Appropriate Requirements

Standard, Requirement, or Limitation	Description	Applicability
Action-Specific ARARs		
Evaluate Environmental Impacts		
State Environmental Policy Act (SEPA) (RCW 43.21C; WAC 197-11)	Establishes the state's policy for protection and preservation of the natural environment.	Applicable; implemented during design and permitting phase. Coordination with federal agencies may be necessary to ensure the SEPA process will meet NEPA requirements. SEPA and MTCA are integrated processes per WAC 197-11-250 through 197-11-268.
Disposal of Excavated Material		
Resource Conservation and Recovery Act (RCRA) (42 USC 6921-6949a; 40 CFR 268, Subtitles C and D)	Establishes requirements for the identification, handling, and disposal of hazardous and nonhazardous waste.	Facility is a RCRA Facility delegated to Washington State for implementation of final corrective actions. Facility is regulated under MTCA and must meet MTCA standards.
Dangerous Waste Regulations (RCW 70.105; WAC 173-303)	Establishes regulations that are the state equivalent of RCRA requirements for determining whether a solid waste is a state dangerous waste. This regulation also provides requirements for the management of dangerous wastes.	Only applicable if waste is generated from the proposed cleanup action alternative.
Solid Waste Disposal Act (42 USC 325103259, 6901-6991; 40 CFR 257, 258) Federal Land Disposal Requirements (40 CFR 268)	Protects health and the environment and promotes conservation of valuable material and energy resources.	
Minimum Functional Standards for Solid Waste Handling (WAC 173-304)	Sets minimum functional standards for the proper handling of all solid waste materials originating from residential, commercial, agricultural, and industrial operations and other sources.	
Solid Waste Handling Standards (WAC 173-350)	Regulates upland beneficial reuse of sediments.	Only applicable if sediments are reused in uplands areas, on- or off-site.
Wastewater/Stormwater Discharge		
Washington Water Pollution Control Law (RCW 90.48; WAC 173-216, WAC 173-220)	Washington State has been delegated authority to issue NPDES permits. CWA Sections 301, 302, and 303 require states to adopt water quality standards and implement an NPDES permitting process. The Washington Water Pollution Control Law and regulations address this requirement.	State version of CWA NPDES. Substantive requirements are applicable. MTCA cleanup actions are exempt from the procedural requirements of this law but must comply with the substantive requirements. Any construction or regrading activity will require compliance with NPDES.
National Pollutant Discharge Elimination System (NPDES) (CWA Section 402)	Regulates discharges to off-site activities for pretreatment standards.	Any discharges from the facility to a POTW or other water body (Blair Waterway) will be required to comply with pretreatment standards and permitted through the public utility.
National Pretreatment Standards (40 CFR 403)		
Tacoma Wastewater Treatment Requirements (Tacoma City Ordinance, Chapter 12.08) and Shoreline Management (Chapter 13.10.130 for discharges to surface water in Port Industrial Area)	Provides requirements for discharge to the POTW.	Applicable through NPDES permit.

Table 3.1
Applicable or Relevant and Appropriate Requirements

Standard, Requirement, or Limitation	Description	Applicability
Action-Specific ARARs (cont.)		
Worker Safety		
Health and Safety for Hazardous Waste Operations and Emergency Response (WAC 296-62; Health and Safety 29 CFR 1901.120)	Health and Safety for Hazardous Waste Operations and Emergency Response (HAZWOPER) regulates health and safety operations for hazardous waste sites. The health and safety regulations describe federal requirements for health and safety training for workers at hazardous waste sites.	Any cleanup work will require compliance with OSHA and WISHA.
Occupational Safety and Health Act (OSHA), (29 USC 653, 655, 657; Occupational Safety and Health Standards and 29 CFR 1910)	Employee health and safety regulations for construction activities and general construction standards as well as regulations for fire protection, materials handling, hazardous materials, personal protective equipment, and general environmental controls. Hazardous waste site work requires employees to be trained prior to participation in site activities, medical monitoring, monitoring to protect employees from excessive exposure to hazardous substances, and decontamination of personnel and equipment.	Any cleanup work will require compliance with OSHA and WISHA.
Washington Industrial Safety and Health Act (WISHA) (RCW 49.17) Washington Industrial Safety and Health Regulations (WAC 296-62; WAC 296-155)	Adopts the OSHA standards that govern the conditions of employment in all work places. The regulations encourage efforts to reduce safety and health hazards in the work place and set standards for safe work practices for dangerous areas such as trenches, excavations, and hazardous waste sites.	Any cleanup work will require compliance with OSHA and WISHA.
Air Quality Controls		
Federal, State, and Local Air Quality Protection Programs State implementation of ambient air quality standards NWAPA ambient and emission standards Regional standards for fugitive dust emissions and toxic air pollutants	Regulations promulgated under the federal Clean Air Act (42 USC 7401) and the Washington State Clean Air Act (RCW 70.94) govern the release of airborne contaminants from point and nonpoint sources. Local air pollution control authorities such as the Puget Sound Clean Air Authority (PSCAA) have also set forth regulations for implementing these air quality requirements. These requirements may be applicable to the facility for the purposes of dust control should the proposed cleanup action alternative require excavation activities. Both PSCAA (under Regulation III) and WAC 173-460 establish ambient source impact levels for arsenic.	The proposed cleanup action alternative will require compliance with air quality regulations and best management practices for dust control.
Miscellaneous		
Noise Control Act of 1974 (RCW 70.107; WAC 173-60)	Establishes maximum noise levels.	The selective alternative will need to comply with local and state noise pollution requirements. Construction and other activities will need to be limited to normal working hours.
Grading Activities under Tacoma Municipal Code (Chapters 13.11 and 13.12)	Establishes restrictions of upland grading activities.	Substantive compliance required to minimize stormwater and other related impacts. MTCA cleanup actions are exempt from the procedural requirements of this law but must comply with the substantive requirements.

Abbreviations:

ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
Ecology	Washington State Department of Ecology
HWMA	Hazardous Waste Management Act
MTCA	Model Toxics Control Act
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NWAPA	Northwest Air Pollution Authority
OSHA	Occupational Safety and Health Act
POTW	Publicly owned treatment works
PSCAA	Puget Sound Clean Air Authority
RCRA	Resource Conservation and Recovery Act
SEPA	State Environmental Policy Act
USC	United States Code
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act

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Figures

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Figure 1.1
Vicinity Map

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January, 2016

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Figure 2.1
Monitoring Well Sample Locations and Surface Water Features

I:\GIS\Projects\SSA-RHOLD\MXD\Phase 6200\Cleanup Action Plan Amendment\Figure 2.1 Monitoring Well Sample Locations and Surface Water Features.mxd
November 2015

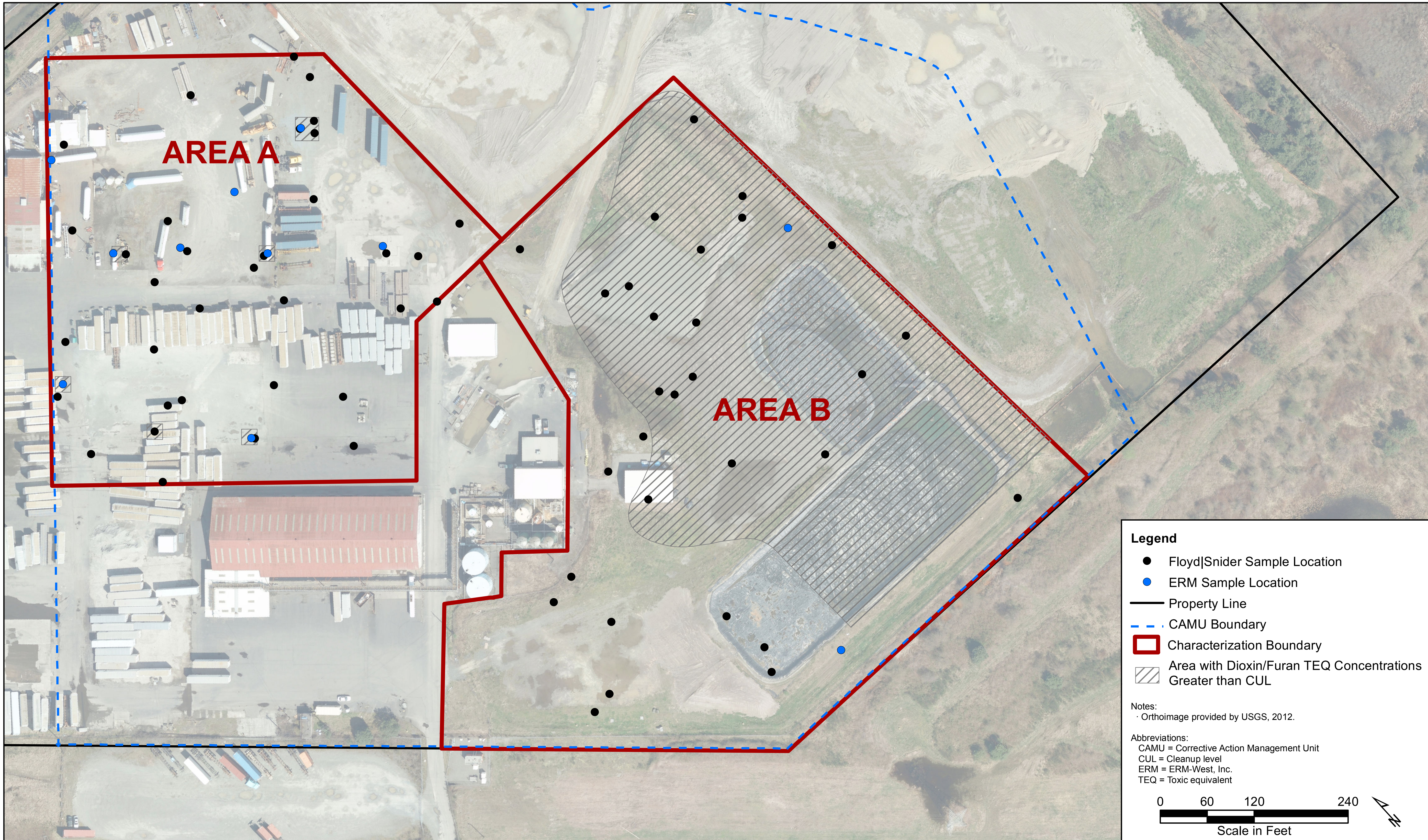

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Figure 3.1
2014 Dioxins/Furans Sample Locations in Areas A and B

I:\GIS\Projects\SSA-RHOLD\MXD\Phase 6200\Cleanup Action Plan Amendment\Figure 3.1 2014 Dioxins Furans Sample Locations in Areas A and B.mxd
November, 2015

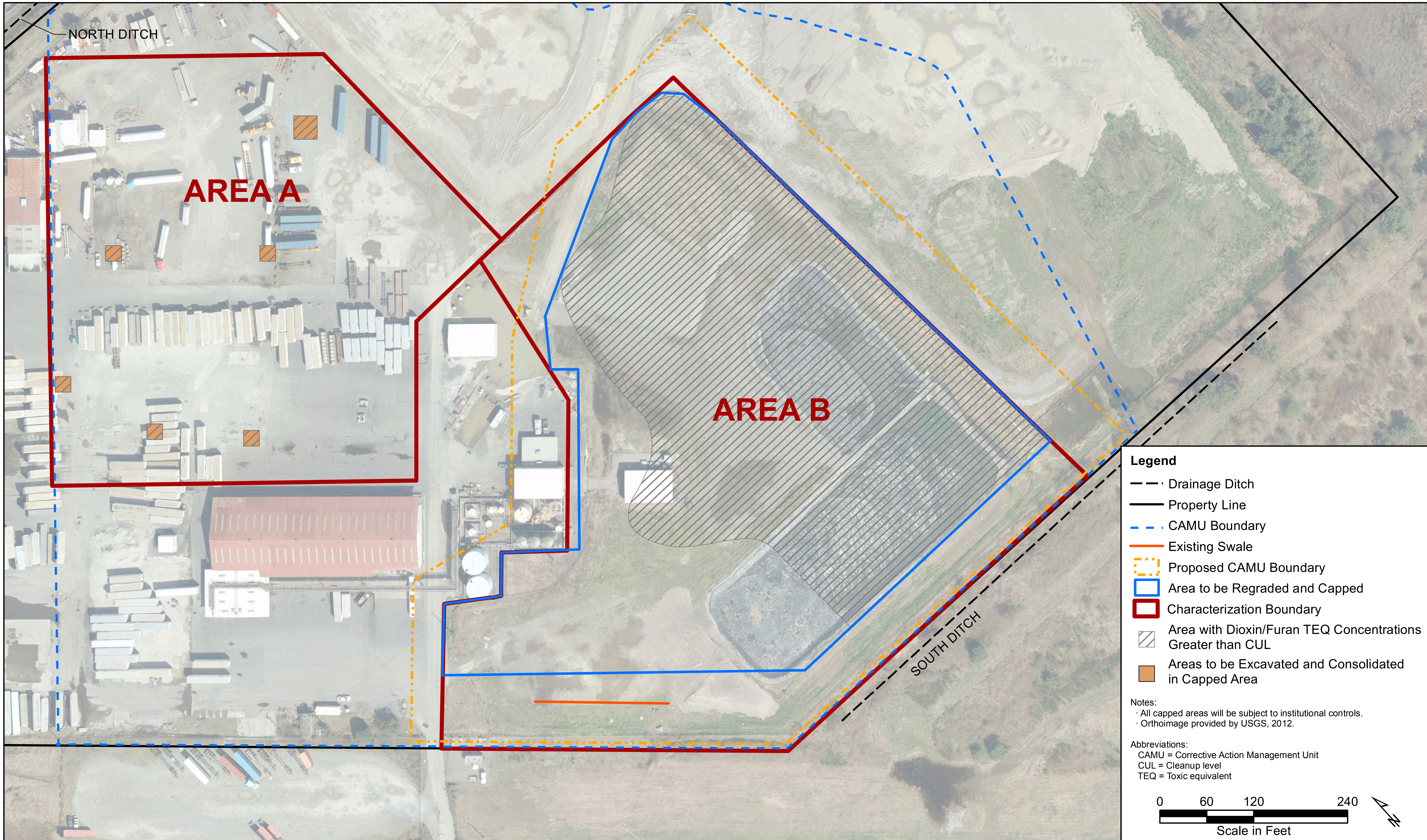

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Figure 4.1
Selected Remedial Action

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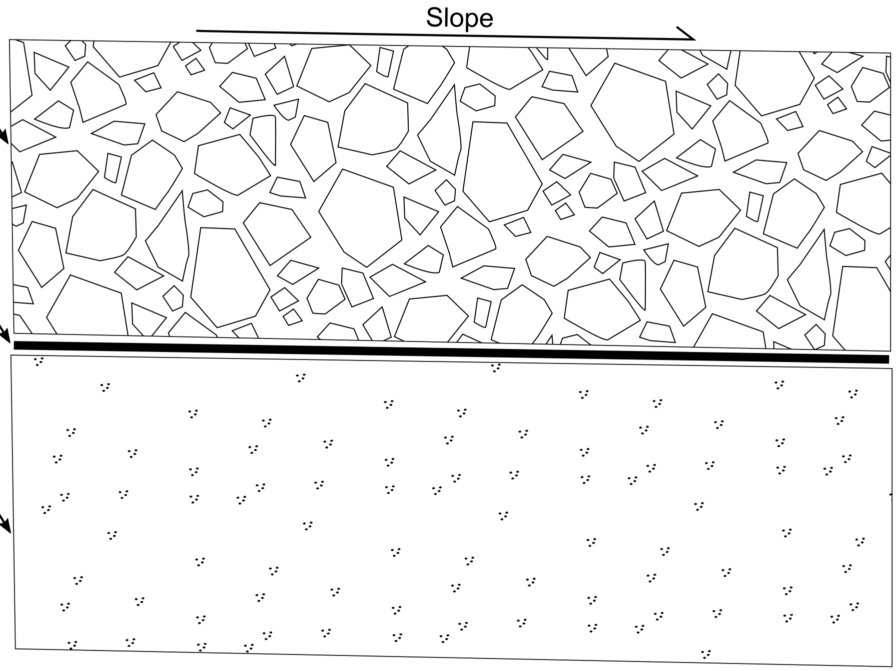
1/27/2016



Note:

1. The cap proposed is a geotextile or GeoGrid indicator layer that would be placed with a minimum 12-inch-thick cap of crushed rock surfacing. This cap design would allow for infiltration of stormwater and would prevent any stormwater that does not infiltrate from contacting any contaminated soil. Future development of the Reichhold/SSA Containers Facility (the Site) may include placement of asphalt and buildings and stormwater controls. Both of these surfaces would prevent direct contact for humans and also prevent terrestrial ecological exposure. If this alternative surface is proposed to be installed in lieu of the cap described above, plans would be presented to Washington State Department of Ecology for their approval.
2. The crushed rock will be based on the 2008 Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9(3) for Crushed Surfacing or equivalent. The specifications for construction will require standard placement and compaction methods for structural backfill (i.e., placement and compaction of the material in lifts with appropriate moisture content for the material type).

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Appendix A
Compliance Monitoring and Contingency Plan Amendment

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List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
ARI	Analytical Resources, Inc.
CAP	Cleanup Action Plan
CMCP	Compliance Monitoring and Contingency Plan
COC	Contaminants of concern
CPOC	Conditional point of compliance
CUL	Cleanup level
DQO	Data quality objective
EcoChem	EcoChem, Inc.
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPI	Environmental Partners, Inc.
IDW	Investigation-derived waste
LCS	Laboratory control sample
L/min	Liters per minute
µm	Micrometer
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MS	Matrix spike
MSD	Matrix spike duplicate
MTCA	Model Toxics Control Act
pg/g	Picograms per gram
pg/L	Picograms per liter
PPE	Personal protective equipment
PQL	Practical Quantitation Limit
QA	Quality assurance
QC	Quality control
RPD	Relative percent difference
SFFS	Supplemental Focused Feasibility Study
SFRI	Supplemental Focused Remedial Investigation

Acronym/ Abbreviation	**Definition**
Site	Reichhold/SSA Containers Facility
SSA	SSA Tacoma, Inc.
TCDD	Tetrachlorodibenzo-p-dioxin
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

1.0 Introduction

This Compliance Monitoring and Contingency Plan (CMCP) Amendment applies to the Reichhold/SSA Containers Facility (the Site), located at 3320 Lincoln Avenue in Tacoma, Washington (Figure A.1), and owned by SSA Tacoma, Inc. (SSA). It accompanies the Cleanup Action Plan (CAP) Amendment, which describes the final cleanup actions to be implemented as a result of the recent discovery of dioxins/furans at the Site. The CAP Amendment was developed to account for the Proposed Cleanup Action selected on the basis of the Supplemental Focused Remedial Investigation/Supplemental Focused Feasibility Study (SFRI/SFFS) for the Site (Floyd|Snider 2015). The activities in this CMCP Amendment apply specifically to dioxins/furans and will be conducted concurrently with the activities identified in the CMCP prepared as part of the 2008 CAP (Ecology 2008) that address other contaminants of concern (COCs) at the Site. This CMCP Amendment has been prepared in accordance with the Model Toxics Control Act (MTCA) requirements for compliance monitoring (Washington Administrative Code [WAC] 173-340-410).

The components of the Proposed Cleanup Action are presented in the CAP Amendment. Because groundwater at the Site is already in compliance, the only component of the Proposed Cleanup Action that is associated with groundwater is groundwater monitoring, which is discussed in this CMCP Amendment.

This CMCP Amendment presents compliance monitoring requirements and contingency plans that address the exposure pathways at the Site. After the cleanup actions defined in the CAP Amendment have been implemented, the on-site soil will meet the requirements for direct contact and will not require monitoring. The groundwater monitoring activities outlined in this CMCP Amendment are designed to ensure that the proposed cleanup actions are protective of the adjacent surface water bodies. Discharge to surface water is the highest beneficial use of groundwater at the Site. The monitoring activities in this CMCP Amendment are intended to address the performance of the cleanup actions and confirm the long-term effectiveness of the remedy after the completion of remedial activities.

This CMCP Amendment also sets forth a clear process by which monitoring may trigger contingency responses and establishes a framework for implementing contingency actions.

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2.0 Site Description

In this section, relevant Site conditions are presented to provide the context and rationale for the CMCP Amendment.

2.1 OVERVIEW OF SITE CONDITIONS

The hydrogeologic conditions relevant to compliance monitoring and contingency planning are briefly summarized herein. The Site conditions, land use, and geologic setting are summarized in the CAP Amendment.

2.1.1 Summary of Hydrogeologic Units and Groundwater Flow Direction

The Site is underlain by three near-surface aquifers and two near-surface aquitards, or confining layers. The three aquifers, which are nonpotable, are referred to as the Shallow, Intermediate, and Deep Aquifers. The two aquitards are referred to as the upper and lower aquitards.

The Site is located within the Tacoma Tideflats, which is a regional groundwater discharge area. Groundwater flows from recharge areas at higher elevations toward discharge areas along Commencement Bay and its adjacent waterways, such as the Blair Waterway southwest of the Site. Because of this situation, the vertical groundwater gradient direction is typically upward from the Deep Aquifer to the Intermediate Aquifer.

- The Shallow Aquifer consists of fine to medium sand and silty sand that is primarily dredge spoils from the Hylebos and Blair Waterways, which were hydraulically emplaced as fill in the 1950s. The Shallow Aquifer is unconfined and seasonally ranges in saturated thickness from 0 to approximately 10 feet. The groundwater flow direction is generally radial from the interior of the Site toward the perimeter drainage ditches. The Shallow Aquifer is unconfined and is not tidally influenced.
- The upper aquitard is the uppermost native formation, considered to represent the former ground surface of the salt marsh that existed prior to filling. The unit ranges in thickness from approximately 1 to 20 feet and consists primarily of silt, organic silt, and clayey silt, with zones of peat.
- The Intermediate Aquifer consists primarily of fine to medium sand and silty sand, with zones of interbedded sand, silty sand, and silt. The Intermediate Aquifer is confined and ranges in thickness from approximately 4 to 31.5 feet. Groundwater elevation data indicate that groundwater in the Intermediate Aquifer generally flows from east to west across the eastern portion of the Site, toward the Blair Waterway. The Intermediate Aquifer is tidally influenced and experiences short-term transient reversals in the groundwater flow direction in areas near the Blair Waterway, which is the closest marine waterway to the Site. However, the net groundwater flow direction is toward the waterway, and the transient reversals in the groundwater flow direction do not prevent groundwater discharge to the waterway.

- The lower aquitard separates the Intermediate and Deep Aquifers at the Site. This unit consists of silt, organic silt, and clayey silt, with occasional very fine sandy silt and peat interbeds and zones of organic material. The lower aquitard ranges in thickness from approximately 5.5 to 18 feet.
- The Deep Aquifer consists primarily of alternating fine to medium sand and silty sand, with occasional silt interbeds. The total thickness of the Deep Aquifer is unknown; regional studies indicate that the sand might reach a thickness of 80 feet or more in the vicinity of the Site (Walters and Kimmel 1968). Groundwater flow in the Deep Aquifer occurs under confined conditions, with the potentiometric surface approximately 20 to 30 feet above the top of the unit. Groundwater flow in the Deep Aquifer is generally to the southwest toward the Blair Waterway. The Deep Aquifer is tidally influenced like the Intermediate Aquifer and also experiences transient, localized reversals in the groundwater flow direction in areas near the Blair Waterway. The net groundwater flow direction in the Deep Aquifer is toward the Blair Waterway.

Underlying the three uppermost aquifers is up to 400 feet of generally fine-grained marine sediments. These fine-grained sediments provide a low-permeability base that separates the three uppermost aquifers beneath the Site from the underlying deep regional aquifer, a glacially derived unit of alternating layers of fine- and coarse-grained materials (Walters and Kimmel 1968).

2.1.2 Surface Water Features

The surface water features in the immediate vicinity of the Site are the Blair Waterway, the Lincoln Avenue Ditch, the North Ditch, and the South Ditch. The Site is located approximately 800 feet northeast of the Blair Waterway, which was created by the excavation of the sediment from the Puyallup River Delta at the head of Commencement Bay. The North Ditch is a man-made industrial drainage ditch that runs along the northern SSA property boundary and carries stormwater runoff from SSA and other adjacent properties to the Lincoln Avenue Ditch, which runs along the northwestern property boundary. The Lincoln Avenue Ditch, which receives runoff from several industrial and urban properties northeast of the Site, enters a concrete culvert adjacent to the Site that conveys runoff to the Blair Waterway. The South Ditch is located along a portion of the southern property boundary. The North and South Ditches flow only when precipitation runoff or high groundwater levels discharge into them; they typically either dry up or cease to flow and become stagnant during dry summer conditions.

In 2007, a portion of the Blair Waterway was widened by the Port of Tacoma in the vicinity of the Site. This new cutback decreased the distance from the property to the Blair Waterway by approximately 200 feet.

3.0 Compliance Criteria and Monitoring Requirements

This section summarizes the development of compliance criteria and defines the proposed methods of compliance monitoring in the context of the MTCA requirements (WAC 173-340-410). The groundwater cleanup standards discussed in the CAP Amendment are summarized for clarity. Because dioxins/furans are present at concentrations of concern only within the uppermost 6 feet of soil below the original ground surface, groundwater monitoring is required only within the Shallow Aquifer.

3.1 DEVELOPMENT OF COMPLIANCE CRITERIA AND ROLE OF GROUNDWATER MONITORING

Based on the results of the BIOSCREEN modeling performed as part of the SFRI/SFFS (Floyd|Snider 2015), it was determined that a source area target concentration that is protective of surface water at the conditional point of compliance (CPOC) is impractical to calculate and use for compliance purposes. A summary of this modeling and analysis is presented in Section 3.1.1.

As part of the SFRI/SFFS, soil cleanup levels (CULs) were defined to be protective of nearby surface water bodies and human health by preventing the leaching of COCs from soil to groundwater and subsequent groundwater transport to surface water. Therefore, monitoring of the groundwater pathway is an effective approach for overall compliance monitoring at the Site.

The most stringent dioxin/furan surface water criterion for the protection of human health via consumption of organisms is 0.0051 picograms per liter (pg/L) for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD; Federal Clean Water Act Section 304). Thus, the compliance criterion will be based on 2,3,7,8-TCDD concentrations.

3.1.1 Source Area Target Concentrations

Source area target concentrations in groundwater are concentrations that are protective of the nearest surface water receptors based on modeled attenuation rates, groundwater flow velocities, and relevant surface water criteria. Because groundwater at the Site is nonpotable, the risk of exposure to COCs in groundwater is limited to those in groundwater that discharges into surface water within the perimeter ditches and the Blair Waterway. Therefore, because the groundwater enters the surface water, it must meet the relevant surface water criteria.

Because of the strong tendency of dioxins/furans to adsorb to soils and attenuate at a rapid rate, it was determined that even at concentrations of 2,3,7,8-TCDD greater than 1×10^{54} milligrams per liter (mg/L) in a monitoring well, the concentration at the CPOC would still be less than the surface water criterion of 0.0051 pg/L within 16 feet of the monitoring well, less than half the 40-foot distance to surface water in the perimeter ditches. Based on the results of the modeling, it was determined that calculating a source area target concentration was impractical. Dioxins/furans are predicted to attenuate rapidly as the groundwater moves through soil, and they are not likely to reach surface water at concentrations greater than the surface water criterion.

As an additional level of analysis, the maximum concentration of 2,3,7,8-TCDD in groundwater throughout the Site was calculated with the use of actual analytical data for soil, 0.0033 milligrams per kilogram (mg/kg) at location SS-1. Using Ecology's three-phase model calculations (Ecology 2014), this soil concentration is in equilibrium with groundwater at a concentration of 1.7 x 10^{-7} mg/L, or 170 pg/L. The BIOSCREEN modeling results show that this concentration attenuates to 0.0018 pg/L, less than the surface water criterion of 0.0051 pg/L, within 10 feet.

Therefore, this modeling evaluation demonstrates that 2,3,7,8-TCDD concentrations in groundwater at the Site are protective of surface water and that soil at the Site containing dioxins/furans may remain on-site at a distance of greater than 10 feet from surface water features without posing a risk to adjacent surface waters, as described in Section 3.1.2.

Because of the impracticality of calculating a source area target concentration and because all of the groundwater results for 2,3,7,8-TCDD have been non-detections, it was determined that a source area target concentration is not a sufficient method for evaluating compliance. In January 2015, Ecology revised the Water Quality Program Permit Writer's Manual (Ecology 2015) and established a Practical Quantitation Limit (PQL) of 5 pg/L for 2,3,7,8-TCDD. However, the PQL for local laboratories that provide analysis of dioxins/furans in groundwater is 10 pg/L. Therefore, 10 pg/L will be used as the baseline compliance criterion for groundwater monitoring. Importantly, as described previously, even a groundwater concentration of 1 x 10^{54} mg/L would attenuate to a concentration that meets the CUL at the CPOC; therefore, the higher baseline compliance criterion would not constitute an exceedance; instead it would be a concentration of interest.

3.1.2 Soil Cleanup Levels

The rationale and development process for the soil CUL in the source area is consistent with the process used in the development of the cleanup standards described in the 2008 CAP (Ecology 2008). Because the Site meets the criteria for an industrial site (WAC 173-340-745) and will continue to do so by means of a deed restriction in the form of a restrictive covenant limiting the Site to industrial or other use consistent with industrial exposure assumptions, the MTCA Method C Industrial Criterion for dioxins/furans (1,680 pg/g) has been identified as the appropriate CUL for industrial use and worker exposure by direct contact with soil. To protect groundwater, the BIOSCREEN modeling demonstrated that on-site soil containing dioxins/furans may remain on-site at distances greater than 10 feet from the surface water features without posing a risk to adjacent surface waters. Consequently, it was determined that 1,680 pg/g is the appropriate CUL for the Site.

3.2 COMPLIANCE CRITERIA

Based on the results of the BIOSCREEN modeling, the PQL of 10 pg/L for 2,3,7,8-TCDD discussed in Section 3.1.1 will be used to assess compliance during the groundwater sampling of Shallow Aquifer monitoring wells. Only two monitoring wells in the Shallow Aquifer will be included in the compliance monitoring, as explained in the following subsections.

3.2.1 Shallow Aquifer

The Shallow Aquifer monitoring wells are Site perimeter wells located at least 40 feet from the perimeter ditches. For the purposes of compliance monitoring, two Shallow Aquifer monitoring wells will be sampled on a semi-annual basis (Figure A.2). These Shallow Aquifer compliance monitoring wells (MW-109(S) and MW-108(S)) are the only two Shallow Aquifer monitoring wells that are downgradient of areas that will have contamination remaining on-site at concentrations greater than the CUL. The PQL of 10 pg/L for 2,3,7,8-TCDD is suitable as a compliance criterion for assessing compliance and for protection of surface water bodies.

As discussed in the SFRI/SFFS (Floyd|Snider 2015), groundwater was analyzed for dioxins/furans in three wells installed in April 2014 by ERM-West, Inc. (ERM). 2,3,7,8-TCDD was not detected in any groundwater samples collected from wells EMW-7, EMW-9, or EMW-19; however, the reporting limits were greater than the surface water criteria of 0.0051 pg/L. Thus, the remaining Shallow Aquifer monitoring wells are already in compliance and, in the absence of ongoing source area contamination, continued compliance monitoring of these wells is not necessary.

3.2.2 Intermediate Aquifer

No compliance monitoring of groundwater in the Intermediate Aquifer is proposed, based on an understanding of the nature and extent of the on-site dioxin/furan contamination.

3.2.3 Deep Aquifer

No compliance monitoring of groundwater in the Deep Aquifer is proposed, based on an understanding of the nature and extent of the on-site dioxin/furan contamination.

3.3 PROCESS FOR ASSESSING COMPLIANCE

The following process will be used to assess compliance in the Shallow Aquifer compliance monitoring wells. Unless otherwise noted, this process will be used during the entire compliance monitoring period.

Shallow Aquifer compliance monitoring wells will be considered in compliance if the concentration of 2,3,7,8-TCDD in groundwater is less than the compliance criterion—equivalent to the PQL of 10 pg/L.

If a 2,3,7,8-TCDD concentration in groundwater is equal to or greater than the compliance criterion, additional action will be required. The compliance well will be resampled for confirmation within 4 weeks of receipt of the laboratory results, and the new sample will be tested. If the analytical result for the new sample does not exceed the compliance criterion, the well will be considered in compliance and regularly scheduled monitoring of the well will continue.

If the analytical result for the new sample exceeds the compliance criterion, the result will be reported to and discussed with the Washington State Department of Ecology (Ecology). Because an exceedance of the compliance criterion does not constitute an exceedance of the surface water criterion, the likely outcome will be continued confirmation monitoring. If an increasing trend is detected, i.e. increases of greater than 50 percent per sampling event for three consecutive sampling events, additional sampling may be required by Ecology. Any additional sampling would be discussed with and approved by Ecology prior to implementation.

3.4 COMPLIANCE MONITORING TYPES AND OBJECTIVES

In this section, the proposed methods of compliance described in this plan are defined and placed in the context of the MTCA requirements for compliance monitoring (WAC 173-340-410). MTCA requirements for compliance monitoring consist of evaluation monitoring, protection monitoring, performance monitoring, and confirmation monitoring. Evaluation monitoring will not be conducted at the Site because the Site has been the subject of decades of groundwater monitoring; it has an existing monitoring well network, and baseline chemical and hydrogeologic conditions have been well established.

3.4.1 Protection Monitoring

According to the MTCA requirements for compliance monitoring, the goal of protection monitoring is to confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of a cleanup action. The cleanup actions include removal of a minimal amount of soil, relocation of the removed soil, regrading and capping[1] of areas with dioxin/furan concentrations greater than the CUL, and groundwater monitoring to confirm continued compliance.

Protection monitoring will be conducted during both remedy construction and operation and maintenance activities to confirm the protection of human health and the environment. The requirements for protection monitoring will be described in Health and Safety Plans addressing worker activities during remedy construction and in the Cap Inspection and Maintenance Plan for future operations and maintenance associated with the constructed cleanup action. Any activities conducted at the Site after implementation of the cleanup action that have the potential to disturb capped areas will require adherence to the Cap Inspection and Maintenance Plan.

[1] As used in this document, capping refers to either an engineered cap or physical barrier (buildings, paved roads, etc.) that prevent wildlife from being exposed to contaminated soil, in conjunction with institutional controls. General characteristics of the cap are described in the SFRI/SFFS; the cap is described in greater detail in the CAP Amendment.

3.4.2 Performance Monitoring

According to the MTCA requirements, performance monitoring should confirm that the cleanup action has attained the cleanup standards or other performance standards. Performance monitoring activities will be conducted during construction of the Proposed Cleanup Action. Performance monitoring will consist of the following:

- Quality control (QC) monitoring for construction activities
- Monitoring during cap placement to confirm that the constructed caps meet design requirements

Because groundwater at the Site is already in compliance with the criterion presented in Section 3.2, performance monitoring for groundwater will not be conducted.

3.4.3 Confirmation Monitoring

According to the MTCA requirements, the purpose of confirmation monitoring is to confirm the long-term effectiveness of the action once the cleanup standards or other performance standards have been met. Groundwater at the Site is already in compliance with the groundwater compliance criterion presented in Section 3.2. After remedy completion, semi-annual groundwater monitoring will be conducted for 3 years to verify that the concentrations of 2,3,7,8-TCDD in groundwater continue to be in compliance. Compliance monitoring of groundwater will be conducted in the Shallow Aquifer compliance monitoring wells.

In addition to groundwater monitoring, long-term maintenance would be conducted to ensure the stability and effectiveness of the constructed cap. Maintenance would include regular observation for any problems or damage to the cap. Long-term maintenance in capped areas will be conducted for as long as contamination at concentrations greater than the CUL is present at the Site. Groundwater confirmation monitoring is discussed in further detail in Section 4.0.

3.4.4 Monitoring Well Inspection and Maintenance Procedures

Shallow Aquifer compliance monitoring wells will be inspected and maintained on an annual schedule as defined in Appendix A of the 2008 CMCP (Ecology 2008).

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4.0 Confirmation Monitoring

Shallow Aquifer compliance monitoring wells will be sampled during the confirmation monitoring phase. The objective of the confirmation monitoring is to demonstrate the long-term effectiveness of the cleanup action.

4.1 PROJECT TEAM AND RESPONSIBILITIES

To ensure consistency with prior Site groundwater monitoring events, Environmental Partners, Inc. (EPI) will conduct the sampling under the direction of Floyd|Snider. Analytical Resources, Inc. (ARI) in Tukwila, Washington, will be the primary analytical laboratory, performing dioxin/furan chemical analyses on all samples that are collected and submitted. EcoChem, Inc. (EcoChem) in Seattle, Washington, will perform third-party data validation on the dioxin/furan data generated by the field activities.

The responsibilities of key project personnel (project management, quality assurance [QA], and laboratory and data validation) are based on the current ownership and staffing and are defined in the following subsections.

4.1.1 Project Management Responsibilities

4.1.1.1 Ari Steinberg—SSA Project Manager

Mr. Ari Steinberg is the SSA Project Manager for this project. He will be involved in all aspects of the planning and implementation of the project.

4.1.1.2 Al Jeroue—SSA Site Manager

Mr. Al Jeroue is the SSA Site Manager and will be involved in many aspects of the planning and implementation of the project.

4.1.1.3 Stephen Bentsen—Floyd|Snider Project Manger

Mr. Stephen Bentsen will have overall responsibility for project implementation. As Project Manager, he will be responsible for the overall QA on this project to ensure that it meets the technical and contractual requirements. The Floyd|Snider Project Manager will report directly to the SSA Project Manager and is responsible for technical QC and project oversight. He will also support SSA in coordinating with Ecology.

4.1.2 Quality Assurance Responsibilities

4.1.2.1 Jenny Pracht—Floyd|Snider QA Manager

The Floyd|Snider QA Manager reports directly to the Floyd|Snider Project Manager and will be responsible for ensuring that all QA/QC procedures for this project are being followed. The

Floyd|Snider QA Manager will be responsible for laboratory coordination and managing data validation of all sample results from the analytical laboratories.

4.1.3 Laboratory and Data Validation Responsibilities

ARI will provide dioxin/furan analytical services. EcoChem will perform all data validation on all chemical data generated by the field activities. The project managers at ARI and EcoChem will be responsible for daily coordination with the Floyd|Snider QA Manager, as described in the following subsections.

4.1.3.1 Cheronne Oreiro—ARI Project Manager

The ARI Project Manager will report directly to the Floyd|Snider QA Manager and will be responsible for ensuring that all of the laboratory resources are available, advising Floyd|Snider on project status, reviewing and approving the final analytical reports, coordinating the internal laboratory analyses and in-house chain-of-custody procedures, and overseeing the data review.

4.1.3.2 Christine Ransom—EcoChem Project Manager

The EcoChem Project Manager will report directly to the Floyd|Snider QA Manager and will be responsible for determining the validity of the analytical data, in accordance with the analytical methods and data quality review guidance discussed in Section 5.0. The EcoChem Project Manager will advise Floyd|Snider on the project status and review and approve the final data validation report.

4.2 SAMPLE COLLECTION AND HANDLING PROCEDURES

4.2.1 Sample Labeling

For the groundwater sampling, the sample number format for all groundwater samples will be "SSA-GW-well number-month/day/year of collection." For example, a sample collected from Monitoring Well 105(S) on September 15, 2014, would be labeled "SSA-GW-105S-091514."

4.2.2 Monitoring Well Sampling

EPI will collect groundwater samples from all Shallow Aquifer compliance monitoring wells. The monitoring wells will be purged and sampled using low-flow sampling to achieve the lowest turbidity practicable with a peristaltic pump (or equivalent) and disposable polyethylene tubing.

To minimize turbidity, the monitoring wells will be purged before sampling at a flow rate of 0.1 liters per minute (L/min), if achievable, and up to a maximum of 0.25 L/min. Before and during sampling, depth to water will be measured to the nearest 0.01 foot using a water level indicator. During purging, field parameters (i.e., temperature, pH, conductivity, and turbidity) will be recorded at 3- to 5-minute intervals using a multi-parameter groundwater meter, or equivalent single parameter meters. Once the field measurements for turbidity and conductivity are approximately stable (within 10 percent) for three consecutive readings, a field-filtered sample will be collected. Because these field parameters may not reach the stabilization criteria, the timing of the collection of the groundwater sample will be based on the professional judgment of the field personnel at the time of sampling. The last set of field parameters measured during purging will represent the field parameters for the particular groundwater sample. All field measurements will be recorded on a groundwater sample collection form. The labeled groundwater samples will be immediately placed in a cooler packed with ice and transported to the laboratory for 2,3,7,8-TCDD analysis.

4.2.2.1 Field Filtering Rationale

It is well known that turbidity in groundwater samples can cause false detections or elevated concentrations of metals in water samples due to the presence of metals sorbed to the surface of small suspended solids particles in the water.

Each sample will be field filtered with an in-line 0.2-micron (micrometer [µm]) polycarbonate membrane filter and collected directly into laboratory-provided bottles. Filtration through a 0.2-µm polycarbonate membrane filter and low-flow sampling can effectively remove suspended solids that might contain adsorbed dioxin/furan compounds to achieve more reliable and representative dioxin/furan results in groundwater samples (Persson et al. 2008).

4.2.3 Sample Documentation

Field notes and groundwater collection forms will be maintained during sampling activities and include the following information:

- Monitoring well and sample number
- Weather conditions
- Field parameters, as described in Section 4.2.2.
- Date and time of collection of each sample
- Names of field person(s) who collected each sample
- Any deviations from the approved CMCP Amendment

4.2.4 Sampling Equipment Decontamination

Field sampling equipment for reuse, such as the water level indicator, will be cleaned before the sampling begins and between each sampling location. Decontamination will be performed before each sample is collected, in accordance with the following the procedure:

1. Wash with brush and Alconox soap.
2. Rinse with clean tap water.
3. Rinse with distilled water.

Disposable field sampling equipment (e.g., nitrile gloves, filters) are considered single use and will not be reused.

4.2.5 Disposal of Investigation-Derived Waste

Waste generated during sample collection will be managed and disposed of in accordance with applicable waste management regulations. Investigation-derived waste (IDW) includes the following:

- Decontamination wash water
- Monitoring well purge water
- Disposable materials used during field work that may be impacted by contaminated media or decontamination wash water (e.g., disposable personal protective equipment [PPE], paper towels, etc.)

For IDW that is containerized (decontamination wash water and monitoring well purge water), a 55-gallon drum approved by the Washington State Department of Transportation will be used for temporary storage, pending disposal. Each container holding IDW will be sealed and labeled with its contents, the dates on which the wastes were placed in the container, the owner's name and contact information for the field person who generated the waste, the site name, and the well from which the waste was obtained or extracted.

All disposable sampling materials and PPE used in sample processing will be placed in heavy-duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system.

4.2.6 Health and Safety

All of the described field investigation activities will be conducted in accordance with the previously developed site-specific Health and Safety Plan.

4.3 LABORATORY ANALYSES

The analytical results will be compared to the applicable MTCA criteria (Table A.1).

4.3.1 Laboratory Analytical Protocols

The analytical protocols, including the sample holding time and the method detection limit, will be in accordance with the MTCA requirements. The analytical method, target detection limit, and target reporting limit are provided in Table A.1. The analytical requirement, analytical method, sample preservation, bottle type, and sample holding time are provided in Table A.2.

4.3.2 Specific Dioxin/Furan Data Analyses and Considerations

Dioxins/furans are typically analyzed by either U.S. Environmental Protection Agency (USEPA) Method 8290 or USEPA Method 1613. Both methods use high-resolution gas chromatography/mass spectrometry and are able to meet low reporting limits. In Washington State, USEPA Method 1613 is commonly used for the analysis of dioxins/furans. Therefore, USEPA Method 1613 will be used for the analysis of 2,3,7,8-TCDD.

4.3.3 Quality Assurance/Quality Control

Surrogates will be required (organics only) for every sample, including matrix spike (MS) samples, blanks, laboratory control samples (LCSs), and standard reference materials. MS/matrix spike duplicates (MSDs) will be required for every 20 samples received.

All samples will be diluted and reanalyzed if the target compounds are detected at concentrations that exceed their respective established calibration ranges. Any cleanups will be conducted prior to the dilutions. Reanalyses will be performed if surrogate, internal standard, or spike recoveries are outside of the data quality objective (DQO) parameters. QC samples may be reanalyzed if results are not within the control limits and it cannot be determined that the sample matrix is the cause.

4.3.4 Written Laboratory Report

A written laboratory report will be prepared by the analytical laboratory to document all the activities associated with the sample analyses. At a minimum, the following will be included in the report:

- Project analytical narrative
- Results of the laboratory analyses, QA/QC results, and data validation
- All protocols used during the analyses
- Chain-of-custody information, including an explanation of any deviation from those identified herein.
- Any protocol deviations from the approved sampling plan
- Location and availability of data

4.4 LABORATORY QUALITY ASSURANCE OBJECTIVES

The overall QA objective is to specify laboratory procedures for ensuring that data quality is maintained for field sampling, chain-of-custody, laboratory analyses, and reporting.

4.4.1 Laboratory Data Quality Objectives

The DQOs are to obtain the type and quantity of data in a manner such that the data are of known, appropriate, and sufficient quality to support the intended use. Analytical DQOs include obtaining data that are technically sound and properly documented, having been evaluated against established criteria for the principle data quality indicators (i.e., precision, accuracy, representativeness, completeness, and comparability) as defined in Ecology and USEPA guidance (Ecology 2004; USEPA 1998). The data QA criteria are presented in Table A.3.

The quality of the analytical data generated is assessed by the frequency and type of internal QC checks developed for analysis type. The laboratory results will be evaluated by reviewing the analytical results for method blanks, MS samples, duplicate samples, LCSs, calibrations, performance evaluation samples, and interference checks as specified by the specific analytical methods.

4.4.2 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, precision is a quantitative measure of the variability of a group of measurements compared to their average values. Analytical precision is measured through MS/MSD samples for organic analysis and through laboratory duplicate samples for inorganic analyses.

Analytical precision measurements will be carried out on project-specific samples at a minimum frequency of 1 per laboratory analysis group or 1 in 20 samples, whichever is more frequent per matrix analyzed, as practical. Laboratory precision will be evaluated against quantitative relative percent difference (RPD) performance criteria. The acceptable ranges of RPD applied to this project vary by analyte according to the USEPA Contract Laboratory Program National Functional Guidelines. Analytes with RPDs outside the acceptable range will be qualified, using professional judgment, with a “J” as an estimated concentration.

Field precision will be evaluated by the collection of blind field duplicates at a minimum frequency of 1 per laboratory analysis group or 1 in 20 samples.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit, where the percent error (expressed as RPD) increases. The equations used to express precision are as follows:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{\frac{(C_1 + C_2)}{2}}$$

Where:

RPD = relative percent difference

C_1 = larger of the two observed values

C_2 = smaller of the two observed values

4.4.3 Accuracy

Accuracy is an expression of the degree to which a measured or computed value represents the true value. Analytical accuracy may be assessed by analyzing “spiked” samples with known standards (surrogates, LCSs, and/or MS samples) and measuring the percent recovery. Accuracy measurements on MS samples will be carried out at a minimum frequency of 1 in 20 samples per matrix analyzed. Because MS/MSDs measure the effects of potential matrix interferences of a specific matrix, the laboratory will perform MS/MSDs analysis only on samples from this investigation and not from other projects. Surrogate recoveries will be determined for every sample analyzed for organics. The acceptable accuracy ranges for the analytes included in this investigation are presented in Table A.3. Should the percent recoveries be outside the acceptable range, using professional judgment, data may be J-flagged as estimated concentrations.

Laboratory accuracy will be evaluated against quantitative LCS, MS, and surrogate spike recoveries using limits for each applicable analyte. Accuracy can be expressed as a percentage of the true or reference value, or as a percent recovery in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

$$\%R = 100\% \times \frac{(S-U)}{C_{sa}}$$

Where:

%R = percent recovery
S = measured concentration in the spiked aliquot
U = measured concentration in the unspiked aliquot
C_{sa} = actual concentration of spike added

4.4.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Care will be taken in the design of the sampling program to ensure that sampling locations are selected properly, sufficient numbers of samples are collected to accurately reflect conditions at the location(s), and samples are representative of the sampling location(s). A sufficient volume of sample will be collected at each sampling location to minimize bias or errors associated with sample particle size and heterogeneity.

4.4.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another. In order to ensure that results are comparable, samples will be analyzed using standard USEPA methods and protocols. Calibration and reference standards will be traceable to certified standards and standard data reporting formats will be used. Data will also be reviewed to verify that precision and accuracy criteria were achieved and, if not, that data were appropriately qualified.

4.4.6 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

$$C = \frac{(Number\ of\ acceptable\ data\ points) \times 100}{(Total\ number\ of\ data\ points)}$$

The DQO for completeness for each component of this project is 95 percent. Data that were qualified as estimated because the QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that were qualified as rejected will not be considered valid for the purpose of assessing completeness.

4.4.7 Laboratory Quality Control Procedures

Laboratory Quality Control Criteria. Results of the QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine whether control limits were exceeded. If control limits were exceeded in the sample group, corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated before a subsequent group of samples is processed.

All primary chemical standards and standard solutions used in this project will be traceable to documented and reliable commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities identified in the standard will be documented.

The following paragraphs summarize the procedures that will be used to assess data quality throughout the sample analysis.

Laboratory Duplicates. Analytical duplicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates are subsamples of the original sample that are prepared and analyzed as a separate sample. A minimum of 1 duplicate will be analyzed per sample group or 1 for every 20 samples, whichever is more frequent.

Matrix Spikes and Matrix Spike Duplicates. Analysis of MS samples provides information on the extraction efficiency of the method on the sample matrix. By performing MSD analyses, information on the precision of the method is also provided for organic analyses. A minimum of 1 MS/MSD will be analyzed per sample group or 1 for every 20 samples, whichever is more frequent.

Laboratory Control Samples. An LCS is a method blank sample carried throughout the same process as the samples to be analyzed, with a known amount of standard added. The blank spike compound recovery assesses analytical accuracy in the absence of any sample heterogeneity or matrix effects.

Surrogate Spikes. All project samples analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined in the analytical methods. Surrogate recoveries will be reported by the laboratories; however, no sample result will be corrected for recovery using these values.

Method Blanks. Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. A minimum of 1 method blank will be analyzed per extraction batch or 1 for every 20 samples, whichever is more frequent.

4.5 CONFIRMATION MONITORING SCHEDULE

The confirmation monitoring frequency will be semi-annually for 3 years after successful completion of the cleanup action.

4.6 CONFIRMATION MONITORING REPORTING REQUIREMENTS

During the 3 years of confirmation monitoring, groundwater monitoring reports will be submitted to Ecology on an annual basis. Each report will contain a summary table, laboratory data reports validated at Level 4 (refer to Section 5.0), and a summary evaluation of groundwater monitoring results relative to the compliance criteria and other contingency plan triggers. Results will be submitted to Ecology's Environmental Information Management (EIM) database.

After 3 years of semi-annual confirmation monitoring, if there have been no detections at concentrations greater than the compliance criteria and no additional monitoring has been required by Ecology, the confirmation monitoring will be discontinued at the Site. The third annual report will contain a summary of all 3 years of compliance data and conclusions related to the discontinuation of monitoring.

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5.0 Data Evaluation and Management

5.1 DATA VALIDATION

Floyd|Snider will review the laboratory reports for internal consistency, transmittal errors, laboratory protocols, and adherence to the DQOs as specified in this CMCP Amendment. A Stage 4 Full Validation will be performed by EcoChem for all 2,3,7,8-TCDD data.

A Stage 4 Full Validation includes the following:

- Evaluation of package completeness
- Verification that sample numbers and analyses match those requested on the Chain-of-Custody Form
- Review of method-specified preservation and sample holding times
- Verification that the required detection limits and reporting limits have been achieved
- Verification that the field duplicates, MS/MSDs, and LCSs were analyzed at the proper frequency
- Verification of analytical precision and accuracy via replicate analysis and analyte recoveries
- Verification that the surrogate compound analyses have been performed and meet QC criteria
- Verification that the laboratory method blanks are free of contaminants
- Review of instrument performance—initial calibration, continuing calibration, tuning, sensitivity, and degradation
- Recalculation of instrument and sample results from the raw data
- Evaluation of the instrument outputs for confirmation of correct identification and quantitation of analytes (e.g., peak integrations, use of appropriately labeled compounds, retention times, ion ratios, and interferences)

Data validation will be based on the QC criteria as recommended in the methods identified in this CMCP Amendment and in the National Functional Guidelines for Organic and Inorganic Data Review (USEPA 2008 and 2010). The 2,3,7,8-TCDD data will also be evaluated using the *USEPA Region 10 SOP for Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data* (USEPA 1996).

Data usability, conformance with the DQOs, and any deviations that may have affected the quality of the data, as well as the basis for the application of qualifiers, will be included in the final reporting of the data. Any required corrective actions based on the evaluation of the analytical data will be determined by the ARI Project Manager and EcoChem Project Manager in consultation with the Floyd|Snider QA Manager and may include qualification or rejection of the data.

5.2 DATA MANAGEMENT AND EVALUATION

All groundwater quality results from the confirmation monitoring will be managed in an electronic database and submitted to Ecology's EIM database.

Analytical data from confirmation monitoring activities will be subjected to Level 4 verification and reviewed in accordance with the USEPA functional guidelines for data validation (USEPA 1999). The goal of the more intensive data validation procedure is to provide more defensible monitoring results to support the planned cessation of compliance at the end of the confirmation monitoring. The results will be reported for each event in regular monitoring reports.

6.0 References

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Cleanup Action Plan Amendment

Appendix A
Compliance Monitoring and Contingency Plan Amendment

Tables

Table A.1
Parameter for Analysis, Analytical Method, Detection Limit, and Reporting Limit

Parameter	Analytical Method	Detection Limit	Reporting Limit (PQL)[1]
Groundwater Samples			
2,3,7,8-TCDD	USEPA 1613	5 pg/L	10 pg/L

Note:
1 Reporting limit is method PQL from Analytical Resources, Inc., laboratory in Tukwila, Washington.

Abbreviations:
pg/L Picograms per liter
PQL Practical quantitation limit
TCDD Tetrachlorodibenzo-p-dioxin
USEPA U.S. Environmental Protection Agency

Table A.2
Parameter for Analysis, Analytical Method, Bottle Type, Preservative, and Holding Time

Parameter	Analytical Method	Bottle Type	Preservative	Holding Time
Groundwater Samples				
2,3,7,8-TCDD	USEPA 1613	Two 1-liter amber glass jars	None, cool to 4 degrees Celsius	1 year

Abbreviations:
TCDD Tetrachlorodibenzo-p-dioxin
USEPA U.S. Environmental Protection Agency

Table A.3
Data Quality Assurance Criteria

Parameter	Matrix	Units	Reporting Limit/PQL[1]	Precision	Accuracy	Completeness	Reference
Groundwater Samples							
2,3,7,8-TCDD	Water	pg/L	10	± 30%	± 30%	95%	USEPA Method 1613

Note:

1 Reporting limit is method PQL from Analytical Resources, Inc., laboratory in Tukwila, Washington.

Abbreviations:

pg/L Picograms per liter
PQL Practical quantitation limit
TCDD Tetrachlorodibenzo-p-dioxin
USEPA U.S. Environmental Protection Agency

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Appendix A
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Figures

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Figure A.1
Vicinity Map

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Figure A.2
Shallow Aquifer Compliance Monitoring Wells and Surface Water Features

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Appendix B
Area A Pre-Excavation Extent Investigation
Sampling and Analysis Plan and
Quality Assurance Project Plan

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List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
ARI	Analytical Resources, Inc.
bgs	Below ground surface
CUL	Cleanup level
DQO	Data quality objective
EcoChem	EcoChem, Inc.
Ecology	Washington State Department of Ecology
IDW	Investigation-derived waste
LCS	Laboratory control samples
MS	Matrix spike

Acronym/ Abbreviation	Definition
MSD	Matrix spike duplicate
MTCA	Model Toxics Control Act
pg/g	Picograms per gram
PPE	Personal protective equipment
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RPD	Relative percent difference
SAP	Sampling and Analysis Plan
SFFS	Supplemental Focused Feasibility Study
SFRI	Supplemental Focused Remedial Investigation
Site	Reichhold/SSA Containers Facility
SSA	SSA Tacoma, Inc.
TCDD	Tetrachlorodibenzo-p-dioxin
TEF	Toxicity equivalency factor
TEQ	Toxic equivalency
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

1.0 Introduction

This Area A Pre-Excavation Extent Investigation Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) was prepared by Floyd|Snider on behalf of SSA Tacoma, Inc. (SSA) for the Reichhold/SSA Containers Facility (Site) located at 3320 Lincoln Avenue in Tacoma, Washington (Figure B.1). This SAP/QAPP describes field and analytical procedures for conducting compliance sampling of soils prior to proposed Area A excavation activities presented in the Supplemental Focused Remedial Investigation/Supplemental Focused Feasibility Study (SFRI/SFFS; Floyd|Snider 2015).

This document was developed in accordance with the Washington State Model Toxics Control Act (MTCA) sampling and analysis plan requirements found in Washington Administrative Code (WAC) 173-340-820. Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses are described herein. All quality assurance/quality control (QA/QC) procedures are structured in accordance with MTCA Cleanup Regulation (WAC 173-340).

1.1 PROJECT BACKGROUND AND PURPOSE

The Site is the location of a former chemical manufacturing plant located at 3320 Lincoln Avenue in Tacoma, Washington, and numerous corrective actions have been performed at the Site since 1986 by the former and current owners. In November 2015, a SFRI/SFFS was prepared and submitted to the Washington State Department of Ecology (Ecology) in accordance with the First Amendment to Consent Decree No. 08-2-15781-0 (Ecology 2015a) to address dioxin/furan soil contamination at the Site. The SFRI/SFFS provided the basis for Ecology and SSA to select the Proposed Cleanup Action Alternative. The Proposed Cleanup Action Alternative includes excavation of dioxin/furan-contaminated soil in six areas within Area A and relocation of this material to Area B, where it will be capped. Following excavation, each of the six areas will be backfilled with clean imported material and compacted.

The six areas with dioxins/furans toxic equivalency (TEQ) concentrations that exceed the MTCA Method C Industrial Criterion of 1,680 picograms per gram (pg/g) are shown on Figure B.2 along with the existing dioxin/furan data within Area A. Five of the areas are estimated to be approximately 20 feet by 20 feet, and one is approximately 30 feet by 30 feet. Contaminated soil is present from the ground surface to 7.0 feet below ground surface (bgs). Within these six areas, dioxins/furans were detected at concentrations ranging from 2,010 pg/g to 91,900 pg/g, which will require excavation. However, sufficient data do not exist to define the lateral extent of contamination. In addition, the vertical extent of contamination has not been defined in two areas (A2 and A4).

Laboratory analysis of dioxins/furans takes approximately 3 weeks for each sample. In order to expedite the excavation and eliminate the duration that the excavation remains open, an Area A pre-excavation extent investigation described in this SAP/QAPP will be conducted prior to construction. The activities described in this SAP/QAPP will provide compliance sampling to verify that these areas will be excavated to extents sufficient to ensure that remaining soil contains dioxins/furans TEQ concentrations less than the cleanup level (CUL).

The results of these samples and existing data will be presented to Ecology in an Area A Cleanup Action Work Plan, which will identify the horizontal and vertical extents of the excavations.

1.2 SAMPLING APPROACH

1.2.1 Sidewall Samples

In general, samples will be collected at locations representing the anticipated base and sidewalls of excavation Areas A1 through A6. The sidewall samples will be analyzed immediately following collection, and are designated as “Tier 1” samples. Samples will also be collected from “stepped-out” locations (“Tier 2” and “Tier 3”), which are spaced on a 10-foot grid outward from the anticipated sidewalls. Tier 2 and Tier 3 samples will be archived by the laboratory for future analysis. Tier 2 samples will be analyzed if the results of Tier 1 sample analysis indicate that dioxin/furan TEQ concentrations exceed the CUL, and Tier 3 samples will be analyzed if Tier 2 results exceed the CUL.

One composite sample will be collected from each sidewall at a depth that straddles the greatest dioxin/furan TEQ concentration detected in previous investigations. The composite sample will be composed of aliquots collected from 6-inch intervals obtained from the Geoprobe core. The range of the 6-inch intervals will be based upon the depth of the greatest dioxin/furan TEQ concentration and the depth of contamination, if known. The aliquots will be spaced equally above and below the depth of the previous greatest TEQ detection. Composite soil collected from these 6-inch intervals will be homogenized thoroughly in a decontaminated stainless steel bowl prior to collecting the composite sample.

1.2.2 Base Samples and Aquitard

Base samples will be collected in Areas A2 and A4, in which the maximum depth of contamination is not known. Base sample depth intervals in those areas are based on existing data and the depth of the aquitard according to the borings logs. Soil boring logs indicate that an aquitard is encountered at various depths between 4.0 and 7.0 feet bgs throughout the property, which has been determined in previous investigation and remediation efforts at the Site to act as a barrier that prevents downward contaminant migration. Therefore, the aquitard represents the maximum depth that each area will be excavated.

1.2.3 Sampling Approach Guidelines

Generally, the following criteria will be used as guidelines to determine the sampling approach for each excavation area:

- A minimum of one sample will be collected from each sidewall.

- Sidewall samples will be collected at a frequency of one sample for every 30 lineal feet of sidewall.
- A minimum of one sample will be collected from the excavation base, where base sampling is determined necessary.

Figures B.3 through B.8 show Tier 1, Tier 2, and Tier 3 sample locations for each excavation area. Depths and sampling rationale for each excavation area are described in further detail in the following sections.

1.2.4 Excavation Area A1

Figure B.3 shows the anticipated excavation limits of Area A1, the Tier 1, Tier 2, and Tier 3 proposed boring locations, and the analytical results from previous investigations. The anticipated excavation limits of Area A1 are 20 feet by 20 feet. Results from the previous investigations indicate that the greatest dioxin/furan TEQ concentration was detected at SB-20/EMW-9 at 3.5 feet bgs. Therefore, sidewalls will be sampled by collecting an aliquot of soil every 6 inches within an interval between 1.5 and 5.5 feet bgs and homogenized in a stainless steel bowl. This will be the process for all Tier 1, Tier 2, and Tier 3 boring locations. At the same location, a TEQ concentration less than the CUL was encountered at a depth of 6.0 to 8.0 feet bgs. Therefore, Area A1 will be excavated to a depth of 6.0 feet bgs and additional base samples will not be collected because existing data indicate that this area is clean at 6.0 feet bgs.

Tier 1 samples will be analyzed immediately and Tier 2 and 3 samples will be archived and analyzed dependent upon the results of the Tier 1 samples.

1.2.5 Excavation Area A2

Figure B.4 shows the anticipated excavation limits of Area A2, the Tier 1, Tier 2, and Tier 3 proposed boring locations, and the analytical results from previous investigations. The anticipated excavation limits of Area A2 are 20 feet by 20 feet. Results from the previous investigations indicate that an elevated dioxin/furan TEQ concentration was detected at A-10 at 1.5 to 2.0 feet bgs. Therefore, sidewalls will be sampled by collecting an aliquot of soil every 6 inches within an interval between 0.5 and 3.5 feet bgs and homogenized in a stainless steel bowl. This will be the process for all Tier 1, Tier 2, and Tier 3 boring locations. Tier 1 samples will be analyzed immediately and Tier 2 and 3 samples will be archived and analyzed dependent upon the results of the Tier 1 samples.

Because a clean bottom sample was not obtained within Area A2, base samples will be collected from a soil boring located within the center of Area A2 at the 3.0- to 3.5-foot, 4.0- to 4.5-foot, and 5.0- to 5.5-foot bgs depth intervals. The 4.0- to 4.5-foot bgs and 5.0- to 5.5-foot bgs depth intervals will be archived and will only be analyzed if the 3.0- to 3.5-foot sample results indicate that the TEQ concentration exceeds the CUL. The aquitard was encountered at a depth of 6.5 feet bgs in boring location A-10. Therefore, the anticipated maximum depth of Area A2 will be 6.5 feet bgs.

1.2.6 Excavation Area A3

Figure B.5 shows the anticipated excavation limits of Area A3, the Tier 1, Tier 2, and Tier 3 proposed boring locations, and the analytical results from previous investigations. The anticipated excavation limits of Area A3 are 20 feet by 20 feet. Results from the previous investigations indicate that the greatest dioxin/furan TEQ concentration was detected at SB-11/EMW-5 between 0.3 and 2.0 feet bgs. Therefore, sidewalls will be sampled by collecting an aliquot of soil every 6 inches within an interval between 0.5 and 3.5 feet bgs and homogenized in a stainless steel bowl. This will be the process for all Tier 1, Tier 2, and Tier 3 boring locations. At the same location, a TEQ concentration less than the CUL was encountered at a depth of 2.0 to 6.0 feet bgs. Therefore, Area A3 will be excavated to a depth of 4 feet bgs and additional base samples will not be collected because existing data indicate that this area is clean at 4 feet bgs.

Tier 1 samples will be analyzed immediately and Tier 2 and 3 samples will be archived and analyzed dependent upon the results of the Tier 1 samples.

1.2.7 Excavation Area A4

Figure B.6 shows the anticipated excavation limits of Area A4, the Tier 1, Tier 2, and Tier 3 proposed boring locations, and the analytical results from previous investigations. The anticipated excavation limits of Area A4 are 20 feet by 20 feet. Results from the previous investigation indicate that the greatest dioxin/furan TEQ concentration was detected at SB-12 between 2.0 and 3.0 feet bgs. Therefore, sidewalls will be sampled by collecting an aliquot of soil every 6 inches within an interval between 1.0 and 4.0 feet bgs and homogenized in a stainless steel bowl. This will be the process for all Tier 1, Tier 2, and Tier 3 boring locations. Tier 1 samples will be analyzed immediately and Tier 2 and 3 samples will be archived and analyzed dependent upon the results of the Tier 1 samples.

Base samples will be collected from a Tier 1 sample location because existing data from sample EX-31 may lie outside the excavation footprint. Base samples will be from a soil boring located within the center of Area A4 and collected in the 3.5- to 4.0-foot, 4.0- to 4.5-foot, and 5.0- to 5.5-foot bgs depth intervals. The 4.0- to 4.5-foot bgs and 5.0- to 5.5-foot bgs depth intervals will be archived and will only be analyzed if the 3.5- to 4.0-foot sample results indicate that concentrations exceed the CUL. The aquitard was encountered at a depth of 6.0 feet bgs in boring location EX-31. Therefore, the anticipated maximum depth of Area A4 will be 6.0 feet bgs.

1.2.8 Excavation Area A5

Figure B.7 shows the anticipated excavation limits of Area A5, the Tier 1, Tier 2, and Tier 3 proposed boring locations, and the analytical results from previous investigations. The anticipated excavation limits of Area A5 are 20 feet by 20 feet. Results from the previous investigation indicate that the greatest dioxin/furan TEQ concentration was detected at SB-19 between 0 and 2.0 feet bgs. Therefore, sidewalls will be sampled by collecting an aliquot of soil every 6 inches within an interval between 0.5 and 3.0 feet bgs and homogenized in a stainless steel bowl. This will be the process for all Tier 1, Tier 2, and Tier 3 boring locations. At the same location, TEQ concentrations less than the CUL were encountered at depths of 2.0 to 4.0 feet bgs and 4.0 to 4.5 feet. Therefore, Area A5 will be excavated to a depth of 3.0 feet and additional base samples will not be collected because existing data indicate that this area is clean at 3.0 feet bgs.

Tier 1 samples will be analyzed immediately and Tier 2 and 3 samples will be archived and analyzed dependent upon the results of the Tier 1 samples.

1.2.9 Excavation Area A6

Figure B.8 shows the anticipated excavation limits of Area A6, the Tier 1, Tier 2, and Tier 3 proposed compliance sample locations, and the analytical results from the previous investigations. The anticipated excavation limits of Area A6 are 30 feet by 30 feet. Results from the previous investigation indicate that the greatest dioxin/furan TEQ concentration was detected at A-20 between 3.0 and 3.5 feet bgs. Therefore, sidewalls will be sampled by collecting an aliquot of soil every 6 inches within an interval between 1.0 and 5.5 feet bgs and homogenized in a stainless steel bowl. This will be the process for all Tier 1, Tier 2, and Tier 3 boring locations. At the same location, a TEQ concentration less than the CUL was encountered at a depth of 6.0 to 6.5 feet bgs. Therefore, Area A6 will be excavated to a depth of 6.0 feet and additional base samples will not be collected because existing data indicate that this area is clean at 6.0 feet bgs. In addition, the aquitard was encountered at depths of 6.5 and 7.0 feet bgs in borings A-20 and A-23.

Tier 1 samples will be analyzed immediately and Tier 2 and 3 samples will be archived and analyzed dependent upon the results of the Tier 1 samples.

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2.0 Project Team and Responsibilities

On behalf of SSA, Floyd|Snider will perform field activities identified in this SAP/QAPP as part of proposed Area A excavation activities presented in the SFRI/SFFS at the Site. Analytical Resources, Inc. (ARI) in Tukwila, Washington, will be the primary analytical laboratory, performing dioxin/furan chemical analyses on all samples that are collected and submitted during the Area A Pre-Excavation Extent Investigation. EcoChem, Inc. (EcoChem) in Seattle, Washington, will perform third-party data validation on dioxin/furan data generated by field activities.

The various project management, QA, laboratory, data validation, and field responsibilities of key project personnel are defined below.

2.1 MANAGEMENT RESPONSIBILITIES

2.1.1 Ari Steinberg—SSA Project Manager

Mr. Ari Steinberg is the SSA Project Manager for this project. He will be involved in all aspects of the planning and implementation of the project.

2.1.2 Al Jeroue—SSA Site Manager

Mr. Al Jeroue is the SSA Site Manager and will be involved in many aspects of the planning and implementation of the project. As Site Manager, he will work closely with the field team during completion of the Area A Pre-Excavation Extent Investigation.

2.1.3 Stephen Bentsen—Floyd|Snider Project Manger

Mr. Stephen Bentsen will have overall responsibility for project implementation. As Floyd|Snider Project Manager, he will be responsible for the overall QA on this project to ensure that it meets technical and contractual requirements. Mr. Bentsen will report directly to SSA's Project Manager and is responsible for technical QC and project oversight. He will also support SSA in coordinating with Ecology. Following plan approval by Ecology, Mr. Bentsen will be responsible for coordination to assure timely and successful completion of the sampling and analysis project.

2.2 QUALITY ASSURANCE RESPONSIBILITIES

2.2.1 Lisa Meoli—Floyd|Snider QA Manager

As the Floyd|Snider QA Manager, Ms. Lisa Meoli reports directly to the Floyd|Snider Project Manager and will be responsible for ensuring that all QA/QC procedures for this project are being followed. She will be responsible for laboratory coordination and managing data validation of all sample results from the analytical laboratories.

2.3 LABORATORY AND DATA VALIDATOR RESPONSIBILITIES

ARI will perform dioxin/furan analytical services in support of the Area A Pre-Excavation Extent Investigation. EcoChem will provide all data validation on all chemical data generated by field activities. The following project managers will be responsible for daily coordination, as described below, with the Floyd|Snider QA Manager.

2.3.1 Cheronne Oreiro — ARI Project Manager

The ARI Project Manager will report directly to the Floyd|Snider QA Manager and will be responsible for ensuring all resources of the laboratory are available, advising Floyd|Snider on status, reviewing and approving final analytical reports, coordinating internal laboratory analyses and in-house chain-of-custody procedures, and overseeing data review.

2.3.2 Christine Ransom—EcoChem Project Manager

The EcoChem Project Manager will report directly to the Floyd|Snider QA Manager and will be responsible for determining the validity of collected analytical data, in accordance with the analytical methods and data quality review guidance. The EcoChem Project Manager will advise Floyd|Snider on the status, review, and approval of the final data validation report.

2.4 FIELD RESPONSIBILITIES

2.4.1 Gabe Cisneros—Floyd|Snider Field QA Officer

As the Floyd|Snider Field QA Officer, Mr. Gabe Cisneros will be responsible for leading and coordinating the day-to-day activities in the field. Mr. Cisneros will report directly to the Floyd|Snider Project Manager and will provide overall direction for the field sampling in terms of logistics, personnel assignments, and field operations. He will supervise collection of the field samples and will be responsible for accurate sample positioning; recording sample locations, depths, and identification; ensuring conformance to sampling and handling requirements including field decontamination procedures; physical evaluation and logging of the samples; and ensuring chain-of-custody of the samples.

3.0 Sample Collection and Handling Procedures

3.1 POSITION METHODOLOGY

Approximately 16 soil borings are proposed per area, and locations are shown on Figures B.2 through B.8 for a total of 96 locations. Sampling locations will be measured and marked in the field using a global positioning system (GPS) unit in latitude and longitude referenced to the North American Datum of 1983 (NAD 83) to the nearest 0.1 second. The accuracy of measured and recorded horizontal coordinates will be within ±2 meters.

A private utility location service will be utilized prior to the investigation at the time of location marking. A public utility location notification will be completed in accordance with state law, at least 3 business days prior to the start of the investigation. Public utility locate information will be provided to the drilling contractor prior to the start of work.

Vertical elevations within each boring location will be measured directly based on depth sampled compared to ground surface. Depths below ground surface can typically be determined within approximately 0.1 foot.

3.2 SAMPLING FIELD PROCEDURES, NOMENCLATURE, AND COLLECTION

To verify the vertical and lateral depth of dioxin/furan impacts within the vicinity of all six areas (A1 through A6), 96 soil borings will be advanced radially outward by direct-push methods to a maximum depth of 8.0 feet bgs, depending on known contamination extent and aquitard depth. All borings will be monitored and recorded by a field technician. Soil samples will be described and classified according to the United Soil Classification System and photographed. When using direct-push technology, soil intervals will be collected continuously using a 5-foot-long sampler and continuously logged.

To collect clean, continuous soil cores, two sets of rods are used. The first set of rods is driven into the ground and acts as an outer casing, which eliminates the chance for cross-contamination. The second, smaller set of rods are placed within the outer casing. The smaller rods hold a clean, expendable sample liner in place and both are driven downward with the outer casing in 5-foot intervals. The smaller rods are retracted and recovered with the 5-foot interval of soil contained within the liner. A schematic of the sampling system including the casing, rods, and liner are shown on Attachment B.1. Sample interval collection will start at the ground surface and the maximum depth varies with each area. This boring methodology will allow for observation and delineation of the stratigraphy and the aquitard.

3.2.1 Soil Field Screening Procedures

Soil samples will be screened visually for the presence of staining, sheens, odors, or anthropogenic materials such as slag, metal fragments, and woody debris. Photographs of the soil will also be taken. For the purpose of health and safety, select intervals potentially contaminated with volatile constituents will be screened using a photoionization detector.

3.2.2 Sampling Nomenclature

For each excavation area (A1 through A6), up to 16 borings will be advanced, and each individual boring will be assigned a unique alphanumeric identifier, numbers 1 through 16. The naming convention that will be used for the compliance samples is described in the example below. This example describes a soil sample collected at soil boring location 9 in excavation area A3 from 0.5 to 3.5 feet bgs.

[excavation area number].[soil boring number] [depth interval]

"A3.9 0.5-3.5"

3.3 SAMPLE COLLECTION AND HANDLING

Logs and field notes of all samples will be maintained during sampling activities. The following will be included in all sampling logs and field notes:

- The sample boring number as derived from this SAP/QAPP.
- Weather conditions.
- Soil sample depth, soil description, recovery, presence of debris on boring logs.
- Date and time of collection of each sample.
- Names of field person(s) collecting and logging in the sample.
- Presence of sheen or any other indications of contamination such as odor.
- Any deviation from the approved SAP/QAPP.

Following sample collection, soil will be placed into laboratory-supplied sample containers with the lid tightly sealed, and the containers labeled and placed in a cooler packed with ice. An 8-ounce jar is sufficient to provide enough material for dioxin/furan analysis. Standard chain-of-custody procedures will be implemented for all sampling events.

3.4 SAMPLING EQUIPMENT DECONTAMINATION

When possible, disposable sampling equipment such as plastic spoons and bowls will be used for sample collection, as dioxins/furans have the potential to adsorb onto materials. Field sampling equipment for reuse will be cleaned before the start of work and will be cleaned between each sampling location. Decontamination will be performed before each sample is collected, in accordance with this SAP/QAPP and standard good practices, following the procedure below:

1. Water rinse or spray to dislodge remaining soils from previous sample location.
2. Wash with brush and Alconox soap.
3. Rinse with clean tap water.
4. Rinse with distilled water.

After cleaning, all sampling equipment that is not disposable and not used immediately will be wrapped in aluminum foil and/or stored in plastic bags. The rule of "potential for contaminants" will be used such that any sampling equipment suspected of contamination will be rejected and decontaminated prior to use. In addition, all reusable down-hole drill rig equipment, such as rods and casings, will be decontaminated with a pressure washer between boring locations.

It should be noted that decontamination procedures for larger earth-moving equipment, such as excavators and bulldozers will be described in detail in the Cleanup Action Work Plan.

3.5 DISPOSAL OF INVESTIGATION-DERIVED WASTE

Waste derived will be managed and disposed of in accordance with applicable waste management regulations. The approach to handling and disposal of these materials is discussed below. Investigation-derived waste (IDW) includes the following liquids and solids:

- Decontamination wash water.
- Soil drill cuttings, including non-soil debris that may be removed from the subsurface during drilling.
- Disposable materials used during field work that may be impacted by contaminated media, or decontamination wash water (e.g., disposable personal protective equipment [PPE], plastic sheeting, paper towels, etc.).

Soil drill cuttings, including non-soil debris that may be removed from the subsurface during drilling, will be containerized and then placed in Area B where it will be capped.

For IDW that is containerized (e.g., soil cuttings processed on land, decontamination wash water), 55-gallon drums approved by Washington State Department of Transportation will be used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled with its contents (e.g., "soil cuttings"), the dates on which the wastes were placed in the container, the owner's name and contact information of the field person generating the waste, and the site name.

All disposable sampling materials and PPE used in sample processing will be placed in heavy duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system.

3.6 HEALTH AND SAFETY

All field investigation activities described in this SAP/QAPP will be conducted in accordance with applicable regulations and the site-specific health and safety plan presented in the Supplemental Focused Remedial Investigation Work Plan (Floyd|Snider 2014).

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4.0 Chemical Laboratory Analyses

Data from the compliance sampling activities will be compared to applicable MTCA criteria for soil. These criteria are shown in Table B.1.

4.1 LABORATORY ANALYSIS PROTOCOLS

Analytical protocols, including sample holding times and method detection limits, will be in accordance with MTCA requirements. Several details of these procedures are discussed below. Table B.1 presents the analytical methods, target detection limits, and target reporting limits. Table B.2 outlines analytical requirements, methods, sample preservation, bottle types, and sample holding times.

4.2 LIMITS OF DETECTION

The target detection limits are less than MTCA Industrial Criteria and are presented in Table B.1. All reasonable means, including additional cleanup steps and method modifications, will be used to bring all limits-of-detection to levels less than applicable MTCA criteria.

4.3 SPECIFIC DIOXIN/FURAN DATA ANALYSES AND CONSIDERATIONS

Dioxins/furans are typically analyzed using either U.S. Environmental Protection Agency's (USEPA's) Method 8290 or USEPA Method 1613. Both methods are high-resolution gas chromatography/mass spectrometry. USEPA Method 8290 will be employed in the analysis of the dioxin/furan congeners. This method also provides for an analytical holding time of 1 year following sample collection, which allows for future additional analyses.

Dioxins/furans are generally present in the environment as a complex mixture of chemical congeners that differ in terms of the number and location of chlorine atoms. The most toxic and best-studied of the dioxin/furan congeners is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). Because of the need to evaluate the risks associated with the mixture of congeners, the toxicity equivalency factor (TEF) methodology is used. A TEF value is assigned to each congener relative to the toxicity of TCDD. The total TEQ of a mixture is the sum of the products of the concentration of each congener in a sample and the congener's corresponding TEF value. The TEF values used to calculate the TEQs are those resulting from the World Health Organization re-evaluation of TEFs for dioxins performed in 2005 (Van den Berg et al. 2006). Table B.3 presents the dioxin/furan congeners and their TEFs that will be analyzed for and evaluated using the methodology described above.

The laboratory should report each of the 17 dioxin/furan congeners with a chlorine substitution in the 2,3,7,8- position on a dry-weight basis as well as the summation of each homolog group (e.g., all hexachlorodibenzo-p-dioxins). The latter is standard practice, but the homologs are not used in calculating TEQ. The 17 congeners of interest will be tabulated as TEQ, both with non-detected values set to half the detection limit (for congeners that have been detected at the Site but not in the sample) and non-detected values set to zero (for congeners that have never been detected at the Site). TEQ calculations will be done in accordance to the latest 2015 dioxin/furan guidance for upland soil (Ecology 2015b).

4.4 QUALITY ASSURANCE/QUALITY CONTROL

Surrogates will be required (organics only) for every sample, including matrix spike (MS) samples, blanks, laboratory control samples (LCS), and standard reference materials. MS/matrix spike duplicates (MSDs) will be required for every 20 samples received. MSs and laboratory duplicates are analyzed for samples requiring metals analyses.

All samples will be diluted and re-analyzed if target compounds are detected at levels that exceed their respective established calibration ranges. Any cleanups will be conducted prior to the dilutions. Re-analyses will be performed if surrogate, internal standard, or spike recoveries are outside of the data quality objective (DQO) parameters. QC samples may be re-analyzed if results are not within control limits and it cannot be determined that the sample matrix is the cause.

4.5 LABORATORY WRITTEN REPORT

A written laboratory report will be prepared by the analytical laboratory documenting all the activities associated with sample analyses. At a minimum, the following will be included in the report:

- Project analytical narrative.
- Results of the laboratory analyses, QA/QC results, and data validation.
- All protocols used during analyses.
- Chain-of-custody information including explanation of any deviation from those identified herein.
- Any protocol deviations from the approved sampling plan.
- Location and availability of data.
- References to protocol descriptions in this SAP/QAPP, as appropriate.

5.0 Laboratory Quality Assurance Objectives

This SAP/QAPP establishes QC procedures and QA criteria to meet the DQOs set forth for the field activities to be conducted during the compliance sampling activities at the Site. The overall QA objective is to specify laboratory procedures for ensuring that data quality is maintained for field sampling, chain-of-custody, laboratory analyses, and reporting.

Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal QC, preventative maintenance of field/laboratory equipment, and corrective action are described in other sections of this SAP/QAPP.

5.1 LABORATORY DATA QUALITY OBJECTIVES

The DQOs for the sampling activities described in this SAP/QAPP are to obtain the type and quantity of data in a manner such that the data are of known, appropriate, and sufficient quality to support the intended use. Analytical DQOs include obtaining data that are technically sound and properly documented, having been evaluated against established criteria for the principle data quality indicators (i.e., precision, accuracy, representativeness, completeness, and comparability) as defined in Ecology and USEPA guidance (Ecology 2004 and USEPA 1998). Data QA criteria are presented in Table B.4.

The quality of analytical data generated is assessed by the frequency and type of internal QC checks developed for analysis type. Laboratory results will be evaluated by reviewing results for analyses of method blanks, MSs, duplicate samples, LCSs, calibrations, performance evaluation samples, and interference checks as specified by the specific analytical methods.

5.2 PRECISION

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, precision is a quantitative measure of the variability of a group of measurements compared to their average values. Analytical precision is measured through MS/MSD samples for organic analysis and through laboratory duplicate samples for inorganic analyses.

Analytical precision measurements will be carried out on project-specific samples at a minimum frequency of 1 per laboratory analysis group or 1 in 20 samples, whichever is more frequent per matrix analyzed, as practical. Laboratory precision will be evaluated against quantitative relative percent difference (RPD) performance criteria. The acceptable ranges of RPD applied to this project vary by analyte according to the USEPA Contract Laboratory Program National Functional Guidelines. Analytes with RPDs outside the acceptable range will be qualified, using professional judgment, with a “J” as an estimated concentration (J-flagged).

Field precision will be evaluated by the collection of blind field duplicates at a minimum frequency of 1 per laboratory analysis group or 1 in 20. However, no data will be qualified based solely on field duplicate precision.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit, where the percent error (expressed as RPD) increases. The equations used to express precision are as follows:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{\frac{(C_1 + C_2)}{2}}$$

Where:

RPD = relative percent difference

C_1 = larger of the two observed values

C_2 = smaller of the two observed values

5.3 ACCURACY

Accuracy is an expression of the degree to which a measured or computed value represents the true value. Analytical accuracy may be assessed by analyzing "spiked" samples with known standards (surrogates, LCSs, and/or MS) and measuring the percent recovery. Accuracy measurements on MS samples will be carried out at a minimum frequency of 1 in 20 samples per matrix analyzed. Because MS/MSDs measure the effects of potential matrix interferences of a specific matrix, the laboratory will perform MS/MSDs only on samples from this investigation and not from other projects. Surrogate recoveries will be determined for every sample analyzed for organics. The acceptable accuracy ranges for the analytes included in this investigation are presented in Table B.4. Should the percent recoveries be outside the acceptable range, using professional judgment, data may be J-flagged as estimated concentrations.

Laboratory accuracy will be evaluated against quantitative LCS, MS, and surrogate spike recoveries using limits for each applicable analyte. Accuracy can be expressed as a percentage of the true or reference value, or as a percent recovery in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

$$\%R = 100\% \times \frac{(S-U)}{C_{sa}}$$

Where:

%R = percent recovery

S = measured concentration in the spiked aliquot

U = measured concentration in the unspiked aliquot

C_{sa} = actual concentration of spike added

5.4 REPRESENTATIVENESS

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Care will be taken in the design of the sampling program to ensure that sample locations are selected properly, sufficient numbers of samples are collected to accurately reflect conditions at the location(s), and samples are representative of the sampling location(s).

A sufficient volume of sample will be collected at each sampling location to minimize bias or errors associated with sample particle size and heterogeneity.

5.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another. In order to ensure that results are comparable, samples will be analyzed using standard USEPA methods and protocols. Calibration and reference standards will be traceable to certified standards and standard data reporting formats will be employed. Data will also be reviewed to verify that precision and accuracy criteria were achieved and, if not, that data were appropriately qualified.

5.6 COMPLETENESS

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

$$C = \frac{(Number\ of\ acceptable\ data\ points) \times 100}{(Total\ number\ of\ data\ points)}$$

The DQO for completeness for each component of this project is 95 percent. Data that were qualified as estimated because the QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that were qualified as rejected will not be considered valid for the purpose of assessing completeness.

5.7 QUALITY CONTROL PROCEDURES

Sampling procedures for this investigation are described in detail in Section 3.0. The following sections discuss the field and laboratory QC procedures that will be followed for this investigation.

5.7.1 Field Quality Control Procedures

A rinsate blank QC sample will also be collected for each sampling event on the non-dedicated field equipment (i.e., if disposable equipment is not used) to ensure that field decontamination procedures are effective. All field QC samples will be documented in the field logbook and verified by the QA Manager or designee. A blind field duplicate will be collected at a frequency of 1 in 20 samples to evaluate the efficiency of field decontamination procedures, variability from sample handling, and site heterogeneity.

5.7.2 Laboratory Quality Control Procedures

Laboratory Quality Control Criteria. Results of the QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine whether control limits were exceeded. If control limits are exceeded in the sample group, corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

All primary chemical standards and standard solutions used in this project will be traceable to documented and reliable commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities identified in the standard will be documented.

The following paragraphs summarize the procedures that will be used to assess data quality throughout sample analysis.

Laboratory Duplicates. Analytical duplicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates are subsamples of the original sample that are prepared and analyzed as a separate sample. A minimum of 1 duplicate will be analyzed per sample group or for every 20 samples, whichever is more frequent.

Matrix Spikes and Matrix Spike Duplicates. Analysis of MS samples provides information on the extraction efficiency of the method on the sample matrix. By performing MSD analyses, information on the precision of the method is also provided for organic analyses. A minimum of 1 MS/MSD will be analyzed per sample group or for every 20 samples, whichever is more frequent.

Laboratory Control Samples. A LCS is a method blank sample carried throughout the same process as the samples to be analyzed, with a known amount of standard added. The blank spike compound recovery assesses analytical accuracy in the absence of any sample heterogeneity or matrix effects.

Surrogate Spikes. All project samples analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined in the analytical methods. Surrogate recoveries will be reported by the laboratories; however, no sample result will be corrected for recovery using these values.

Method Blanks. Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. A minimum of 1 method blank will be analyzed per extraction batch or for every 20 samples, whichever is more frequent.

6.0 Data Validation and Reporting

6.1 DATA VALIDATION

Floyd|Snider will review the laboratory reports for internal consistency, transmittal errors, laboratory protocols, and adherence to the DQOs as specified in this SAP/QAPP. A Stage 4 Full Validation will be performed by EcoChem as described below for all dioxin/furan data.

A Stage 4 Full Validation includes the following:

- Evaluation of package completeness.
- Verification that sample numbers and analyses match those requested on the Chain-of-Custody Form.
- Review of method-specified preservation and sample holding times.
- Verification that the required detection limits and reporting limits have been achieved.
- Verification that the field duplicates, MS/MSDs, and LCSs were analyzed at the proper frequency.
- Verification of analytical precision and accuracy via replicate analysis and analyte recoveries.
- Verification that the surrogate compound analyses have been performed and meet QC criteria.
- Verification that the laboratory method blanks are free of contaminants.
- Review of instrument performance—initial calibration, continuing calibration, tuning, sensitivity, and degradation.
- Recalculation of instrument and sample results from the raw data.
- Evaluation of the instrument outputs for confirmation of correct identification and quantitation of analytes (e.g., peak integrations, use of appropriately labeled compounds, retention times, ion ratios, and interferences).

Data validation will be based on the QC criteria as recommended in the methods identified in this SAP/QAPP and in the *National Functional Guidelines for Organic and/or Inorganic Data Review* (USEPA 2014a and 2014b). The dioxin/furan data will also be evaluated using the *USEPA Region 10 SOP for Validation of Dioxins and Furans* (USEPA 1996).

Data usability, conformance with the DQOs, and any deviations that may have affected the quality of the data, as well as the basis of application of qualifiers, will be included in the final reporting of the data. Any required corrective actions based on the evaluation of the analytical data will be determined by the ARI Project Manager and EcoChem Project Manager in consultation with the Floyd|Snider QA Manager and may include qualification or rejection of the data.

6.2 QUALITY ASSURANCE REPORT

EcoChem will prepare a QA report based upon review of the laboratory analytical data. The laboratory QA/QC reports will be incorporated for reference. This report will identify laboratory activities that deviated from the approved sampling plan and the referenced protocols and will make a statement regarding the overall validity of the data collected.

6.3 FINAL REPORTING

The Area A Cleanup Action Work Plan will document activities associated with the collection, transportation, and laboratory analysis of all samples collected during the compliance sampling activities at the Site. The report(s) will include the following:

- A description of the purpose and goals of the Area A Pre-Excavation Extent Investigation activities conducted at the Site.
- A summary of the field sampling and laboratory analytical procedures, referencing this SAP/QAPP and identifying any deviations resulting from field conditions.
- A general vicinity map showing the location of the Site, and a sampling location map. Coordinates (i.e., latitude and longitude and state plan coordinates) for the sampling locations will be reported in an accompanying table.
- Data tables for all media summarizing the chemical results, as well as pertinent QA/QC data. The data tables will include sample location numbers, sample IDs, dates of sample collection, depth of sample collection, and whether the sample was a duplicate or other QC sample.
- QA reports and laboratory data reports as appendices or attachments.
- Copies of field logs and Chain-of-Custody Forms as appendices or attachments.
- Comparison of analytical results to applicable site CULs.
- Sampling location and chemical data submittal in the Ecology Environmental Information Management System format.

7.0 References

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Reichhold/SSA Containers Facility

Cleanup Action Plan Amendment

Appendix B
Area A Pre-Excavation Extent Investigation
Sampling and Analysis Plan and
Quality Assurance Project Plan

Tables

Table B.1
Parameters for Analysis, Screening Criteria, Analytical Methods, Detection Limits, and Reporting Limits for Soil

Parameter	Soil MTCA Method C—Standard, Carcinogen—Industrial Land Use (pg/g)	Surface Water ARAR—Human Health—Marine Waters Clean Water Act §304 (pg/L)	Analysis Method	Detection Limit	Reporting Limit (PQL)[1]
Dioxins/Furans	1,680	NA	USEPA 8290	0.5–5.0 pg/g	1–10[2] pg/g

Notes:
1 All reporting limits shown are method PQLs from Analytical Resources, Inc., laboratory in Tukwila, Washington.
2 Range is for all individual dioxin/furan congeners. The final result will be lower after calculating the toxic equivalency (TEQ) and multiplying by the individual congener toxicity equivalency factors (TEFs).

Abbreviations:
ARAR Applicable or Relevant and Appropriate Requirements
MTCA Model Toxics Control Act
NA Not applicable
pg/g Picograms per gram
pg/L Picograms per liter
PQL Practical quantitation limit

Table B.2
Analytical Requirements, Methods, Preservation, Bottle Type, and Holding Times for Soil Samples

Analyses	Analysis Method	Bottle Type	Preservative	Holding Time
Dioxins/Furans	USEPA 8290	One 8-oz WMG	None, cool to 4 °C	1 year

Abbreviations:

°C Degrees Celsius
oz Ounce
WMG Wide-mouth glass

Table B.3
Toxicity Equivalency Factors for Chlorinated Dibenzo-p-Dioxin and Chlorinated Dibenzofuran Congeners[1]

CAS Number	Congener	TEF (unitless)
Dioxin Congeners (CDDs)		
1746-01-6	2,3,7,8-TCDD	1
40321-76-4	1,2,3,7,8-PeCDD	1
39227-28-6	1,2,3,4,7,8-HxCDD	0.1
57653-85-7	1,2,3,6,7,8-HxCDD	0.1
19408-74-3	1,2,3,7,8,9-HxCDD	0.1
35822-46-9	1,2,3,4,6,7,8-HpCDD	0.01
3268-87-9	1,2,3,4,6,7,8,9-OCDD	0.0003
Furan Congeners (CDFs)		
51207-31-9	2,3,7,8-TCDF	0.1
57117-41-6	1,2,3,7,8-PeCDF	0.03
57117-31-4	2,3,4,7,8-PeCDF	0.3
70648-26-9	1,2,3,4,7,8-HxCDF	0.1
57117-44-9	1,2,3,6,7,8-HxCDF	0.1
72918-21-9	1,2,3,7,8,9-HxCDF	0.1
60851-34-5	2,3,4,6,7,8-HxCDF	0.1
67562-39-4	1,2,3,4,6,7,8-HpCDF	0.01
55673-89-7	1,2,3,4,7,8,9-HpCDF	0.01
39001-02-0	1,2,3,4,6,7,8,9-OCDF	0.0003

Note:

1 Source: 2005 World Health Organization Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds (Van den Berg et al. 2006).

Abbreviations:

CAS Chemical Abstracts Service
CDD Chlorinated dibenzo-p-dioxin
CDF Chlorinated dibenzofuran
HpCDD Heptachlorodibenzo-p-dioxin
HpCDF Heptachlorodibenzofuran
HxCDD Hexachlorodibenzo-p-dioxin
HxCDF Hexachlorodibenzofuran
OCDD Octachlorodibenzo-p-dioxin
OCDF Octachlorodibenzofuran
PeCDD Pentachlorodibenzo-p-dioxin
PeCDF Pentachlorodibenzofuran
TCDD Tetrachlorodibenzo-p-dioxin
TCDF Tetrachlorodibenzofuran
TEF Toxicity equivalency factor

Table B.4
Data Quality Assurance Criteria for Soil

Parameter	Matrix	Units	Reporting Limit/PQL	Precision	Accuracy	Completeness	Reference
Dioxins/Furans	Soil	pg/g	1.0–10.0	± 30%	± 30%	95%	USEPA Method 8290

Note:
1 All reporting limits shown are method PQLs from Analytical Resources, Inc. laboratory in Tukwila, Washington.

Abbreviations:
pg/g Picograms per gram
PQL Practical Quantitation Limit

Reichhold/SSA Containers Facility

Cleanup Action Plan Amendment

Appendix B
Area A Pre-Excavation Extent Investigation Sampling and Analysis Plan and Quality Assurance Project Plan

Figures

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Area A Pre-Excavation Extent Investigation SAP/QAPP
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure B.1
Vicinity Map

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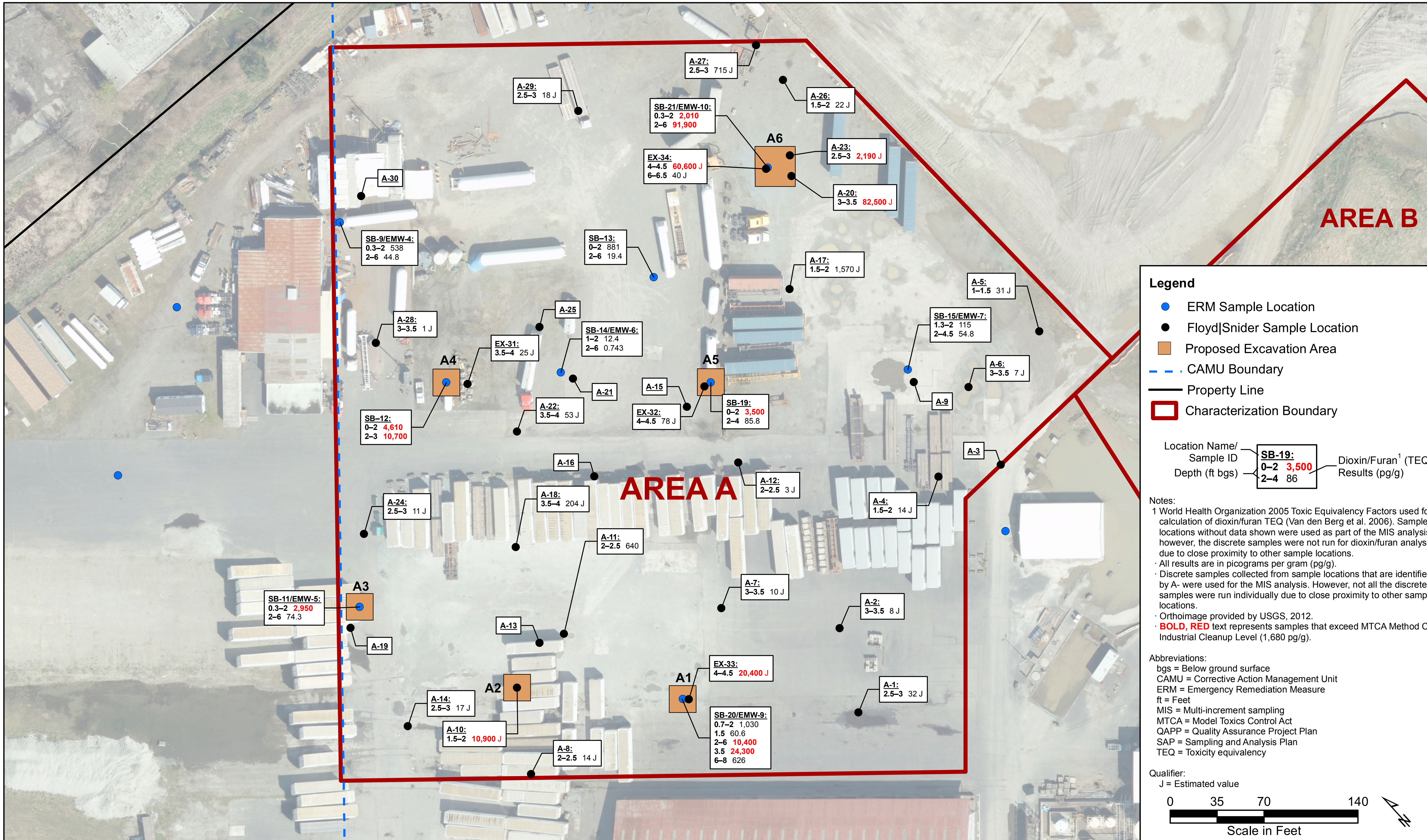
January, 2016



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Area A Pre-Excavation Extent Investigation SAP/QAPP
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure B.2
Area A Excavation Areas

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Area A Pre-Excavation Extent Investigation SAP/QAPP
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure B.3
Excavation Area A1

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January, 2016

Legend

Proposed Confirmation Sample Location

- Tier 1
- Tier 2
- Tier 3
- ERM Sample Location
- Floyd|Snider Sample Location
- Proposed Excavation Area A2

Location Name/ Sample ID — **SB-19:**
Depth (ft bgs) — **0–2** **3,500** / **2–4** 86 — Dioxin/Furan[1] (TEQ) Results (pg/g)

Notes:

1 World Health Organization 2005 Toxic Equivalency Factors used for calculation of dioxin/furan TEQ (Van den Berg et al. 2006). Sample locations without data shown were used as part of the MIS analysis; however, the discrete samples were not run for dioxin/furan analysis due to close proximity to other sample locations.

· All results are in picograms per gram (pg/g).

· Discrete samples collected from sample locations that are identified by A- were used for the MIS analysis. However, not all the discrete samples were run individually due to close proximity to other sample locations.

· Orthoimage provided by USGS, 2012.

· **BOLD, RED** text represents samples that exceed MTCA Method C Industrial Cleanup Level (1,680 pg/g).

Abbreviations:

bgs = Below ground surface
ERM = Emergency Remediation Measure
ft = Feet
MIS = Multi-increment sampling
MTCA = Model Toxics Control Act
QAPP = Quality Assurance Project Plan
SAP = Sampling and Analysis Plan
TEQ = Toxicity equivalency

Qualifier:

J = Estimated value

0 5 10 20
Scale in Feet

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Area A Pre-Excavation Extent Investigation SAP/QAPP
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure B.4
Excavation Area A2

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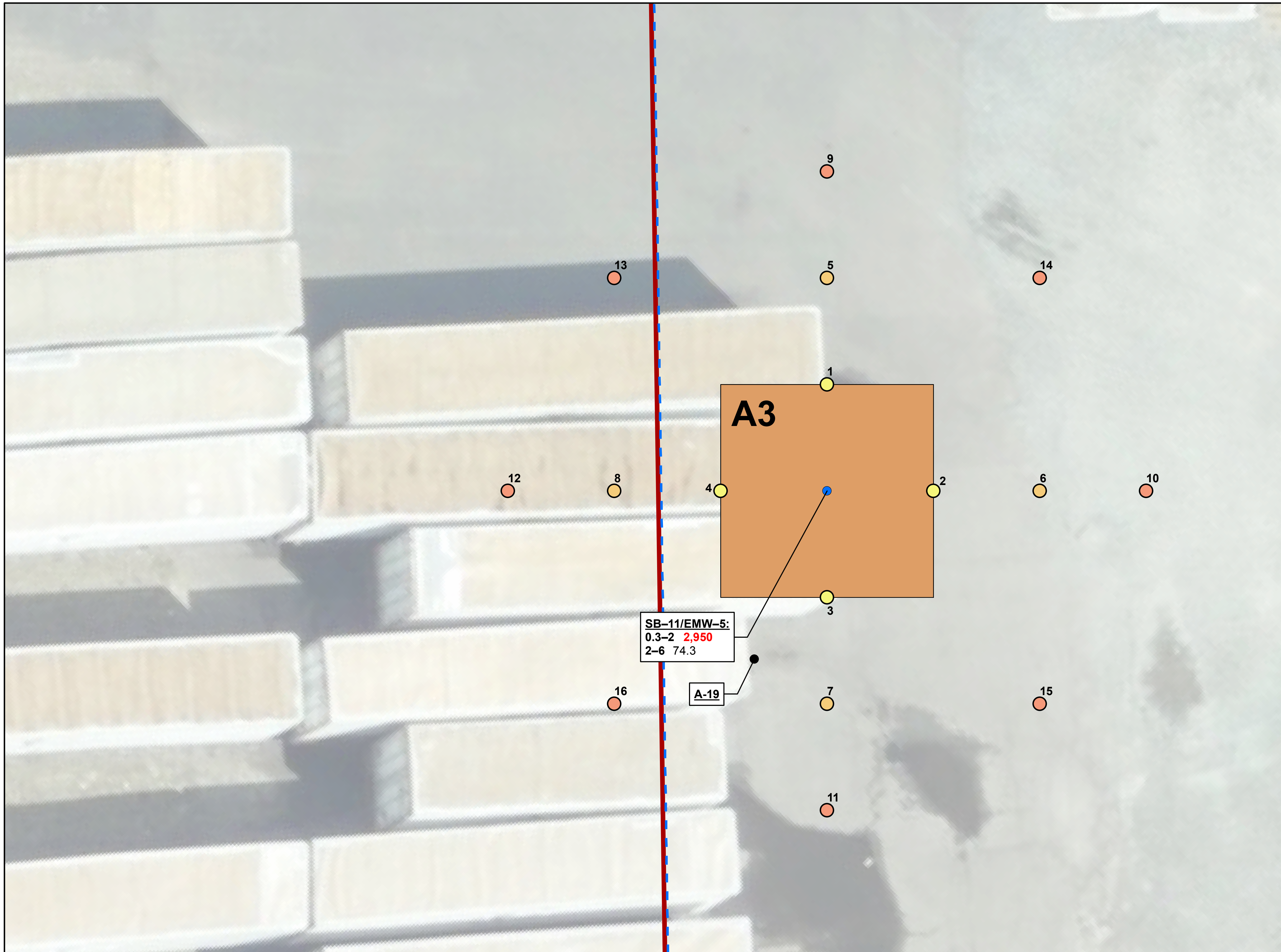
January, 2016



Legend

Proposed Confirmation Sample Location

- Tier 1
- Tier 2
- Tier 3
- ERM Sample Location
- Floyd|Snider Sample Location
- Proposed Excavation Area A3
- CAMU Boundary
- Characterization Boundary

Location Name/ Sample ID — **SB-19:**
Depth (ft bgs) — **0–2** **3,500** / **2–4** 86
Dioxin/Furan[1] (TEQ) Results (pg/g)

Notes:
1 World Health Organization 2005 Toxic Equivalency Factors used for calculation of dioxin/furan TEQ (Van den Berg et al. 2006). Sample locations without data shown were used as part of the MIS analysis; however, the discrete samples were not run for dioxin/furan analysis due to close proximity to other sample locations.
· All results are in picograms per gram (pg/g).
· Discrete samples collected from sample locations that are identified by A- were used for the MIS analysis. However, not all the discrete samples were run individually due to close proximity to other sample locations.
· Orthoimage provided by USGS, 2012.
· **BOLD, RED** text represents samples that exceed MTCA Method C Industrial Cleanup Level (1,680 pg/g).

Abstract:

Abbreviations:
bgs = Below ground surface
CAMU = Corrective Action Management Unit
ERM = Emergency Remediation Measure
ft = Feet
MIS = Multi-increment sampling
MTCA = Model Toxics Control Act
QAPP = Quality Assurance Project Plan
SAP = Sampling and Analysis Plan
TEQ = Toxicity equivalency

Qualifier:
J = Estimated value

0 5 10 20
Scale in Feet

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Area A Pre-Excavation Extent Investigation SAP/QAPP
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure B.5
Excavation Area A3

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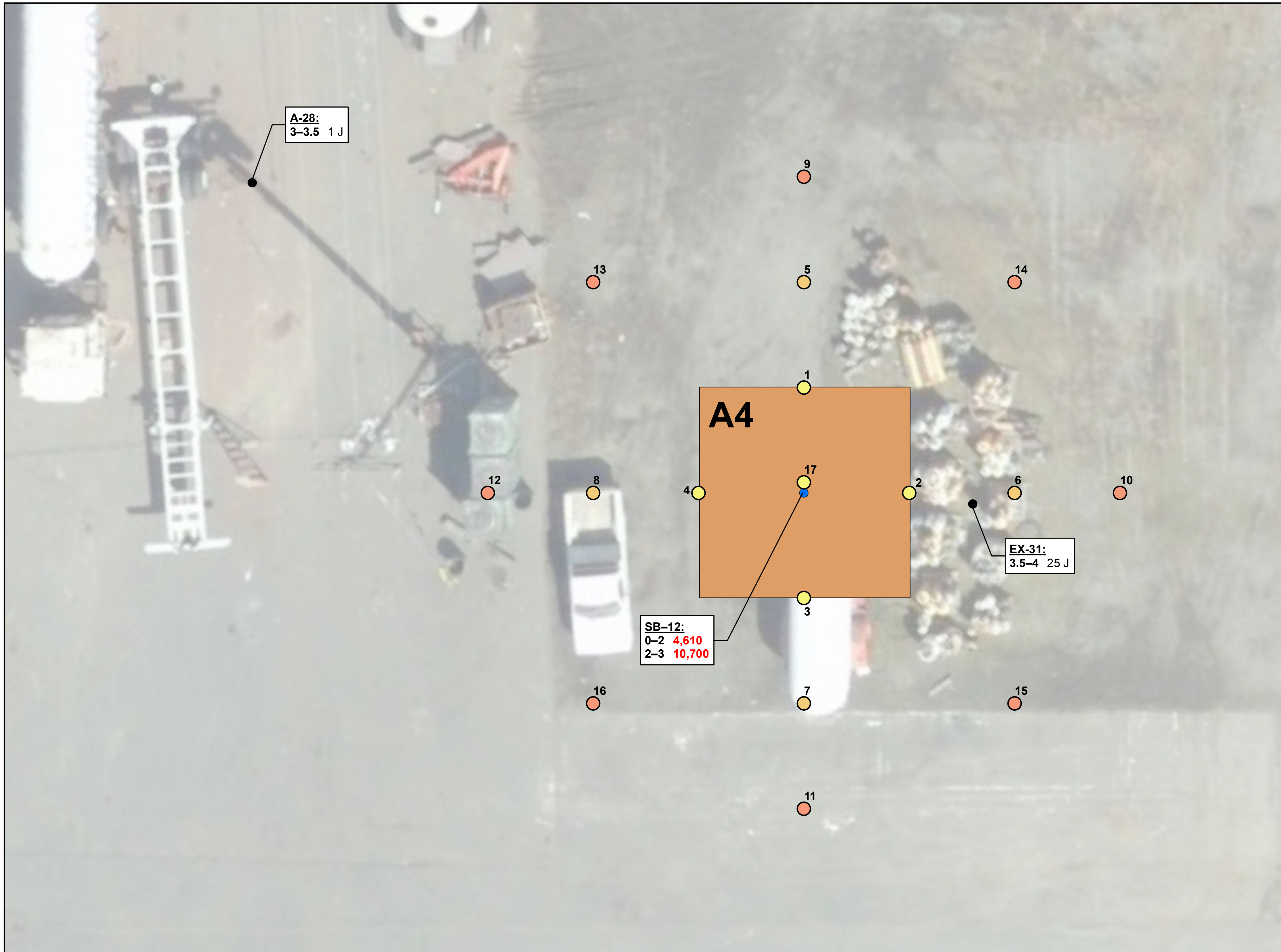

Legend

Proposed Confirmation Sample Location

- Tier 1
- Tier 2
- Tier 3
- ERM Sample Location
- Floyd|Snider Sample Location
- Proposed Excavation Area A4

Location Name/ Sample ID — **SB-19:**
Depth (ft bgs) — **0–2** **3,500** / **2–4** 86
Dioxin/Furan[1] (TEQ) Results (pg/g)

Notes:
1 World Health Organization 2005 Toxic Equivalency Factors used for calculation of dioxin/furan TEQ (Van den Berg et al. 2006). Sample locations without data shown were used as part of the MIS analysis; however, the discrete samples were not run for dioxin/furan analysis due to close proximity to other sample locations.
· All results are in picograms per gram (pg/g).
· Discrete samples collected from sample locations that are identified by A- were used for the MIS analysis. However, not all the discrete samples were run individually due to close proximity to other sample locations.
· Orthoimage provided by USGS, 2012.
· **BOLD, RED** text represents samples that exceed MTCA Method C Industrial Cleanup Level (1,680 pg/g).

Abbreviations:
bgs = Below ground surface
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ft = Feet
MIS = Multi-increment sampling
MTCA = Model Toxics Control Act
QAPP = Quality Assurance Project Plan
SAP = Sampling and Analysis Plan
TEQ = Toxicity equivalency

Qualifier:
J = Estimated value

0 5 10 20
Scale in Feet

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Area A Pre-Excavation Extent Investigation SAP/QAPP
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure B.6
Excavation Area A4

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January, 2016

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Area A Pre-Excavation Extent Investigation SAP/QAPP
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure B.7
Excavation Area A5

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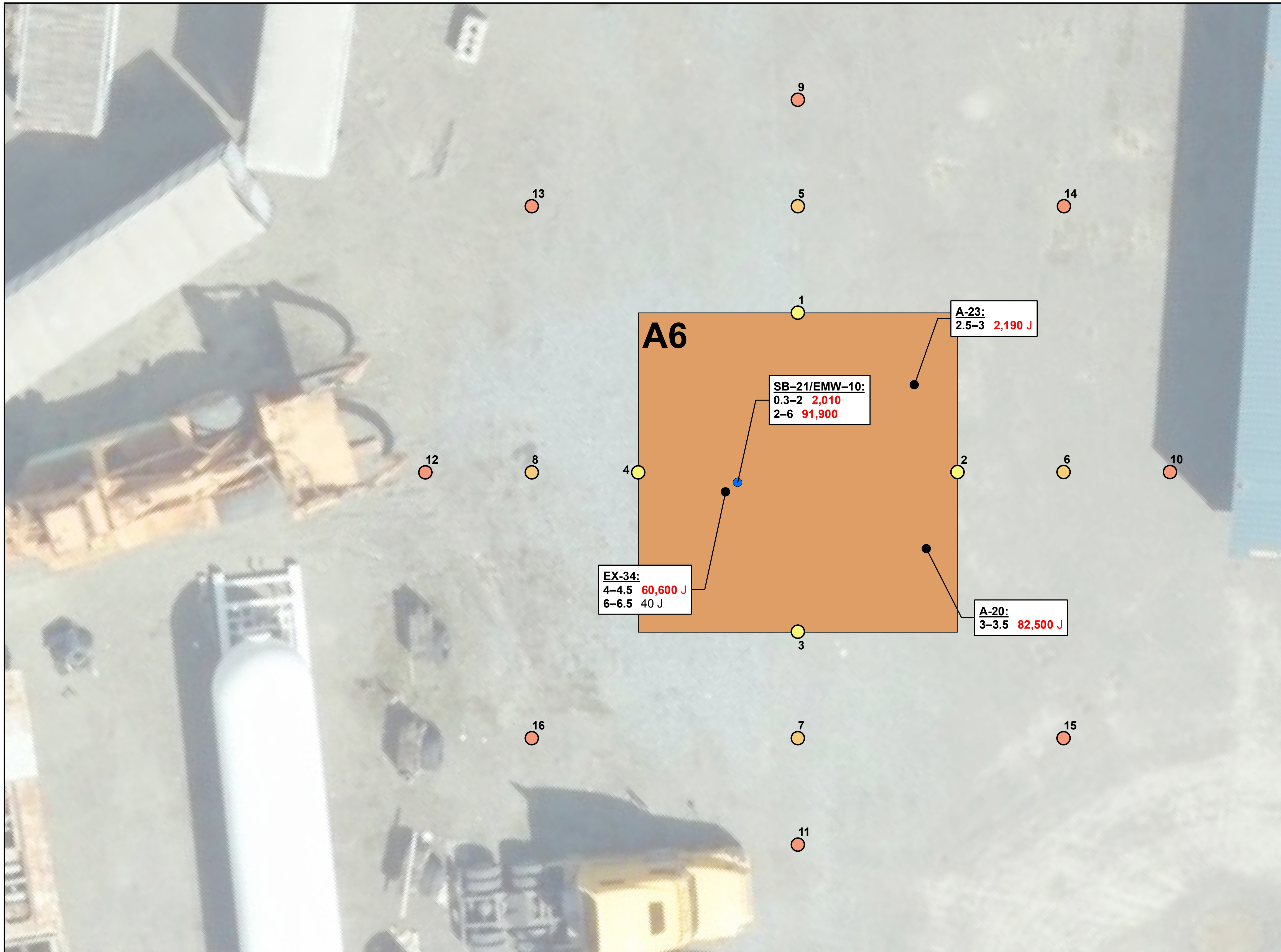
January, 2016



Legend

Proposed Confirmation Sample Location

- Tier 1
- Tier 2
- Tier 3
- ERM Sample Location
- Floyd|Snider Sample Location
- Proposed Excavation Area A6
- Characterization Boundary

Location Name/ Sample ID — **SB-19:**
Depth (ft bgs) — **0–2** **3,500** / **2–4** 86 — Dioxin/Furan[1] (TEQ) Results (pg/g)

Notes:
1 World Health Organization 2005 Toxic Equivalency Factors used for calculation of dioxin/furan TEQ (Van den Berg et al. 2006). Sample locations without data shown were used as part of the MIS analysis; however, the discrete samples were not run for dioxin/furan analysis due to close proximity to other sample locations.
· All results are in picograms per gram (pg/g).
· Discrete samples collected from sample locations that are identified by A- were used for the MIS analysis. However, not all the discrete samples were run individually due to close proximity to other sample locations.
· Orthoimage provided by USGS, 2012.
· **BOLD, RED** text represents samples that exceed MTCA Method C Industrial Cleanup Level (1,680 pg/g).

Abbreviations:
bgs = Below ground surface
ERM = Emergency Remediation Measure
ft = Feet
MIS = Multi-increment sampling
MTCA = Model Toxics Control Act
QAPP = Quality Assurance Project Plan
SAP = Sampling and Analysis Plan
TEQ = Toxicity equivalency

Qualifier:
J = Estimated value

0 5 10 20
Scale in Feet

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Area A Pre-Excavation Extent Investigation SAP/QAPP
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure B.8
Excavation Area A6

Reichhold/SSA Containers Facility

Cleanup Action Plan Amendment

Appendix B
Area A Pre-Excavation Extent Investigation Sampling and Analysis Plan and Quality Assurance Project Plan

Attachment B.1
Geoprobe MC5 Sampling Schematic

MC^5 Soil Sampling System

The Industry Work Horse in Soil Sampling..!

- ***Discrete Soil Sampling***
- ***Continuous Soil Sampling***
- ***Unmatched Durability***

Coupled with Light-Weight Center Rods, soil sampling got faster and easier! Times have changed since the first Macro-Core® tooling was developed in 1994. Machines are larger, hammers are more powerful, and field operators push tool strings deeper into the subsurface. The formula to meet these demands began with designing a larger MC Sample Tube (increased the OD from 2.125 in. to 2.25 in.) which led to beefing up the thread design. These improvements to the already robust Macro-Core® sampler make a great product perform even better in the field.

Macro-Core® Liner Cutter
Manufactured under Patent #6029355

"The success of testing and using this new MC system has given us an increase in confidence, in production, and in profit."
Scott Vojta, Geotek Alaska

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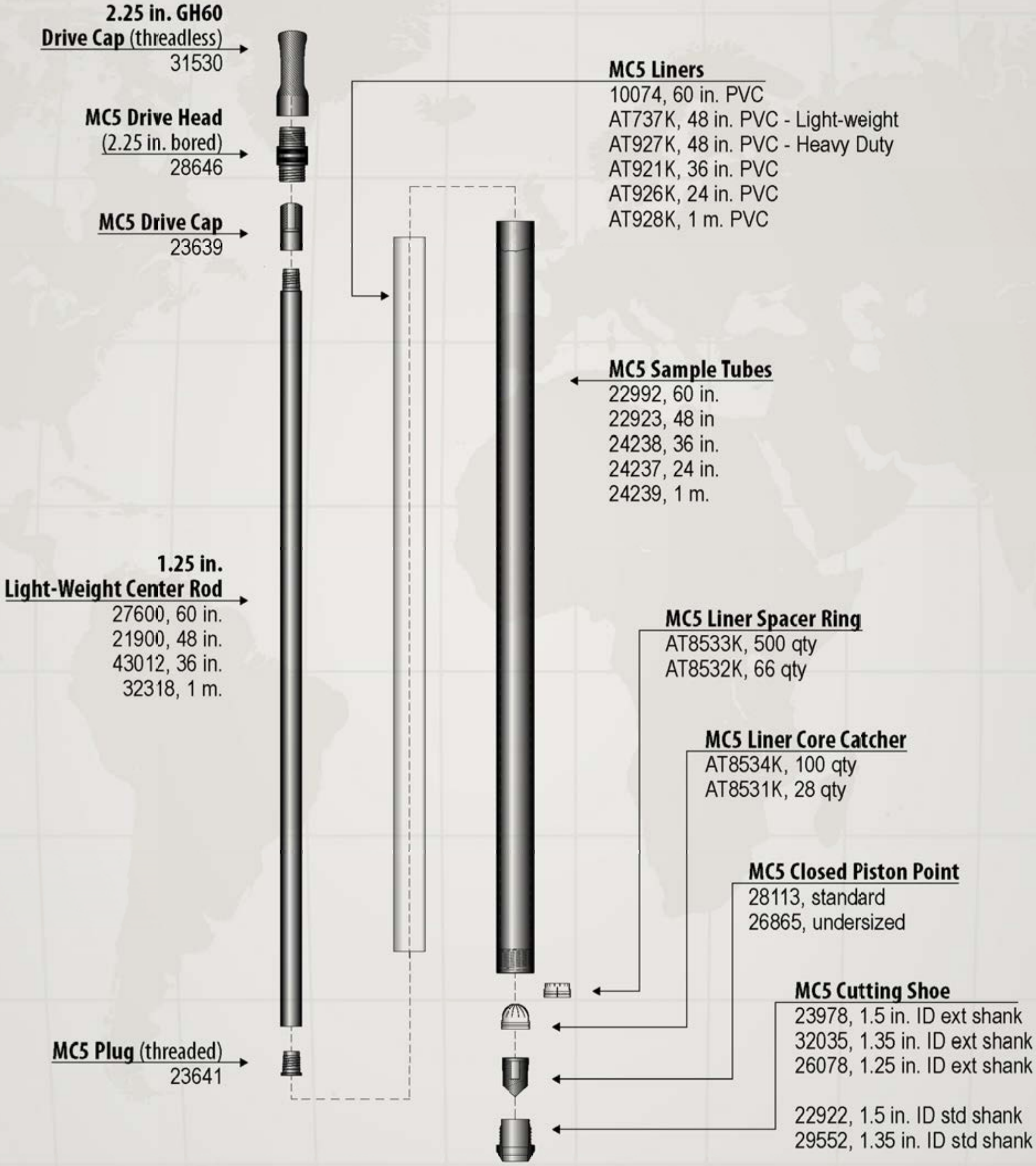
MC^5 Soil Sampling System

TOOL STRING DIAGRAM



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Reichhold/SSA Containers Facility

Cleanup Action Plan Amendment

Appendix C
Corrective Action Management Unit Application

Table of Contents

List of Figures

List of Acronyms and Abbreviations

Acronym/ Abbreviation	**Definition**
AO	Agreed Order
BMP	Best management practice
CAMU	Corrective Action Management Unit
CAP	Cleanup Action Plan
CD	Consent Decree
CMCP	Compliance Monitoring and Contingency Plan
COC	Contaminants of concern
CPOC	Conditional point of compliance
CUL	Cleanup level
DWM	Dangerous Waste Management
Ecology	Washington State Department of Ecology
FFS	Focused Feasibility Study
FRI	Focused Remedial Investigation
MTCA	Model Toxics Control Act
PCP	Pentachlorophenol
pg/L	Picograms per liter
PHC	Principal hazardous constituent
RCRA	Resource Conservation and Recovery Act
Reichhold	Reichhold, Inc.
SFFS	Supplemental Focused Feasibility Study
SFRI	Supplemental Focused Remedial Investigation
Site	Reichhold/SSA Containers Facility
SSA	SSA Tacoma, Inc.
TCDD	Tetrachlorodibenzo-p-dioxin
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

1.0 Introduction

This document is an application to request approval from the Washington State Department of Ecology (Ecology) for the designation of a Corrective Action Management Unit (CAMU) at the Reichhold/SSA Containers Facility (Site), a former chemical manufacturing plant located at 3320 Lincoln Avenue East in Tacoma, Washington. This application has been prepared in accordance with the CAMU regulations as identified in Washington Administrative Code (WAC) 173-303-64650 and WAC 173-303-64660.

Per WAC 173-303-64650(3), Ecology may designate an area at a facility as a CAMU for the purpose of treating, storing, or disposing CAMU-eligible waste that originates at the same facility in order to implement remedies or other cleanup actions. The designation of the proposed CAMU will enable dioxin/furan-contaminated soil at the Site to be permanently managed as part of the proposed cleanup action alternative, as documented in the Supplemental Focused Remedial Investigation/Supplemental Focused Feasibility Study (SFRI/SFFS; Floyd|Snider 2015a). This application provides information regarding the Site and the proposed CAMU required by applicable state and federal regulations.

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2.0 Site Background

2.1 PROPERTY OWNERSHIP AND REGULATORY HISTORY

Reichhold, Inc. (Reichhold) formerly owned the subject property and used it for chemical manufacturing. From 1956 to 1990, Reichhold produced chemical and chemical-related products, including pentachlorophenol (PCP), urea-formaldehyde resins, calcium chloride solution, treated fiber products, and a formaldehyde catalyst. Beginning in 1986, Reichhold worked extensively with Ecology and the U.S. Environmental Protection Agency (USEPA) Region 10 to investigate the Site, begin remediation, and permit the property for further cleanup action. Reichhold completed Resource Conservation and Recovery Act (RCRA) corrective actions, including a "facility assessment" and a "facility investigation" prior to ownership transfer to SSA Containers, Inc. then subsequently to SSA Tacoma, Inc. (SSA).

Numerous corrective actions have been completed on the Site, which included the designation of an existing CAMU on the property. The existing CAMU was established under what are now grandfathered regulations for CAMUs (WAC 173-303-64640). On October 20, 2000, Reichhold submitted an application for the designation of a CAMU at the property in a document entitled, *Technical Summary, RCRA Corrective Action Management Unit Summary, Reichhold Inc., 3320 Lincoln Avenue, Tacoma, WA 98421* (State of Washington 2006). Ecology reviewed the application and determined that it was substantially complete in a letter dated November 22, 2000. Reichhold updated the application document in November 2001 and March 2004.

Effective July 30, 2004, under Ecology's authorization to satisfy the RCRA corrective action requirements through Washington's Model Toxics Control Act (MTCA), Ecology issued a Dangerous Waste Management (DWM) Permit for Corrective Action (No. WAD009252891; referred to as the DWM Permit). This DWM Permit was granted by Ecology to Reichhold, and established Agreed Orders (AO) Nos. 1577 (Ecology 2006) and 1578 (Ecology 2008a). AO No. 1577 included requirements for a Focused Remedial Investigation/Focused Feasibility Study (FRI/FFS), the preparation of a draft Cleanup Action Plan (CAP), and the continued operation of interim measures/cleanup actions, while corrective actions elements were completed at the property. AO No. 1578 described the continued use of the CAMU, and provided requirements for construction and operation of on-site soil treatment cells to allow soil designated as an F021-listed waste to be biologically treated on-site and for the treated soil to be placed within an approved laydown area within the CAMU. At the time of establishment of the existing CAMU, dioxins/furans were not identified as a contaminant of concern (COC) at the Site. With the exception of dioxins/furans, the soil was treated to meet the treatment standards for the principal hazardous constituents (PHCs)—PCP, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, and 2,3,4,6-tetrachlorophenol—associated with F021 waste. Verification sampling of the treated soil affirmed that the treatment standards had been met for these PHCs.

In April 2006, Reichhold completed an Ecology-approved FRI report for the facility (CH2M HILL 2006). The FRI completed activities that had been identified in the April 2005 Ecology-approved FRI Work Plan for the facility (CH2M HILL 2005).

On July 27, 2006, SSA Containers, Inc., a subsidiary of SSA Marine, Inc., purchased the property from Reichhold and became the owner and operator of the facility. SSA Containers, Inc., as the new owner of the facility, agreed to assume certain environmental responsibilities of the previous owner and performing party, Reichhold. AO Nos. 1577 and 1578 were amended to be between Ecology and SSA Containers, Inc. (State of Washington 2006a and 2006b).

SSA Containers, Inc. subsequently prepared a FFS defining final cleanup actions for the property which was approved by Ecology (Floyd|Snider 2008a). The FFS updated the site-specific surface water criteria, soil cleanup levels (CULs), groundwater remediation levels, soil treatment levels, and the list of COCs at the property based on current site conditions and an updated review of applicable laws and regulations. The FFS identified the remediation technologies for the treatment of soils exceeding the calculated soil CULs, evaluated the phased shutdown of off-site extraction wells, and evaluated the options for achieving hydraulic control of contaminated groundwater.

The Ecology-approved CAP defined a comprehensive site-wide remedy that is protective of both human health and the environment (Ecology 2008b). The final cleanup action alternative for in situ soil included the site-specific soil CULs and necessary cleanup actions for the four remaining areas of concern. The remedy also included a groundwater cleanup action designed to prevent COCs from reaching nearby surface water bodies and on-going biological treatment of soil within the soil treatment cells.

The CAP included a Compliance Monitoring and Contingency Plan (CMCP; Floyd|Snider 2008b), which identified the process for conducting compliance monitoring of the groundwater to ensure that monitored natural attenuation was occurring and that groundwater CULs were being met at the off-site conditional point of compliance (CPOC).

When the property was transferred from SSA Containers, Inc. to SSA, CD No. 08-2-15781-0 (Ecology 2008c), was executed on December 30, 2008, to replace AO No. 1577. The CD required SSA to undertake the cleanup actions included in the final CAP and identified the selected cleanup actions for the facility and an implementation schedule.

In 2009, SSA completed a Remedial Action Work Plan (Floyd|Snider 2009a) describing the in situ soil cleanup actions to take place at the property in accordance with the FFS and the CAP. The cleanup actions selected for in situ soil under the final CAP were excavation, on-site treatment, and off-site disposal of contaminated soil from four areas of concern. The in situ soil cleanup action activities were conducted at the property in accordance with the Work Plan following its approval by Ecology, and a *Remedial Actions Construction Completion Report* describing the in situ soil cleanup action activities was submitted to, and approved by, Ecology following the completion of the cleanup action activities (Floyd|Snider 2009b).

In accordance with the CAP, three additional work plans were submitted to Ecology in 2010 to: detail the procedures required to meet all CAMU closure requirements; shut down the groundwater extraction and treatment system; and decommission and close the treatment cells present at the property. All work related to these three work plans has been completed and approved by Ecology, and all closure requirements for the existing CAMU predefined in the CAMU Closure Work Plan have been met.

Annual Remedial Action Reports are prepared and submitted to Ecology that describe any cleanup actions that have occurred on the property, and provide an updated schedule for the remaining environmental obligations.

On-going groundwater monitoring and reporting under the CMCP and renewal of the DWM Permit had been the only remaining environmental obligation occurring at the facility until the identification of dioxins/furans at levels of concern in 2014.

In April 2014, on behalf of the potential site purchaser, samples were collected by Environmental Resource Management. The data collected from these samples indicated dioxin/furan concentrations in several locations with exceedances of the MTCA Method C Industrial Criterion. SSA and Ecology determined that these dioxin/furan data and the requirements of the CD warranted further action. An investigation to delineate the extent of dioxin/furan contamination present at the Site was performed and the results have been documented in the SFRI/SFFS. Based on these results and the performance of an alternatives evaluation, capping within a new CAMU was selected as the proposed cleanup action. The new CAMU is within the footprint of the existing CAMU and is being requested to permanently manage the dioxin/furan-contaminated soil. Figure C.1 shows the proposed location of the new CAMU, as well as the existing CAMU and the areas of dioxin/furan-contaminated soil to be capped.

A CAP Amendment (Floyd|Snider 2015b) was prepared to satisfy the MTCA requirements set forth in WAC 173-340-380(1) as they relate to the recent discovery of dioxins/furans on the Site at concentrations greater than the applicable criterion. The CAP Amendment provides information on the Site history, nature and extent of dioxins/furans contamination, cleanup standards, proposed cleanup action and justification for the proposed cleanup action, implementation schedule, and next steps. As an appendix to the CAP Amendment, a CMCP Amendment was prepared in accordance with the MTCA requirements for compliance monitoring (WAC 173-340-410).

2.2 ORIGIN OF WASTE

This section identifies the nature of the material to be capped within the proposed CAMU. It documents that the material includes CAMU-eligible wastes per WAC 173-303-64650(3)(a) and identifies the origin of waste, and whether the waste was listed or dangerous at the time of release per WAC 173-303-64660(2).

Dioxins/furans are an impurity created during the PCP manufacturing process, which was conducted on-site. None of the other chemicals produced on-site have an association with dioxins/furans. Technical-grade PCP, which was the type of PCP historically manufactured at the Site, is approximately 86 percent pure with the remaining percentage typically containing impurities such as lesser chlorinated phenols, dioxins (particularly tetrachlorodibenzo-p-dioxin [TCDD], hexachlorodibenzo-p-dioxin, and octochlorodibenzo-p-dioxin) and hexachlorobenzene as manufacturing byproducts (Extoxnet 1996).

A dioxin/furan congener evaluation, described in the SFRI Work Plan (Floyd|Snider 2014), was conducted utilizing the available dioxin/furan data to confirm that the dioxins/furans present at the Site are associated with the historical PCP production.

Primary PCP manufacturing activities were limited to the central area of the Site around the former PCP Plant. Based on historical documentation, PCP manufacturing occurred aboveground on concrete flooring, and PCP manufacturing materials and waste were not stored at depth. PCP manufacturing waste materials were moved off-site for disposal at a RCRA hazardous waste disposal facility, and anything solid that came into contact with PCP in any form required off-site disposal (CH2M Hill 1987). Dioxin/furan-contaminated soil associated with in-place operation of PCP manufacturing activities was not listed or identified as dangerous at the time of release. With the exception of dioxins/furans, sampling showed that the soil in this area meets the treatment standards for the PHCs—PCP, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, and 2,3,4,6-tetrachlorophenol—associated with F021 waste. Verification sampling of the treated soil affirmed that the treatment standards had been met for these PHCs.

Between 1986 and 2006 multiple corrective actions were performed at the Site by Reichhold, in accordance with the USEPA RCRA Permit, DWM Permit, and Ecology AOs. In 2009, the final corrective actions for in situ soil were completed by SSA. Dioxins/furans were not defined as a COC for any of the corrective actions at the Site. The majority of soils excavated for corrective action were placed in on-site treatment cells, and treated with a proprietary amendment-enhanced biodegradation process that successfully decomposed the PCP and other organic COCs, but did not decompose some other compounds such as polychlorinated biphenyls and dioxins/furans. Upon treatment of each soil horizon, the soil was analyzed to ensure that it met the treatment levels for the site COCs including the F021-listed waste PHCs with the exception of dioxins/furans. If the soil horizon did meet the treatment levels, it was approved by Ecology for removal from the treatment cells, and placed as fill in an approved Treated Soil Laydown Area at the property. The soil that was treated and subsequently used as fill in the Treated Soil Laydown Area is listed as F021 waste. Because dioxins/furans were not a COC, the treated soil was not tested for dioxins/furans. With the exception of dioxins/furans, the soil was treated to meet the treatment standards for the PHCs—PCP, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, and 2,3,4,6-tetrachlorophenol—associated with F021 waste. Verification sampling of the treated soil affirmed that the treatment standards had been met for these PHCs.

The area proposed for the new CAMU is shown in Figure C.1. This includes the area in which the treated soil was placed and will be regraded. Additionally, soil from several smaller areas in the central area of the Site around the former PCP Plant, in which analytical testing identified dioxin/furan contamination present at concentrations greater than CULs in in situ soil, will be excavated and transported to the new CAMU area. Dioxins/furans are the only PHCs associated with F021 waste with concentrations greater than CULs in the new CAMU.

3.0 Rationale for a New CAMU

Designation of a new CAMU for the permanent management of dioxin/furan-contaminated soil is consistent with the seven criteria specified in WAC 173-303-64660. The proposed cleanup action of capping on-site set forth in the SFRI/SFFS meets the requirements of the seven criteria specified in WAC 173-303-64660(1). Each of the criteria is summarized below. The SFRI/SFFS provides further detail regarding characterization of the Site, alternative evaluation, and protection of human health and the environment.

3.1 IMPLEMENT RELIABLE, EFFECTIVE, PROTECTIVE, AND COST-EFFECTIVE REMEDIES

Per WAC 173-303-64660(1)(a), "the CAMU will facilitate the implementation of reliable, effective, protective, and cost-effective remedies." Section 8.0 of the SFRI/SFFS describes the MTCA disproportionate cost analysis performed, which evaluated the protectiveness, permanence, cost, effectiveness, short-term risk, and implementability of each alternative. The proposed cleanup action alternative of capping provides the following:

- The lowest cost per unit benefit ratio. A full removal action is cost prohibitive at 20 times the cost of capping.
- Both the direct contact pathway and the soil erosion pathway are contained or limited due to implementation of the clean cap layer that isolates underlying contamination.
- Less disruptive and more protective to the community due to decreased truck traffic on roadways by not hauling material off-site.
- Reduced exposure risk due to less material handling.

3.2 PROTECT HUMAN HEALTH AND THE ENVIRONMENT

Per WAC 173-303-64660(1)(b), "the designation of a new CAMU will not create unacceptable risks to humans or the environment resulting from exposure to dangerous wastes or dangerous constituents." The CAMU will be designed, constructed, and managed with controls in place to protect human health and the environment. The active current and future potential exposure pathways and receptors at the Site are discussed in this section.

Surface Water. Surface water is present at the Site in perimeter ditches that convey groundwater and stormwater to the Blair Waterway. These ditches only intermittently contain water during the rainy periods of the year and during storm events. Surface water is not a contaminated medium at the Site; however, in order to establish groundwater concentrations that are protective of surface water, the SFRI/SFFS defined concentrations in surface water that are protective of human health and aquatic species, and then established groundwater concentrations that are protective of these calculated surface water concentrations. This process is further described in Section 4.0 of the SFRI/SFFS.

Human receptors for surface water include incidental ingestion by maintenance workers and recreational swimmers (although the Blair Waterway is an industrial/commercial shipping channel and restricted from recreational swimming) and fish consumption for recreational and subsistence anglers. Surface water is protected by the proposed cleanup action.

Groundwater. Because the groundwater in the area is non-potable, the highest beneficial use of groundwater at the Site is protection of surface water. Groundwater in the Shallow Aquifer beneath the Site has the potential to migrate through groundwater flow to the surface water in the drainage ditches at the perimeter of the property. With no on-site exposure to groundwater, the off-property CPOC for the Shallow Aquifer is at these drainage ditches. All groundwater is currently in compliance with site-specific, Ecology-approved CULs, as described in the SFRI/SFFS, and groundwater is protected by the proposed cleanup action.

As described further in Section 4.2.2.2 of the SFRI/SFFS, the BIOSCREEN model was used to identify the maximum dioxin/furan concentration in groundwater that is protective of surface water. Due to the high tendency of dioxins/furans to adsorb to soils and attenuate at a rapid rate, the BIOSCREEN model determined that even for dioxin/furan concentrations far greater than seen on-site, the groundwater concentration at the CPOC would still be less than the surface water criterion. All the results for 2,3,7,8-TCDD at the Site were non-detects at values of 1 to 2 picograms per liter (pg/L) and are not of concern.

Based on the results of the modeling, a source area target concentration was impractical to calculate. Dioxin/furan concentrations are predicted to attenuate rapidly as the groundwater moves through soil, and are not likely to reach surface water at concentrations greater than the surface water quality criterion. In order to provide an additional level of analysis, the maximum 2,3,7,8-TCDD groundwater concentration throughout the Site was calculated based on actual soil analytical data. Using the MTCA three-phase equilibrium equation, the greatest 2,3,7,8-TCDD soil concentration on-site was determined to be in equilibrium with groundwater at a concentration of 170 pg/L. The BIOSCREEN model results show that this concentration attenuates to less than the surface water criterion within 10 feet.

The modeling evaluation demonstrated that groundwater at the Site is protective of surface water and that soil at the Site containing dioxins/furans may remain on-site at a distance of greater than 10 feet from surface water features without posing a risk to adjacent surface waters. Within the proposed CAMU, all soil containing dioxins/furans at concentrations greater than CULs will remain under a cap at least 10 feet from all surface water features.

Following remedy completion, semi-annual groundwater monitoring will be conducted for 3 years to verify that 2,3,7,8-TCDD groundwater concentrations continue to be in compliance with cleanup standards. Compliance monitoring of groundwater will be conducted in the shallow aquifer perimeter wells. The groundwater monitoring and compliance criteria are further described in the CMCP Amendment.

Soil. The following active pathways were identified:

- **Protection of human health via direct contact with contaminated soil.** This pathway would include incidental ingestion occurring during soil-disturbing activities such as utility work, landscaping, trenching, excavation, or regrading. Capping the soil in place within the proposed CAMU boundary and with additional institutional controls would immediately reduce the risks associated with the direct contact pathway for both human and ecological receptors. A Cap Inspection and Maintenance Plan will be prepared and will include requirements to protect this pathway if subsurface soil is excavated and relocated to another area.
- **Protection of groundwater resources from contaminants leaching from soil.** Contamination to the ground surface or to the subsurface can result in leaching of contaminants entrained in soil to the groundwater table. As discussed previously and in further detail in the SFRI/SFFS, existing groundwater concentrations for dioxin/furans are in compliance with site-specific groundwater CULs protective of adjacent surface water resources. There is not a risk of dioxin/furan contamination migrating to groundwater at levels of concern.
- **Protection of surface water from soil erosion.** Surface soil has the potential to reach surface water via direct runoff downslope. The majority of the area that contains dioxins at concentrations of concern is largely unpaved, and presumably the majority of stormwater infiltrates through the ground surface; however, ponding does occur in some areas of the Site and water has the potential to runoff to surface water features. Capping the soil in place within the proposed CAMU boundary and with additional institutional controls would immediately reduce the risks associated with this pathway. In addition, the surface of the cap would be sloped to allow for sheet flow, which would then flow into a swale designed to treat and convey stormwater using applicable best management practices (BMPs) for stormwater treatment.

3.3 INCLUDE UNAFFECTED AREAS IN THE CAMU

Per WAC 173-303-64660(1)(c), "the CAMU will include uncontaminated areas only if including such areas for the purposes of managing CAMU-eligible wastes is more protective than management of such wastes at contaminated areas." The proposed CAMU encloses all areas in which dioxin/furan-contaminated soil will be capped. Regrading of higher elevation areas before capping is required to support future land use. The CAMU boundary is set at the minimum size needed to contain the dioxin/furan areas to be capped and the entire proposed CAMU footprint is within the footprint of the existing CAMU.

3.4 MINIMIZE FUTURE RELEASES TO THE EXTENT PRACTICABLE

Per WAC 173-303-64660(1)(d), "areas within the CAMU where wastes remain in place after closure of the CAMU will be managed and contained so as to minimize future releases of dangerous wastes and dangerous constituents to the extent practicable." Institutional controls will be required in areas where contaminated soil greater than CULs will remain on-site, in order to ensure materials are contained and managed to minimize future releases. Institutional controls will include the following:

- A deed restriction in the form of a restrictive covenant limiting the Site to industrial or other use that is consistent with Site CULs, prohibiting groundwater withdrawal for beneficial uses, including a map showing the nature and extent of residual contamination at concentrations greater than CULs, and requiring implementation of a Cap Inspection and Maintenance Plan within the capped area. This updated restrictive covenant is consistent with and will supersede the existing deed restriction already in place on the Site. The restrictive covenant will meet the requirements of WAC 173-340-440(8), (9), and (10), Chapter 64.70 RCW (Uniform Environmental Covenants Act), and the Toxics Cleanup Program's Procedure 440A (Establishing Environmental Covenants under the Model Toxics Control Act).
- Implementation of an Ecology-approved Cap Inspection and Maintenance Plan specifying soil management procedures for future excavation and health and safety requirements for subsurface work. Consistent with WAC 173-340-440, the Cap Inspection and Maintenance Plan will include requirements for repair if the cap is disturbed or removed and maintenance requirements for the inspection and repair of the cap. These procedures would be applicable to any future site redevelopment or maintenance that involves removal or disturbance of subsurface material within the capped areas. The Cap Inspection and Maintenance Plan would include specific requirements to protect the direct contact and erosion pathways if subsurface soil is excavated and relocated or exposed. The Cap Inspection and Maintenance Plan would be prepared for Ecology approval and would include specifications for the following:
    - Health and safety requirements for working in and during handling of site soils and groundwater.
    - Best Management Practices for soil stockpiling, dust control and erosion control. Requirements for off-site disposal and associated recordkeeping.
    - Requirements for Ecology notification and reporting.

3.5 EXPEDITE THE TIMING OF REMEDIAL ACTIVITY IMPLEMENTATION

Per WAC 173-303-64660(1)(e), "when appropriate and practicable, the CAMU will expedite the timing of remedial activity implementation." Designation of the proposed CAMU will expedite the timing of remedial activity. Confirmation of the ability to cap the contaminated material on-site will significantly expedite the process for cleanup action design, approvals, and contractor mobilization. Use of the CAMU, allowing on-site capping, will expedite construction of the cleanup action by minimizing the schedule required for excavation, hauling, and off-site disposal.

3.6 USE TREATMENT TECHNOLOGIES TO ENHANCE THE LONG-TERM EFFECTIVENESS OF REMEDIAL ACTIONS

Per WAC 173-303-64660(1)(f), "the CAMU will enable the use, when appropriate, of treatment technologies (including innovative technologies) to enhance the long-term effectiveness of remedial actions by reducing the toxicity, mobility, or volume of wastes that will remain in place after closure of the CAMU." The use of treatment technologies for the reduction of toxicity, mobility, or volume of wastes is not applicable or necessary. As described in more detail in the SFRI/SFFS, current treatment technologies do not show a demonstrated effectiveness in remediating sites with the current dioxin/furan concentrations present at the Site.

Dioxins/furans are large organic compounds with multiple chlorine atoms. Dioxins/furans, therefore, have extremely low water solubility levels and high partitioning coefficients, making them extremely immobile compounds in groundwater. Capping the dioxin/furan-contaminated soil is the most effective way to address the exposure pathways at the Site.

3.7 MINIMIZE THE LAND AREA UPON WHICH WASTES WILL REMAIN IN PLACE

Per WAC 173-303-64660(1)(g), "the CAMU will, to the extent practicable, minimize the land area of the facility upon which wastes will remain in place after closure of the CAMU." The proposed CAMU is approximately 7 acres. It is located in the southeastern portion of the Site. Figure C.1 shows the location of the proposed CAMU, as well as the location of the existing CAMU and the areas of dioxin/furan-contaminated soil to be capped. The proposed CAMU is within the boundaries of the existing CAMU. The CAMU boundaries are set at the minimum size needed to contain the dioxin/furan areas to be capped.

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4.0 CAMU Design Basis

No wastes other than those currently present on the Site will be placed within the new CAMU. No hazardous waste, liquid waste, or municipal waste will be placed within the CAMU. The CAMU will only be used to contain the dioxin/furan-contaminated soil that will be capped. The low mobility of dioxins negate the need for a leachate collection and low-permeability cap and liner systems in the design. As defined in the SFRI/SFFS, the cap that will be constructed to contain the material within the proposed CAMU will be permeable to prevent direct contact and potential erosion and transport.

These cap design features constitute an "alternative CAMU design" as authorized under CAMU regulations that will require Ecology approval. The following subsections describe the regulatory basis for the alternative design and demonstrate how the proposed alternative design meets the regulatory requirements.

4.1 CAMU REQUIREMENTS

The key requirements of the CAMU consist of the following:

- Minimum design requirements
- Minimum treatment requirements
- Requirements for groundwater monitoring
- Requirements for closure
- Cap requirements

Each of these requirements is discussed in the following sections.

4.1.1 Alternative Design Requirements

WAC 173-303-64660(3)(c) specifies "Minimum Design Requirements" for the CAMU, which consist of a composite liner and leachate collection system. In accordance with WAC-173-303-64660(3)(c)(ii)(A) and WAC 173-303-64660(3)(c)(ii)(B), Ecology may approve alternative requirements if

> *"the department finds that alternate design and operating practices, together with location characteristics, will prevent the migration of any dangerous constituents into the groundwater or surface water at least as effectively as the liner and leachate collection systems"*

or

> *"the CAMU is to be established in an area with existing significant levels of contamination, and the department finds that an alternative design, including a design that does not include a liner, would prevent migration from the unit that would exceed long-term remedial goals."*

As mentioned previously, the low mobility of dioxins negates the need for a leachate collection and low-permeability cap and liner systems in the design. Existing groundwater concentrations for dioxins/furans are in compliance with site-specific groundwater CULs protective of adjacent surface water resources. There is not a risk of dioxin/furan contamination migrating to groundwater at levels of concern as described in the SFRI/SFFS. It is based on this demonstration that Ecology has approved alternate design and operating practices, approving a cap system that does not include a liner and leachate collection system. A more detailed description of the cap system is included in Section 4.1.5.

4.1.2 Adjusted Treatment Requirements

Wastes within a CAMU are subject to the treatment requirements of WAC 173-303-140(2), which describe land disposal restrictions and universal treatment standards unless they meet one of the factors for adjusted standards. WAC 173-303-64660(3)(d)(v)(E)(V) states that the department may adjust the treatment level or method to a higher or lower level based on the long-term protection offered by the engineering design of the CAMU and related engineering controls. Standards can be adjusted if the adjusted standards are protective of human health and the environment and if,

> *"after review of appropriate treatment technologies, the department determines that cost-effective treatment is not reasonably available, the principal hazardous constituents in the wastes are of very low mobility, and either the CAMU meets or exceeds the liner standards for new, replacement, or laterally expanded CAMUs, or the CAMU provides substantially equivalent or greater protection."*

As previously described, treatment is not applicable to dioxin/furan contamination in soil. Dioxins/furans exhibit very low mobility. The existing CAMU addressed and established treatment for the other PHCs associated with F021 waste including PCP, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, and 2,3,4,6-tetrachlorophenol. Existing groundwater meets applicable CULs, and the cap meets the alternative design requirements, as described earlier in Section 4.1. Therefore, Ecology has approved a proposed cleanup action in which the current concentrations greater than the CUL may be left in place under the cap and within the boundaries of the proposed CAMU. This determination meets the criteria for adjusted standards.

4.1.3 Requirements for Groundwater Monitoring

As described in WAC 173-303-64660(3)(e), groundwater monitoring is required and must include the following components:

- Detection and characterization of the nature, extent, concentration, direction, and movement of existing releases of dangerous waste and dangerous constituents in groundwater from sources located within the CAMU.
- Detection and subsequent characterization of releases of dangerous waste and dangerous constituents to groundwater that may occur from areas of the CAMU in which wastes will remain in place after CAMU closure.

- Required notification to Ecology and corrective action as necessary to protect human health and the environment for releases to groundwater from the CAMU.

As discussed in Section 3.2, following completion of cleanup action construction, semi-annual groundwater monitoring will be conducted for 3 years to verify that 2,3,7,8-TCDD groundwater concentrations continue to be in compliance with cleanup standards. The CMCP Amendment discusses the groundwater monitoring and compliance criteria in greater detail.

4.1.4 Requirements for Closure

Per WAC 173-303-64660(3)(f),

> *"requirements for closure will minimize the need for further maintenance; and control, minimize, or eliminate, to the extent necessary to protect human health and the environment, for areas where wastes remain in place, post-closure escape of dangerous wastes, dangerous constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, to groundwaters, to surface waters, or to the atmosphere."*

Requirements for closure will include:

- Requirements for excavation, removal, treatment, and/or containment of wastes.
- Requirements for removal and decontamination of equipment, devices, and structures used in CAMU-eligible waste management activities within the CAMU. Decontamination of equipment used to excavate or move the contaminated material both during the consolidation and regrading of the CAMU-eligible waste and during future activities that impact the contaminated material under the cap include, but are not limited to, the following:
    - Limit contact with heavy equipment and vehicles involved with contaminated soil.
    - Do not place contaminated tools on non-contaminated equipment/vehicles for transport to decontamination zone. Do not place non-contaminated tools on contaminated equipment/vehicles.
    - Use a high-pressure sprayer and stiff-bristle brushes to decontaminate all surface areas of large and heavy equipment within a designated decontamination zone prior to leaving the CAMU boundary.
    - Capture decontamination fluids and dispose of them at a permitted disposal facility or disperse within the CAMU boundary.

The CAMU is intended to remain contained in place in perpetuity, with institutional controls. Consistent with the WAC 173-303-64660(3)(f)(ii), the characteristics of the soil to remain in place are as follows:

- **CAMU characteristics:** The proposed CAMU is approximately 7 acres. It is located in the southeastern portion of the Site. Figure C.1 shows the location of the proposed CAMU, as well as the location of the existing CAMU and the areas of dioxin/furan-contaminated soil to be capped. The proposed CAMU is within the boundaries of the existing CAMU.

- **Volume of wastes which will remain in place after CAMU closure:** Approximately 56,500 cubic yards of dioxin/furan-contaminated soil will remain in place under the cap.
- **Potential for releases from the CAMU:** Due to the low mobility of dioxins/furans and all dioxin/furan-contaminated soil being capped on-site, there is a low risk of release from the CAMU.
- **Physical and chemical characteristics of the waste:** Dioxins/furans are an impurity created during the manufacturing process of PCP historically manufactured on-site. As described in Section 2.1, the majority of soils excavated for previous corrective action at the Site were placed in on-site treatment cells, and treated with a proprietary amendment-enhanced biodegradation process that successfully decomposed the PCP and other organic COCs, but did not decompose dioxins/furans.
- **Hydrogeological and other relevant environmental conditions at the facility which may influence the migration of any potential or actual releases in and/or from the CAMU:** Groundwater at the Site is non-potable and unfit for human consumption. Surface water is present at the Site in perimeter ditches that convey groundwater and stormwater to the Blair Waterway. The Blair Waterway is an industrial/commercial shipping channel and restricted from recreational swimming.
- **Potential for exposure of humans and environmental receptors if releases were to occur at or from the CAMU:** If a release were to occur, there would be a direct contact exposure risk associated with the dioxin/furan-contaminated soil.

Because the cap is an essential component of the remedy, and will need to remain functional in perpetuity, a Cap Inspection and Maintenance Plan will be implemented. The Cap Inspection and Maintenance Plan will establish specifications for routine cap inspection and maintenance; health and safety requirements for excavation and handling of capped material; BMPs for soil stockpiling, dust control, and erosions control; procedures for replacement of excavated soil below the cap; requirements for repair of the cap following disturbance; requirements for decontamination of equipment; and requirements for Ecology notification and reporting.

4.1.5 Cap Requirements

Per WAC-173-303-64660(3)(f)(iii),

> *"at final closure of the CAMU, for areas in which wastes will remain after closure of the CAMU, with constituent concentrations at or above remedial levels or goals applicable to the site, the owner or operator must cover the CAMU with a final cover designed and constructed to meet the following performance criteria…:*
>
> - *Provide long-term minimization of migration of liquids through the closed unit;*
> - *Function with minimum maintenance;*
> - *Promote drainage and minimize erosion or abrasion of the cover;*

- *Accommodate settling and subsidence so that the cover's integrity is maintained; and*
- *Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present."*

Implementation of this cleanup action will be the final cover for the CAMU. Approximately 317,500 square feet of dioxin/furan-contaminated soil will be capped in place. The area would be regraded in order to provide a suitable surface for both the temporary use of the area (parking for cars and trucks) and for future development. Once regraded, the area would be capped with a surface that would prevent direct contact for humans and also prevent terrestrial ecological exposure. As identified in Section 4.1.1, this cap design meets the alternate design and operating practices such that a liner and leachate system is not required, and the cap design would not need to be impervious and could allow for infiltration of stormwater. Due to the potential of future development, the construction of the final cap has several possibilities. The cap proposed is a geotextile or GeoGrid indicator layer that would be placed below a minimum 12-inch-thick cap of compacted crushed rock surfacing. This cap design would allow for infiltration of stormwater and would prevent any stormwater that does not infiltrate from contacting any contaminated soil. The surface of the cap would be sloped at a minimum of 2 percent to allow for sheet flow, which would then flow into a swale designed to treat and convey stormwater. This cap is protective of ecological exposure and prevents animals from burrowing and contacting the contaminated soil as described in the SFRI/SFFS. A cross-section of the cap is included in the CAP Amendment.

Future development of the Site may include placement of asphalt and buildings and stormwater controls in the capped area. Both asphalt and building slab surfaces would prevent direct contact for humans and also prevent terrestrial ecological exposure. If this alternate surface is proposed to be installed in lieu of the cap described above, plans would be presented to Ecology for their approval.

Institutional controls would be required in areas where soil contamination greater than CULs would remain on-site. Institutional controls would include the designation of this new CAMU for the permanent management of dioxin/furan-contaminated soil, and a deed restriction in the form of a restrictive covenant that would require on-site maintenance and monitoring of the cap surface. Long-term maintenance will be conducted to ensure stability and effectiveness of the constructed cap. Maintenance will include regular observation for any problems or damage to the cap. Long-term maintenance in capped areas will be conducted for as long as contamination at concentrations greater than the CUL is present at the Site. This will be detailed in the Cap Inspection and Maintenance Plan

The Cap Inspection and Maintenance Plan will specify soil management procedures for future excavation work within the capped areas and identify health and safety requirements for subsurface work.

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5.0 Conclusions

This application was prepared in accordance with applicable state and federal laws for designation of a CAMU and shows how the proposed CAMU meets the requirements of WAC 173-303-64650 and WAC 173-303-64660. The proposed CAMU is protective of human health and the environment, consists of the minimum area required to enclose the capped dioxin/furan-contaminated soil, minimizes future releases, and expedites the remedial activity implementation. The proposed CAMU will remain in perpetuity and will be subject to 5-year reviews. The current DWM Permit will be updated every 10 years as needed. Approval of the proposed CAMU is being requested concurrent with approval of the CAP Amendment and the CD Amendment.

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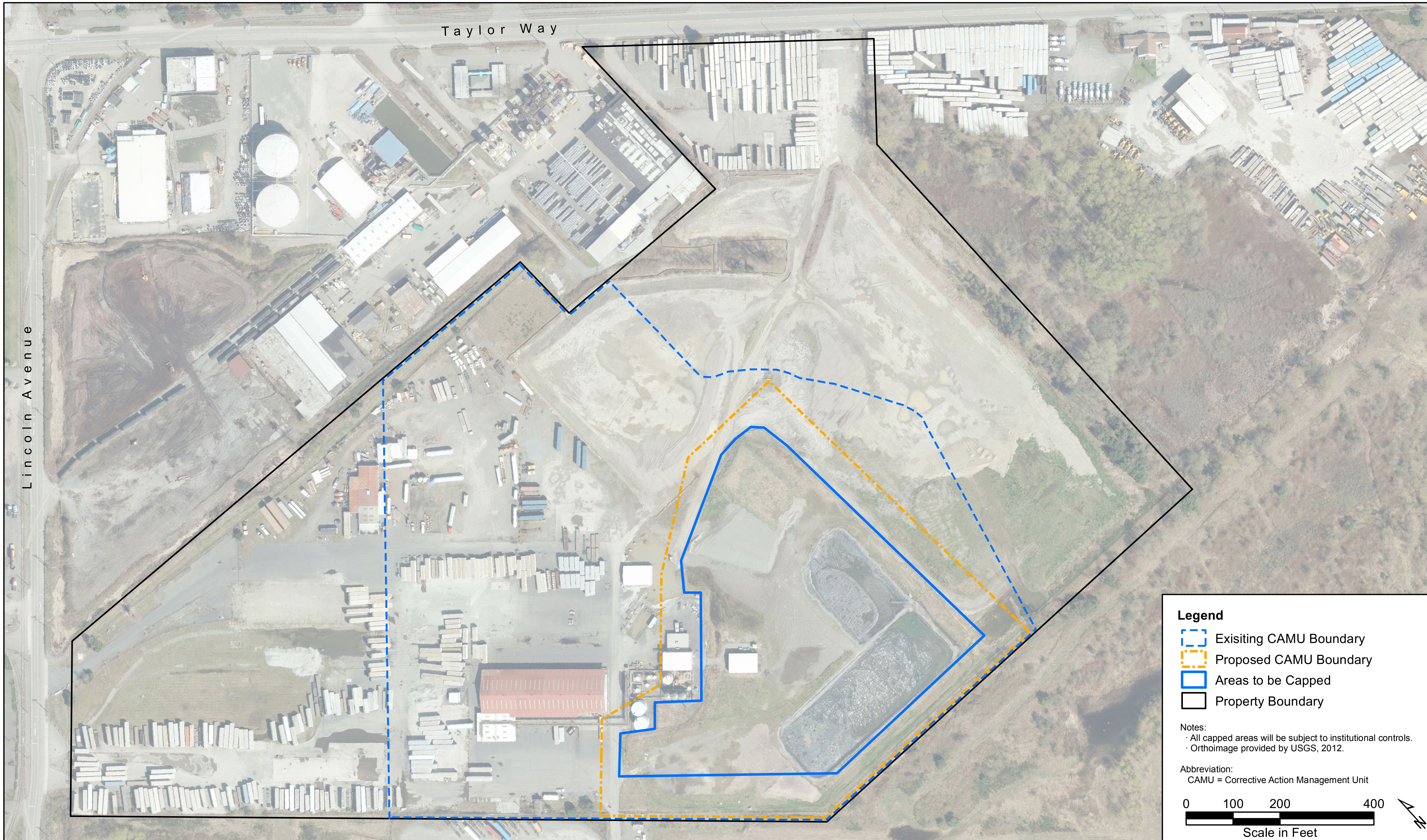
Reichhold/SSA Containers Facility

Cleanup Action Plan Amendment

Appendix C
Corrective Action Management Unit Application

Figure



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Cleanup Action Plan Adendum
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure C.1
Proposed CAMU Boundary

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January, 2016

Reichhold/SSA Containers Facility

Cleanup Action Plan Amendment

Appendix D
Cap Inspection and Maintenance Plan

Reichhold/SSA Containers Facility

Cap Inspection and Maintenance Plan

Prepared for

SSA Tacoma, Inc.
3320 Lincoln Avenue East
Tacoma, Washington
98421

February 2016

FLOYD | SNIDER
strategy ▪ science ▪ engineering
Two Union Square • 601 Union Street • Suite 600
Seattle, Washington 98101 • tel: 206.292.2078

LIMITATIONS

This report has been prepared for the exclusive use of SSA Tacoma, Inc., their authorized agents, and regulatory agencies. It has been prepared following the described methods and information available at the time of the work. No other party should use this report for any purpose other than that originally intended, unless Floyd|Snider agrees in advance to such reliance in writing. The information contained herein should not be utilized for any purpose or project except the one originally intended. Under no circumstances shall this document be altered, updated, or revised without written authorization of Floyd|Snider.

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List of Attachments

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
CAMU	Corrective Action Management Unit
CIMP	Cap Inspection and Maintenance Plan
CUL	Cleanup level
Ecology	Washington State Department of Ecology
Site	Reichhold/SSA Containers Facility
TEQ	Toxicity equivalent
WAC	Washington Administrative Code

1.0 Introduction

1.1 PURPOSE OF DOCUMENT

This Cap Inspection and Maintenance Plan (CIMP) has been developed for the Reichhold/SSA Containers Facility (the Site) located at 3320 Lincoln Avenue in Tacoma, Washington. As identified in the Reichhold/SSA Containers Cleanup Action Plan (CAP) Amendment, a component of the proposed cleanup action for the Site includes a capped area that contains dioxins/furans-contaminated soil. The primary goal of the cap is to prevent direct contact with contaminated soil by humans, plants, and animals.

As part of the proposed cleanup action, implementation of a Washington State Department of Ecology (Ecology)-approved CIMP is required that specifies soil management procedures for future excavation and health and safety requirements for subsurface work within the capped area. These procedures would be applicable to any future site redevelopment or maintenance that involves removal or disturbance of subsurface material within the capped area. This CIMP includes specific requirements to protect the direct contact and erosion pathways if subsurface soil is excavated and relocated or exposed. This document includes the following elements:

- Requirements for cap maintenance, inspection, and documentation.
- Required procedures for cap disturbance and repair, including:
  - Health and safety requirements for working in and during handling of site soils.
  - Best Management Practices for soil stockpiling, dust control, and erosion control. Requirements for off-site disposal and associated recordkeeping.
  - Requirements for Ecology notification and reporting.

1.2 SITE DESCRIPTION

The property, located at 3320 Lincoln Avenue, comprises approximately 52 acres in the Commencement Bay industrial area of Tacoma, Washington, between the Hylebos and Blair Waterways. The property is located on relatively flat terrain with generally less than 5 feet of topographic relief. This area was constructed in the early 1950s by filling the then-existing salt marsh with dredge spoils from adjacent waterways. The property is currently zoned for industrial use. The Site's current zoning classification is Port Maritime and Industrial (PMI).

1.3 ENVIRONMENTAL COVENANT

An Environmental Restrictive Covenant, authorized under Consent Decree 08-2-15781-0 (Ecology 2008), governs activities at the Site. The Restrictive Covenant is required because residual contamination remains on the property after completion of remedial actions. The Restrictive Covenant restricts certain activities and uses of the property to protect human health and the environment, and the integrity of remedial actions conducted at the Site. The Restrictive Covenant meets the requirements of the Washington Administrative Code (WAC) §173-340-440(8), (9), and (10), Chapter 64.70 of the Revised Code of Washington (Uniform Environmental

Covenants Act), and the Toxics Cleanup Program's Procedure 440A (Establishing Environmental Covenants under the Model Toxics Control Act).

The Restrictive Covenant states that activities that temporarily disturb the capped area, such as maintenance actions and construction activities, shall comply with this Ecology-approved CIMP for the property, which is also included as an exhibit to the Restrictive Covenant. Intrusive activities in the capped areas that involve worker contact with contaminated soil and/or groundwater shall be conducted by individuals that have the appropriate training and certifications for working on hazardous waste sites and in conformance with a site-specific health and safety plan. Prior to conducting any activities that will disturb the capped areas, the landowner shall provide written notice to Ecology, following the requirements of this CIMP.

The Restrictive Covenant also states that, with the exception of activities carried out consistent with this CIMP, any activity that will compromise the integrity of the cap is prohibited without prior written approval by Ecology. These activities include: drilling; digging; piercing the cap with a sampling device, post, stake, or similar device; grading; excavation; installation of underground utilities; removal of the cap; and application of loads in excess of the cap load-bearing capacity. The landowner shall report to Ecology within 48 hours of the discovery of any damage to the cap. Unless an alternative plan has been approved by Ecology in writing, the landowner shall promptly repair the damage in accordance with the requirements of this CIMP and submit a report documenting this work to Ecology within 30 days of completing the repairs.

The CIMP will be followed during management of contaminated soil remaining beneath capped areas for as long as dioxins/furans remain in soil at toxicity equivalent (TEQ) concentrations greater than the cleanup level (CUL) at the Site. The cap inspection and maintenance will be conducted by the property owner and all inspection and maintenance activities shall follow requirements outlined in this CIMP.

2.0 Capped Area

2.1 CAPPED AREA DESCRIPTION

The capped area is an approximately 317,000-square-foot (7.3-acre) area within the Corrective Action Management Unit (CAMU) boundary (Figure 2.1) in which dioxin/furan-contaminated soils have been regraded and capped.

The capped surface prevents terrestrial ecological exposure and direct contact for humans. The cap design does not need to be impervious; infiltration of stormwater is allowed. The proposed cap is a geotextile or GeoGrid indicator layer placed below a minimum 12-inch-thick cap of compacted crushed rock surfacing. The crushed rock will be based on the 2008 Washington State Department of Transportation Standard Specification 9-03.9(3) for Crushed Surfacing or equivalent. A cross-section of the cap is shown in Figure 2.2 that summarizes the specifications of the cap.

This cap design allows for infiltration of stormwater and prevents stormwater that does not infiltrate from contacting contaminated soil.

Development of the Site may include placement of asphalt or concrete pavements, buildings, and stormwater controls in the capped area. Both pavement and building slab surfaces would prevent direct contact for humans and also prevent terrestrial ecological exposure. Asphalt pavement, concrete pavement, or building slabs may be substituted for the compacted crushed rock cap if their constructed cross sections have a minimum 12-inch thickness (a reduced thickness would be allowable if advance written approval is received from Ecology).

2.2 CAPPED AREA INSPECTION AND MAINTENANCE REQUIREMENTS

Inspection and maintenance will be conducted annually to ensure stability and effectiveness of the constructed cap for as long as dioxins/furans remain in soil at TEQ concentrations greater than the CUL at the Site (assumed to be in perpetuity). Maintenance would include regular observations for any problems or damage to the cap. Inspection, maintenance, and documentation requirements are detailed in Section 3.0.

2.3 DEVELOPMENT AND SITE USE ABOVE THE CAP

There are no restrictions to redevelopment activities conducted above the capped surface for future site use. As long as the required cap components (described in Section 2.1) remain in place and continuous above the contaminated soil in the capped area, additional earthwork fill, pavements, or structures may be constructed above the cap without limitation.

2.4 DISTURBANCE OF THE CAP

Site development may require disturbance of the cap and excavation of contaminated soil beneath the capped area, for example to install new utilities or foundations. This cap disturbance is acceptable but must be done in accordance with the requirements described in Section 4.2. If the cap is disturbed, it must be restored in accordance with the requirements stated in Section 2.1 and Figure 2.2 or with Ecology-approved alternative surfaces, such as asphalt and/or building slabs.

3.0 Maintenance, Inspection and Documentation Procedures

This CIMP establishes an inspection and maintenance program to identify damaged or disturbed areas of the cap, provide for timely repair and replacement needed to restore the damaged or penetrated cap, and maintain appropriate record-keeping of inspections, repairs, and reporting.

3.1 INSPECTION

Inspections will be conducted by the landowner. A complete inspection of the cap must be conducted on an annual basis by July 30 of each year. Routine cap inspections will consist of a visual survey of the entire cap surface, to ensure cap integrity remains intact throughout the capped area, and that contaminated soil remains isolated below the cap.

"Non-Routine" inspections should be conducted following any event such as an accident, earthquake, or severe weather that could potentially damage the cap.

If disturbances to the cap are identified, they must be noted on the cap inspection form (Attachment 1), documented on a figure, and photographed. Disturbances include the following:

- For crushed rock surfaced areas:
  - Unusual erosion or any depressions that indicate that the crushed rock portion of the cap is not at least 12 inches thick
  - Potholes
  - Exposure of the indicator layer (either a geotextile or GeoGrid)
  - Any other signs of cap damage, failure, or disturbance
- For capped areas covered by pavement or buildings:
  - Absence of pavement or building slabs that could create a pathway for terrestrial ecological exposure or direct contact by humans
  - Separation of cap from building foundations
  - Any other signs of cap damage, failure, or disturbance

3.2 DOCUMENTATION

The integrity of the cap across the entire capped area shown on Figure 2.1 must be documented via notes, figures, and photographs. To facilitate the inspection, a cap inspection form must be completed during each routine annual inspection; a blank cap inspection form is included in Attachment 1.

Annual inspection forms should be saved by the landowner for at least 10 years. Routine inspection forms that confirm cap integrity do not have to be submitted to Ecology; but must be available to Ecology upon request.

If inspections or other observation identify potential breaches of the cap or damage to the cap that exposes the geotextile or GeoGrid indicator layer or underlying soil, Ecology shall be notified within 48 hours of the discovery. Unless an alternative plan has been approved by Ecology in writing, the landowner shall promptly repair the damage in accordance with the requirements of this CIMP and submit a report documenting this work to Ecology within 30 days of completing the repairs. This documentation should be submitted to the Ecology contact defined by the Environmental Restrictive Covenant.

3.3 MAINTENANCE AND REPAIR

Routine site maintenance shall be performed by the landowner whenever necessary to ensure that a cap cross section, as defined in Section 2.1, remains continuous at all times throughout the entire area defined on Figure 2.1.

Breaches of the cap or damage to the cap that exposes the geotextile or GeoGrid indicator layer or underlying soil must be promptly repaired. Cap repair must ensure that a cap cross section, as defined in Section 2.1, is continuous throughout the entire area defined on Figure 2.1. Cap repair shall be performed following the procedures outlined in Section 4.0. Documentation of cap repair shall be submitted to Ecology as described above.

4.0 Disturbance and Repair of the Capped Area

4.1 PLANNED CAP DISTURBANCE – NOTIFICATION AND REPORTING

Disturbance of the capped area for planned development activities is allowed, if the work is conducted in accordance with this CIMP. At least 30 days before the cap is disturbed, notification shall be provided to Ecology, including a description and diagrams of the work to be performed, and confirmation that the work will be performed in accordance with this CIMP.

After disturbance and repair activities are complete, as-built documentation, photographs of the work, and a letter summarizing that work was conducted according to this CIMP shall be submitted to Ecology within 45 days of completion.

4.2 HEALTH AND SAFETY REQUIREMENTS

As previously described, dioxins/furans are the contaminant of concern beneath the capped area, and thus are the focus concerning health and safety requirements. Any activities that include disturbance and/or repairs within the capped area will need to comply with the standards prescribed by the Occupational Safety and Health Act (OSHA) and the Washington Industrial Safety and Health Act (WISHA). All personnel that may be in contact with excavated soil must comply with applicable regulations specified in WAC Chapter 296-843, Hazardous Waste Operations, administered by the Washington State Department of Labor and Industries. Personnel involved will be 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) trained, maintain their training with an annual 8-hour refresher, and wear proper personal protective equipment. Personnel with limited tasks and minimal exposure potential will be required to have 24-hour training and a site hazard briefing and be escorted by a trained employee. Construction contractors shall document and implement their own Health and Safety Plan for their work.

The dioxin/furan-contaminated soil is present beneath the indicator layer at a thickness ranging between 5 and 10 feet below ground surface. Soil analytical data from field investigations indicate that the contaminated soil contains dioxins/furans at TEQ concentrations up to 247,000 picograms per gram, with an average concentration of approximately 54,000 picograms per gram. These concentrations are greater than the industrial CUL of 1,680 picograms per gram. The routes of exposure include inhalation, skin absorption, ingestion, and skin and eye contact. The potential toxic effects include eye irritation, allergic dermatitis, chloracne, gastrointestinal distress, liver and kidney damage, and cancer.

If the capped area is disturbed or needs repairing, decontamination procedures must be strictly followed to prevent spread of dioxin/furan-contaminated soil from beyond the exclusion zone. The exclusion zone and all contaminated soil must remain within the capped area.

To avoid personal contact with contaminants, do the following:

- Do not walk through areas of exposed contaminated soil.
- Do not directly handle or touch contaminated materials.
- Make sure all personal protective equipment have no cuts or tears prior to donning.
- Fasten all closures on suits, and cover with tape, if necessary.
- Take particular care to protect any skin injuries.
- Stay upwind of airborne contaminants.
- Do not carry cigarettes, gum, or similar items into the exclusion zone.

To avoid spreading equipment contamination:

- Take care to limit contact with heavy equipment and vehicles.
- If contaminated tools are to be placed on non-contaminated equipment/vehicles for transport to the decontamination pad, use plastic to keep the non-contaminated equipment clean.

The exclusion zone and the work site in general must include an established support zone and personnel and equipment decontamination areas. The minimum decontamination that will be required for all activities involved with contaminated soil will consist of Level D decontamination as described below.

Decontamination for activities requiring Level D protection will consist of the following:

- Remove and dispose of gloves.
- Remove, wash, and rinse goggles.
- Remove safety boots.
- Wash and rinse face and hands.
- Decontamination of heavy equipment used to excavate or move contaminated material during redevelopment or repairs within the capped area will consist of the following:
  - Do not place non-contaminated tools on contaminated equipment/vehicles.
  - Use a high-pressure sprayer and stiff-bristle brushes to decontaminate all surface areas of large and heavy equipment within a designated decontamination zone prior to leaving the capped area.
  - Capture decontamination fluids and dispose of at a permitted disposal facility or disperse within the capped area.

4.2 EXCAVATION, SOIL MANAGEMENT, BACKFILL, AND CAP REPAIR

If the procedures in this CIMP are followed, the cap may be disturbed for site development activities. Cap disturbance and excavation and reinternment of contaminated soil is allowed for site development activities. However, contaminated soil that is removed must remain within the capped area and, if possible, be used as backfill. After replacing the excavated contaminated soil back within the capped area, the overlying cap shall be replaced to meet the requirements in Section 2.1 throughout the full extent shown on Figure 2.2. Cap replacement in the disturbed areas shall meet original construction specifications, or be constructed with asphalt or concrete pavement or building slabs with a minimum 12-inch-thick constructed cross section (a reduced thickness would be allowable if advance written approval is received from Ecology). If excavated soil is unable to be replaced below the cap, soil may be disposed of off-site, if the requirements in Section 4.3 are met.

If excavation and stockpiling of contaminated soil is necessary, proper procedures and Best Management Practices shall be utilized on-site. This includes, but is not limited to, the following:

- Keeping all excavated soil within the capped area
- Using dust control procedures to eliminate all visible dust
- Placing all stockpiled soil on plastic sheeting, and covering all stockpiles with plastic sheeting, with a perimeter barrier to prevent runoff, erosion, or windborne movement
- Providing decontamination facilities to prevent vehicle or personnel tracking of soil from the exclusion zone to areas beyond the capped area
- Protecting areas downstream and beyond the capped area from erosion or contaminant migration due to rainfall and stormwater runoff

No testing is required for stockpiled contaminated soil if it is used a backfill.

If it is required for construction components to permanently penetrate the indicator layer, such as pile foundations or utility conduits, during cap repair a geotextile must be installed to edge of work as an indicator layer to separate contaminated material from clean overlying fill. All repairs or replacement of the cap must meet the minimum requirements defined in Section 2.1.

4.3 POTENTIAL OFF-SITE DISPOSAL OF EXCAVATED MATERIAL

If excavated soil is unable to be replaced below the cap, soil may be disposed of off-site, if the following requirements are met.

All appropriate procedures and requirements required by Ecology must be followed to properly characterized contaminated soil that will be transported for off-site disposal. The contaminated soil at the Site is a F021-listed waste and must be processed as CAMU-eligible waste; therefore, disposal options are limited. For off-site disposal, excavated contaminated soil must be appropriately profiled and transported either by truck or rail to an appropriate, Ecology-approved, licensed disposal facility for Subtitle C hazardous waste. Ecology and receiving landfill approvals for the soil disposal must be received in writing prior to leaving the Site.

All laboratory reports, waste manifests, trucking slips, and documents associated with the off-site disposal of contaminated soil must be filed for record-keeping and reported to Ecology with the as-built information regarding cap repair.

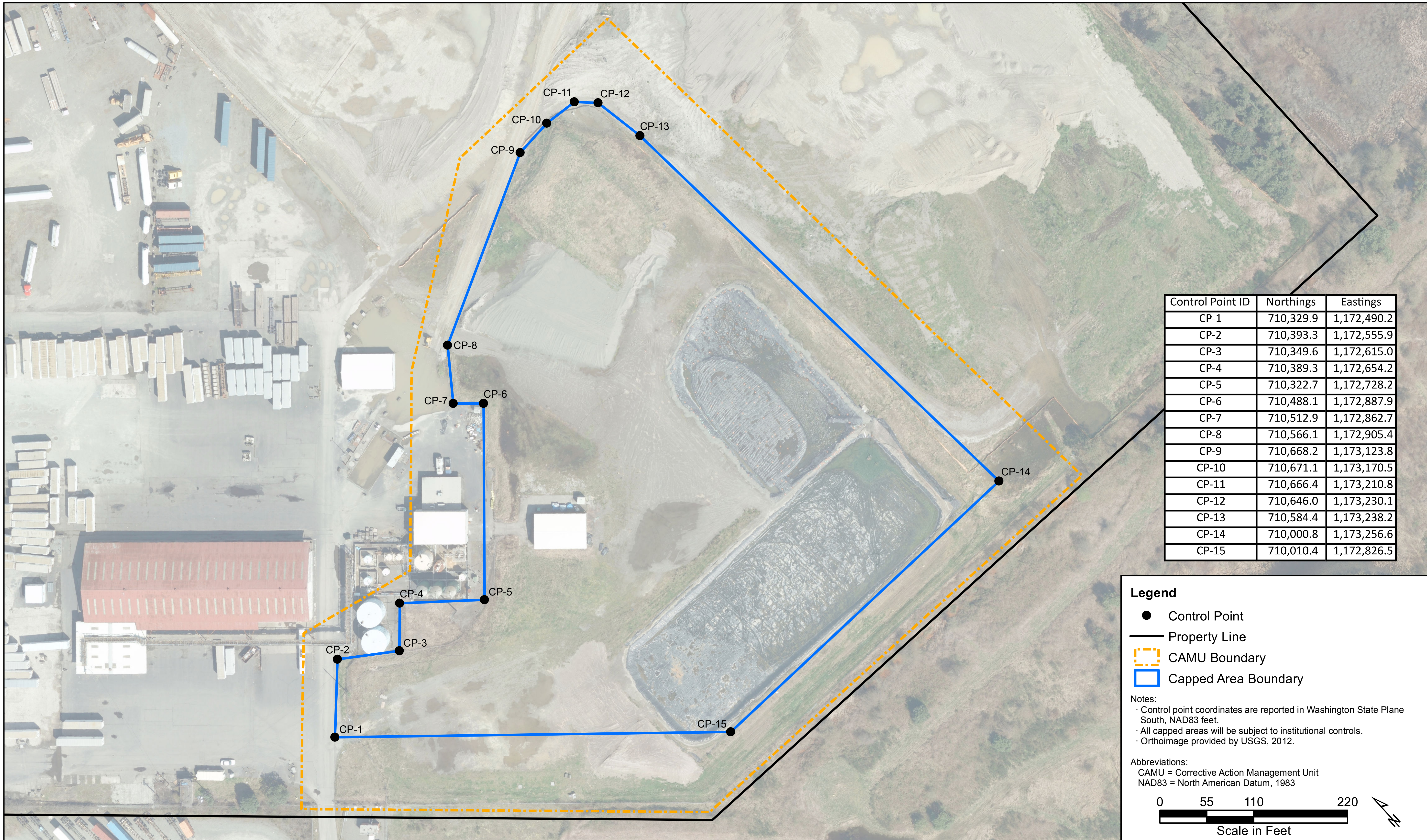
5.0 References

Washington State Department of Ecology (Ecology). 2008. *Consent Decree No. 08-2-15781-0*. 30 December.

Reichhold/SSA Containers Facility

Cap Inspection and Maintenance Plan

Figures



Control Point ID	Northings	Eastings
CP-1	710,329.9	1,172,490.2
CP-2	710,393.3	1,172,555.9
CP-3	710,349.6	1,172,615.0
CP-4	710,389.3	1,172,654.2
CP-5	710,322.7	1,172,728.2
CP-6	710,488.1	1,172,887.9
CP-7	710,512.9	1,172,862.7
CP-8	710,566.1	1,172,905.4
CP-9	710,668.2	1,173,123.8
CP-10	710,671.1	1,173,170.5
CP-11	710,666.4	1,173,210.8
CP-12	710,646.0	1,173,230.1
CP-13	710,584.4	1,173,238.2
CP-14	710,000.8	1,173,256.6
CP-15	710,010.4	1,172,826.5

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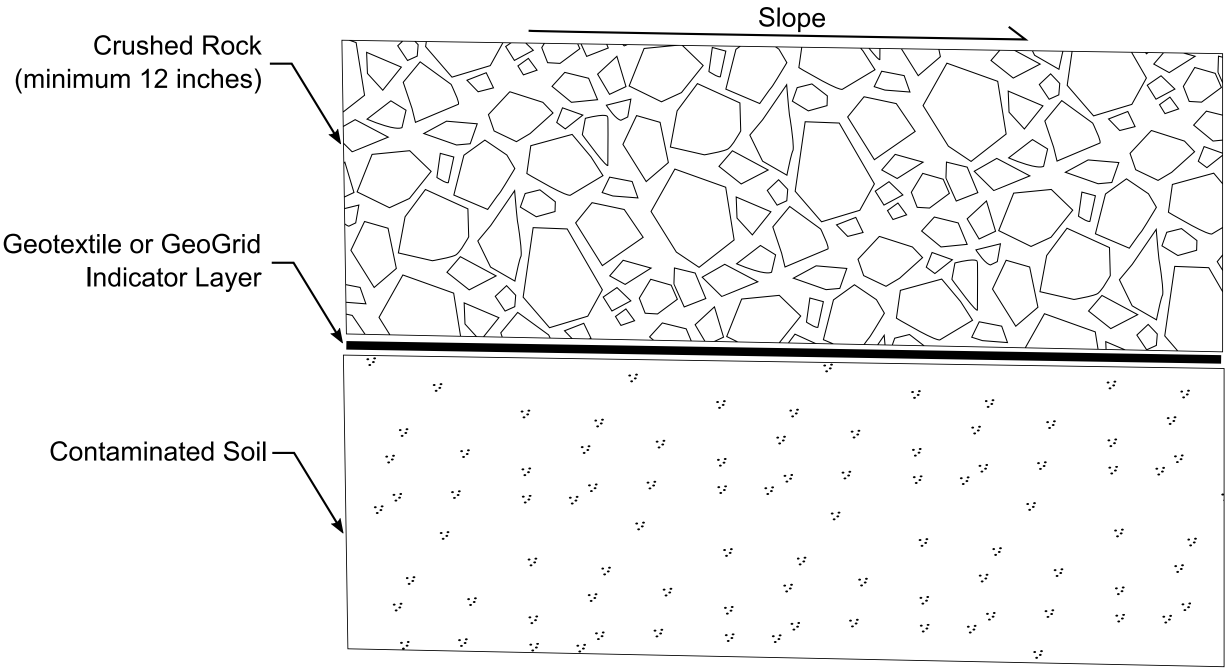
Cap Inspection and Maintenance Plan
Reichhold/SSA Containers Facility
Tacoma, Washington

Figure 2.1
CAMU Boundary and Capped Area

I:\GIS\Projects\SSA-RHOLD\MXD\Phase 6200\CAP Inspection and Maintenance\Figure 2.1 CAMU Boundary and Capped Area.mxd
January, 2016



Notes:

1. Cap minimum standards include a geotextile or GeoGrid indicator layer placed below a minimum 12-inch-thick cap of compacted crushed rock surfacing. Infiltration of stormwater through the cap is allowable. The cap will prevent any stormwater that does not infiltrate from contacting contaminated soil. Asphalt pavement, concrete pavement, or building slabs may be substituted for the compacted crushed rock cap if their constructed cross sections have a minimum 12-inch thickness (or a reduced thickness if advance written approval is received from Washington State Department of Ecology).
2. The crushed rock will be based on the 2008 Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9(3) for Crushed Surfacing or equivalent. The specifications for construction will require standard placement and compaction methods for structural backfill (i.e., placement and compaction of the material in lifts with appropriate moisture content for the material type).

FLOYD | SNIDER strategy ▪ science ▪ engineering	**Cap Inspection and Maintenance Plan** **Reichhold/SSA Containers Facility** **Tacoma, Washington**	Figure 2.2 Cap Cross Section Minimum Requirements

I:\GIS\Projects\SSA-RHOLD\SVG\Figure 2.2 Proposed Cap Cross Section.svg
January, 2016

Reichhold/SSA Containers Facility

Cap Inspection and Maintenance Plan

Attachment 1
Cap Inspection Form

Soils contaminated with dioxin/furan compounds are present at the Reichhold/SSA Containers Facility within a 7.3-acre capped area. The cap integrity must be maintained in perpetuity in compliance with the Environmental Restrictive Covenant applicable to the property. Annual cap inspections are required to be performed every year prior to June 30, per the Cap Inspection and Maintenance Plan. This form is provided to facilitate cap inspections. Refer to inspection requirements in the Cap Inspection and Maintenance Plan.

Date of Inspection: ______________________

Name of Inspector: ______________________

Title: ______________________

Employer: ______________________

☐ Annual Inspection ☐ Non-Routine Inspection

1. Inspect entire capped area and identify areas that represent potential for terrestrial ecological exposure or direct contact to the contaminated soil through the cap. Infiltration of stormwater is allowed; however, ponded areas may indicate surface subsidence. Include location, the nature of the problem, and possible corrective actions. Estimate surface area of disturbances and indicate if indicator layer (geotextile or GeoGrid) is exposed. If large zones of the capped area are inaccessible for visual observation at the time of inspection, identify these locations. Summarize inspection observations in spaces below. **Provide a reason if conducting a Non-Routine Inspection**:

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CAP AREA

Potholes, ponding, damage, erosion, >2 inches of subsidence, unusual disturbance or capped areas that appear less than 12 inches thick: ☐ None ☐ Repair needed

Exposed geotextile or GeoGrid indicator layer: ☐ None ☐ Repair needed

Repair Type/Location: ______________________

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CAP AREA ADJACENT TO BUILDING FOUNDATIONS

Separation of cap material from building foundations: ☐ None ☐ Repair needed

Exposed geotextile or GeoGrid indicator layer adjacent to building foundation: ☐ None ☐ Repair needed

Maintenance/Repair Type/Location: ______________________________

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AREAS WITH PAVEMENT OR BUILDING SLABS

Absence of pavement, open cracks and/or ruts: ☐ None ☐ Repair needed

Surface settlement or ponding: ☐ None ☐ Repair needed

Exposed subsurface adjacent to building foundation: ☐ None ☐ Repair needed

Maintenance/Repair Type/Location: ______________________________

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2. Sketch site. Attach a marked-up copy of a site map (such as an aerial photograph, i.e., Figure 2.1) indicating areas inspected, locations of problem areas (potholes, unusual erosion, damage, large cracks, failure, disturbance, exposed geotextile or GeoGrid indicator layer, etc.), and inaccessible areas. Include photographs of problem areas, if appropriate.

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