ARCADIS Design & Consultancy for natural and built assets

Georgia-Pacific LLC

REMOVAL ACTION WORK PLAN
OPERABLE UNIT E

Former Georgia-Pacific Wood Products Facility

Fort Bragg, California

May 2016

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REMOVAL ACTION WORK PLAN, OPERABLE UNIT E

Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AOI	Area of Interest
AME	Acton•Mickelson•Environmental, Inc.
Arcadis	Arcadis U.S., Inc.
AST	aboveground storage tank
B(a)P	benzo(a)pyrene
BHHERA	Baseline Human Health and Ecological Risk Assessment – Operable Unit E
bgs	below ground surface
bss	below sediment surface
btoc	below top of casing
Cal/OSHA	California Division of Occupational Safety and Health
CCC	California Coastal Commission
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
City	City of Fort Bragg
COPC	chemical of potential concern
CY	cubic yards
dioxin	polychlorinated dibenzo-*p*-dioxin
DTSC	California Environmental Protection Agency, Department of Toxic Substances Control
ELCR	excess lifetime cancer risk
EPC	exposure point concentration
ERA	ecological risk assessment
ESA	environmental site assessment
ESHA	environmentally sensitive habitat area
FS	Feasibility Study, Operable Units C and D
furan	polychlorinated dibenzofuran
Georgia-Pacific	Georgia-Pacific LLC
HASP	Health and Safety Plan

HAZWOPER	hazardous waste site operations
HDPE	high-density polyethylene
HERO	Human and Ecological Risk Office
HSC	California Health and Safety Code
Hygienetics	Hygienetics Environmental Services, Inc.
IRM	Interim Remedial Measure
JSA	job safety analysis
LBP	lead-based paint
LOAEL	lowest observed adverse effect level
mg/kg	milligram(s) per kilogram
mg/kg-day	milligrams per kilogram per day
NAVD88	North American Vertical Datum of 1988
NCP	National Contingency Plan
NTE	not to exceed
ORM	oxygen-releasing material
OSHA	Occupational Safety and Health Administration
OU-C/D	Operable Unit C/D
OU-C/D RAP	*Remedial Action Plan Operable Units C and D*
OU-C/D RI	Remedial Investigation Operable Units C and D
OU-E	Operable Unit E
PAH	polycyclic aromatic hydrocarbon
pg/g	picogram per gram
Phase II ESA	Phase II Environmental Site Assessment
PPE	personal protective equipment
PSL	primary screening level
RAA	removal action area
RAG	removal action goal
RAW	Removal Action Work Plan Operable Unit E
RBTL	risk-based target levels
RDIP	remedial design and implementation plan
RI	remedial investigation

RI Report	Final Remedial Investigation Report Operable Unit E
SAP	Sampling and Analysis Plan
SEIR	Subsequent Environmental Impact Report
SF	square feet
site	former Georgia-Pacific Wood Products Facility located at 90West Redwood Avenue in Fort Bragg, Mendocino County, California
TEQ	toxic equivalent
TPH	total petroleum hydrocarbon
TPHd	total petroleum hydrocarbons in the diesel range
TRC	TRC Companies, Inc.
UCL	upper confidence limit
USEPA	U.S. Environmental Protection Agency
WRA	WRA Environmental Consultants

EXECUTIVE SUMMARY

On behalf of Georgia-Pacific LLC, Arcadis U.S., Inc. (Arcadis) prepared this Removal Action Work Plan (RAW) for Operable Unit E (OU-E) at the former Georgia-Pacific Wood Products Facility located at 90 West Redwood Avenue in Fort Bragg, Mendocino County, California (site), as shown on Figure 1-1. A RAW is a work plan that may be prepared for a hazardous substance release site pursuant to California Health and Safety Code Section 25356.1. The proposed removal action detailed in this RAW addresses impacted soil, groundwater, and sediment in OU-E. The proposed removal action will support the construction and public use of the central portion of the Fort Bragg Coastal Trail in 2017. The City of Fort Bragg plans to construct the central section of the Coastal Trail through this area in 2017. Public access will occur once construction is complete; therefore, this removal action is necessary in 2016 to be protective of human health once the Coastal Trail opens in 2017. Once the proposed activities are complete, risks to public health and the environment will be reduced and the areas addressed by the RAW will be acceptable for the planned recreational use.

The proposed removal action areas (RAAs) include the following: OU-E Lowland RAA, Southern Ponds RAA, Ponds 7 RAA, and Riparian RAA (Figures 2-8 through 2-14). For each RAA, removal action goals (RAGs) were established, with the primary RAG of this RAW being to accelerate remediation within the identified Areas of Concern (AOCs) by removing areas where elevated concentrations of chemicals of potential concern (COPCs) have been identified.

The RAW is an interim action and not the final cleanup. The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) will further evaluate the cleanup for these areas in a future Feasibility Study and future Remedial Action Plan. This RAW is appropriate for removal actions that are projected to cost less than $2,000,000 (DTSC 2016b), and concludes on the optimal alternative for a removal action.

This RAW includes a background of the site, description of removal action goals, evaluation and selection of removal actions, description of implementation, and reporting requirements and implementation schedule. Following the comparative analysis presented in this RAW, excavation and disposal was the selected removal action alternative for each Area of Concern (AOC)/Area of Interest. This selected alternative is estimated to cost $880,000.

OU-E is one of five operable units on the site (Figure 2-1), and consists of approximately 12 acres of man-made ponds and seasonal wetland areas and 45 terrestrial acres divided into eight AOCs (Figure 2-2). Based on the findings of the *Final Remedial Investigation Report Operable Unit E* (Arcadis 2013a) and the *Baseline Human Health and Ecological Risk Assessment – Operable Unit E* (Arcadis 2015a), removal action areas (RAAs) were developed. These RAAs include the following: OU-E Lowland RAA, Southern Ponds RAA, Ponds 7 RAA, and Riparian RAA (Figures 2-8 through 2-14). For each RAA, removal action goals (RAGs) were established, with the primary RAG of this RAW being to accelerate remediation within the identified AOCs by removing areas where elevated concentrations of chemicals of potential concern (COPCs) have been identified. The removal alternative selected (excavation and disposal) most effectively meets the RAG for this RAW.

Following a comparative analysis of three potential removal alternatives, the most effective removal action was concluded to be excavation and off-site disposal. This removal action alternative is easily

implementable and provides immediate and the most effective reduction of risks associated with the COPCs. This alternative can be implemented concurrently with excavation activities at Operable Unit C/D; therefore, the removal action can be conducted in 2016 to accelerate remediation in OU-E. Approximately 3,500 cubic yards are proposed for removal in OU-E, with a 27,000-square-foot footprint and a depth extending to a maximum of 9 feet below ground surface. Excavated soil and sediment will be disposed of off-site at permitted waste facilities. Approximately 175 truck trips are required to remove the soil and sediment. The total duration of removal activities at the excavations is anticipated to last approximately 5 weeks and cost approximately $880,000. Work will be conducted in accordance with applicable federal, state, and local regulations. The necessary permits (i.e., Coastal Development Permit, Grading Permit, Dust Control Permit, Section 401 of the Clean Water Act Permit, Section 404 of the Clean Water Act Permit, Section 1602 Streambed Alteration Agreement Permit, General Permit for Discharges of Storm Water Associated with Construction Activity, and Mendocino County Environmental Health Department Well Destruction Permits) and approvals will be obtained from agencies and acceptance by the state and the community. This RAW concludes that the excavation and disposal alternative is the preferred method of removal action for OU-E RAAs.

The City of Fort Bragg, as Lead Agency under California Environmental Quality Act (CEQA), prepared Subsequent Environmental Impact Report (SEIR) for the coastal trail. DTSC considered the effects described in the City's SEIR and concluded that approval of the Draft RAW would not result in significant impacts to the environment. DTSC has prepared an Addendum to the SEIR having determined this as the appropriate document under CEQA. Upon approval of the Draft RAW, DTSC will fi le a Notice of Determination to start the 30-day statute of limitations on court challenges to the approval under CEQA. The Addendum to the SEIR has identified mitigation measures necessary to protect public health (dust control and monitoring), biological resources, and cultural resources. The implementation plan for the RAW will include a Mitigation Monitoring Plan to ensure the implementation of the identified mitigation measures.

1 INTRODUCTION

On behalf of Georgia-Pacific LLC (Georgia-Pacific), Arcadis U.S., Inc. (Arcadis) prepared this Removal Action Work Plan (RAW) for Operable Unit E (OU-E) at the former Georgia-Pacific Wood Products Facility located at 90 West Redwood Avenue in Fort Bragg, Mendocino County, California (site), as shown on Figure 1-1. The proposed removal action detailed in this RAW addresses impacted soil, groundwater, and sediment in OU-E. The removal action will support the construction and public use of the central portion of the Fort Bragg Coastal Trail in 2017. The City of Fort Bragg (City) plans to construct the central section of the Coastal Trail through this area in 2017. Public access will occur once construction is complete; therefore, this removal action is necessary in 2016 to be protective of human health once the Coastal Trail opens in 2017. The proposed removal action areas (RAAs) include the following: OU-E Lowland RAA, Southern Ponds RAA, Ponds 7 RAA, and Riparian RAA (Figures 2-8 through 2-14). For each RAA, removal action goals (RAGs) were established, with the primary RAG of this RAW being to accelerate remediation within the identified Areas of Concern (AOCs) by removing areas where elevated concentrations of chemicals of potential concern (COPCs) have been identified. This RAW is appropriate for removal actions that are projected to cost less than $2,000,000 (California Environmental Protection Agency, Department of Toxic Substances Control [DTSC] 2016b) and concludes on the optimal alternative for a removal action). This RAW was prepared in accordance with Site Investigation and Remediation Order Docket No. HAS-RAO 06-07-150. Appendix A includes an administrative record.

1.1 Regulatory Framework

As indicated in DTSC's February 2016 letter, a RAW is a work plan that may be prepared for a hazardous substance release site pursuant to California Health and Safety Code (HSC) Section 25356.1 and is appropriate for removal actions that are projected to cost less than $2,000,000 (DTSC 2016b). As defined in HSC Section 25323.1, work conducted in accordance with a RAW must be performed in a manner that is protective of the public health and safety and the environment (HSC 2016). The RAW must include a detailed engineering plan for conducting the removal action, description of the onsite contamination, goals to be achieved by the removal action, and any alternative removal options that were considered and rejected and the basis for that rejection (HSC 2016).

1.2 Objectives

The objectives of this RAW are to:

- Summarize current site conditions and previous investigations relevant to the development of this RAW
- Develop RAAs based on the findings of the *Final Remedial Investigation Report Operable Unit E* (RI Report; Arcadis 2013a) and the *Baseline Human Health and Ecological Risk Assessment – Operable Unit E* (BHHERA; Arcadis 2015a)
- Develop RAGs for the identified RAAs

- Identify and evaluate potential RAAs that will accelerate remediation within the identified AOCs by removing areas where elevated concentrations of COPCs have been identified, resulting in the reduction of risk to human health and the environment.
- Provide comparative analysis of removal action alternatives and select a removal action alternative
- Describe the elements of the proposed removal action
- Achieve site conditions that are acceptable for the planned recreational use

1.3 Report Organization

This RAW was prepared based on the findings of the RI Report (Arcadis 2013a) and the BHHERA (Arcadis 2015a). This RAW presents information regarding environmental conditions at the site and proposes RAAs to reduce risk to human health and the environment. This RAW establishes RAGs to evaluate the effectiveness of RAAs at reducing risks identified in the BHHERA. Furthermore, this RAW identifies removal action alternatives and proposes the preferred course of removal action to achieve RAGs for each RAA.

This RAW is organized as follows:

- Section 2 presents background information relevant to the scope of this RAW, describes the findings of the BHHERA, and identifies RAAs addressed in this RAW.
- Section 3 summarizes RAGs to be achieved by the removal actions.
- Section 4 describes and evaluates the alternatives for removal actions, compares the alternatives for each RAA, and provides a recommended alternative for removal action proposed in OU-E.
- Section 5 provides the means and methods required to implement the removal action alternatives and details documentation to be submitted for implementation, including a Sampling and Analysis Plan (SAP) and Health and Safety Plan (HASP).
- Section 6 summarizes the reporting and schedule prior to, during, and following RAW implementation.
- Section 7 identifies references cited throughout this RAW.

2 SITE DESCRIPTION AND BACKGROUND

This section provides a summary of background information, as well as a summary of findings from the RI Report (Arcadis 2013a) and BHHERA (Arcadis 2015a). Additional detail regarding site history, background, setting, and investigation results is provided within the RI Report.

2.1 Facility Description

The 415-acre site is located west of Highway 1 along the Pacific Ocean coastline and is bounded by Noyo Bay to the south, the City to the east and north, and the Pacific Ocean to the west (Figure 1-1). Union Lumber Company began sawmill operations at the site in 1885. Georgia-Pacific acquired the site in 1973. Sawmill operations at the site included lumber production and power generation by burning residual bark and wood. Georgia-Pacific ceased operations on August 8, 2002. Much of the equipment and structures associated with sawmill operations have been removed. A northern public coastal trail extending 4.5 miles north of Fort Bragg Landing on 82 acres was opened in 2014. An additional public coastal trail extending from the southern end of the property 0.8 mile to the northern side of the City wastewater treatment plant on 5 acres was opened in 2015. With the exception of the public coastal trails, the site is fenced, security patrolled, and locked to restrict trespassers.

OU-E is one of five operable units on the site (Figure 2-1) and consists of approximately 12 acres of man-made ponds and seasonal poor-quality wetland areas and 45 terrestrial acres. In the near future, the ponds and other wetland areas will likely be classified as jurisdictional wetlands by the United States Army Corps of Engineers. Historically, the RI Report (Arcadis 2013a) identified five terrestrial Areas of Interest (AOIs) and 10 aquatic AOIs, which were incorporated into eight AOCs for evaluation in the BHHERA (Figure 2-2; Arcadis 2013b). In addition, three Operable Unit C/D (OU-C/D) AOIs (Interim Remedial Measure [IRM], West of IRM, Riparian) were transferred to OU-E for further evaluation in the *Feasibility Study, Operable Units C and D* (FS; Arcadis 2012).

Areas discussed within this RAW include the Lowland AOC, Southern Ponds AOC, Pond 7 AOC, and Riparian AOI (Figure 2-2). Details of the AOIs/AOCs not discussed in this RAW are provided in the RI Report (Arcadis 2013a), BHHERA (Arcadis 2015a), and the *Remedial Investigation Operable Units C and D* (OU-C/D RI; Arcadis 2011a).

2.2 Site Setting

2.2.1 Land Use

Most industrial features within OU-E have been removed, leaving OU-E generally vacant, with the exception of a few smaller features shown on Figure 2-2. Portions of the terrestrial area north of Pond 8 remain capped following previous foundation removal activities. There are no active structures or uses in terrestrial areas, and the primary use of aquatic areas is to provide stormwater management prior to discharge to the ocean. Portions of a public coastal trail extend north of Fort Bragg Landing and south from the City wastewater treatment plant. The foreseeable future use of OU-E is as continued stormwater management facilities, parkland, and recreational trail development. The site is fenced and locked to restrict trespassers.

Environmentally sensitive habitat areas (ESHAs[1]) comprise approximately 2.0 acres of the OU-E lowland and approximately 13.2 acres of the remaining OU-E area. The configuration of these ESHAs limits the use of this area.

2.2.2 Ecology

The majority of OU-E was previously developed industrial land characterized by large areas covered with structures/foundations, asphalt, crushed rock, or a mixture of both. Weedy ruderal vegetation is occasionally observed in these areas (WRA Environmental Consultants [WRA] 2005).

Within OU-E, identified wetlands and waters include ponds and ditches used in former sawmill operations and seasonal wetlands[2] and wetland seeps[3] (Figures 2-3 and 2-4). Most of the ponds at the site are dominated by species typical of freshwater marshes, although a few consist of open water with less than 5% cover by vegetation.

Two ESHA delineation efforts occurred to identify “any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments” (CCC 2000). In 2009, WRA delineated 20 waters, including wetlands, totaling 13.31 acres, including Ponds 1 through 9 and the North Pond (classified as industrial ponds) and three wetland seeps on the vegetated slope of the northern portion of OU-E (Wetlands B, C, and D, shown on Figure 2-3; WRA 2009).

In 2010, Arcadis identified three wetland seeps (the eastern portion of Wetland E-1, Wetland E-3, and Wetland E-8) and four seasonal wetlands in OU-E (the western portion of Wetland E-1, Wetland E-2, Wetland Complex E-5 and E-6, and Wetland E-7; Figure 2-3). One additional wetland classified as an industrial pond (Wetland E-4) was identified in a concrete-lined pit that was a remnant of a demolished building. Additional discussion of these areas is included in the *Environmentally Sensitive Habitat Areas Delineation Report* (Arcadis 2011b).

2.2.2.1 Operable Unit E Flora and Fauna

In 2005, WRA conducted a biological assessment (WRA 2005) to identify potentially sensitive biological resources at the site. Non-sensitive plant communities identified at the site included developed industrial, non-native grassland, northern coastal bluff scrub, coastal strand, and planted coniferous woodland. Sensitive plant communities observed at the site included coastal terrace prairie, north coast riparian

[1] ESHAs are referred to as "environmentally sensitive habitat area[s]" in Section 30107.5 of the California Coastal Act, and are defined as "any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments". ESHAs in OU-E include wetland and open water habitats. Regulatory protection of ESHAs in the California Coastal Zone ultimately falls under the jurisdiction of the California Coastal Commission (CCC). The City administers CCC Coastal Act jurisdiction for the site under their Local Coastal Program.

[2] Seasonal wetland plant communities occur in depressions that are inundated during the rainy season for sufficient duration to support vegetation adapted to wetland conditions.

[3] Freshwater seep plant communities are wetlands containing perennial and annual herbs, including sedges and grasses, which occur in areas that receive perennial or semi-perennial hydrological input as a result of subsurface flow of water.

scrub, coastal and valley freshwater marsh, freshwater seep, riparian wetland, seasonal wetland, and seasonal wetland ditch.

2.2.3 Geology

2.2.3.1 Regional

Fort Bragg is located along the northern California coastline within the Coast Range geomorphic province. The regional geology consists of complexly folded, faulted, sheared, and altered bedrock. The bedrock of the region is the Franciscan Complex of Cretaceous to Tertiary (late Eocene) age (40 to 70 million years old). The Franciscan Complex comprises a variety of rock types. In the north coast region, the Franciscan Complex is divided into two units: the Coastal Belt and the Melange. In Mendocino County, the Melange lies inland and is an older portion of the Franciscan Complex, ranging in age from the Upper Jurassic to the late Cretaceous. The Coastal Belt consists predominantly of greywacke sandstone and shale.

2.2.3.2 Local

Besides the Coastal Belt, other geologic units present in Fort Bragg and nearby include surficial deposits of beach and dune sands, alluvium, and marine sediments. As discussed below, the most important of these at the site are the marine sediments, which cut bedrock surfaces along the coast and form much of the coastal bluff material overlying bedrock. Artificial fill (reworked native soil or imported material) is also prevalent at the site.

Figure 2-5 depicts the surficial geology of the site and environs. The site is underlain by Quaternary (less than 1.5 million years old) marine sediments deposited in thicknesses up to 30 feet on wave-cut surfaces parallel to the coast (Blackburn Consulting, Inc. 2006). These surfaces were created during the Pleistocene Epoch, when sea level fluctuations caused by glaciation created a series of terraces cut into the Franciscan bedrock by wave action (BACE Geotechnical 2004). The marine sediments comprise poorly to moderately consolidated silts, sands, and gravels, and in some locations, are overlain by a 3- to 4-foot-thick mantle of topsoil or up to a 20-foot-thick layer of artificial fill (BACE Geotechnical 2004). Both the topsoil and fill are generally relatively coarse in texture, ranging primarily from sandy silts to gravel. The marine sediments are also generally coarse, but appreciable thicknesses of finer materials are also found onsite. Beneath these Pleistocene materials are the Tertiary-Cretaceous rocks (approximately 65 million years old) of the Coastal Belt, composed of well-consolidated sandstone, shale, and conglomerate.

2.2.3.3 Operable Unit E Specific

The shallow subsurface of the terrestrial portions of OU-E contain up to three lithologic units: artificial fill, marine sediments, and bedrock.

2.2.3.3.1 Artificial Fill

Soil borings, test pits, and potholes completed in the terrestrial portions of OU-E identified artificial fill in most areas. In general, the fill consists of reworked marine sediments with foreign materials. It can be

generally characterized as coarse-textured material (silty sands to silty gravels), often containing wood chips, bark, ash, sawdust, brick, scrap metal, charcoal, and plastic. Fill thicknesses greater than 30 feet below ground surface (bgs) have been observed along the eastern edges of Ponds 6 and 8, but thicknesses on the order of 5 to 10 feet bgs are more common in the terrestrial areas and around the ponds in Parcel 7.

2.2.3.3.2 Marine Sediments and Bedrock

Marine sediments and bedrock underlie the artificial fill (where present) in OU-E. Similar to other portions of the site, Franciscan bedrock is present beneath the upland portions of OU-E, but based on lithological information available from borings advanced at the site, its surface undulates and depths to bedrock can vary widely over short lateral distances. For example, within a 350-foot distance along the eastern edge of Pond 8, depths to bedrock vary from less than 10 feet bgs to greater than 40 feet bgs. Bedrock depths are generally shallow (approximately 10 feet bgs) near the ponds in Parcel 7, but in the formerly developed areas of Sawmill #1 and the Powerhouse, bedrock depths are generally no less than 30 feet bgs. In some locations around the margins of Pond 8, marine sediments are completely absent and artificial fill is in direct contact with bedrock.

2.2.4 Hydrogeology

2.2.4.1 Regional

The Mendocino County Coastal Ground Water Study (California Department of Water Resources 1982) presents the regional hydrogeologic setting of the Mendocino County coast. The site is located in the western coastal area of Mendocino County, which was divided into five subunits in the study: Westport, Fort Bragg, Albion, Elk, and Point Arena, separated by the major rivers that discharge to the Pacific Ocean. The study included all areas where coastal terrace deposits had been mapped. The site is located within the Fort Bragg subunit, which extends from Big River to the south to Ten Mile River to the north.

Fresh groundwater is primarily obtained from shallow wells in the semi-consolidated marine terrace deposits or through municipal or privately owned water systems. These water systems divert surface flow and springs or tap shallow alluvial aquifers. A combination of wells and surface water diversions is commonly necessary to provide adequate water supply year round.

2.2.4.2 Local

Based on quarterly monitoring from 2004 to 2012 and semi-annual monitoring from 2013 to 2015, groundwater generally flows radially at the site towards Fort Bragg Landing and the Pacific Ocean (Figure 2-6) under average horizontal hydraulic gradients ranging from approximately 0.016 to 0.034 foot per foot (Arcadis 2015c). Gradients are generally steeper in the central portion of the site and flatter in the northern and southern portions of the site. Depths to first-encountered groundwater have historically ranged from less than 1 foot to approximately 29 feet below top of casing (btoc). In terms of elevation, groundwater levels have ranged from approximately 8 to 104 feet relative to North American Vertical Datum of 1988 (NAVD88). Depending on location, groundwater levels have been observed to fluctuate seasonally up to 12 feet with the seasons; elevations are higher in the winter and spring and lower in the

summer and fall. During the September 2015 monitoring event, groundwater encountered ranged from 4.52 to 17.85 feet btoc. Groundwater elevations ranged from 17.66 to 83.25 feet relative to NAVD88, which is consistent with historical trends (Arcadis 2015c).

2.2.4.3 Operable Unit E Specific

Much of OU-E lies at the lowest elevations at the site, and groundwater flow paths tend to converge in the areas around Fort Bragg Landing, with eventual discharge to the Pacific Ocean (Figure 2-6). In September 2015, groundwater encountered in the Lowland AOC of OU-E was measured at 4.80 feet btoc. Groundwater elevation in the OU-E Lowland AOC was measured at 17.66 feet relative to NAVD88. Depths to groundwater of approximately less than 1 foot btoc have been recorded in the center of the area north of Pond 8 (monitoring wells MW-4.4 and MW-5.16), with depths along the eastern (monitoring well MW-5.18) and western perimeters (monitoring well MW-4.6) increasing to more than 12 feet btoc.

2.2.5 Surface Water Hydrology

There are 10 man-made ponds (Ponds 1 through 9 and the North Pond) ranging in size from 0.1 acre to 7.29 acres. The ponds served operational purposes, and Pond 8 also receives stormwater from the City. Water transfer into and among the ponds was an integral part of the operational history of the site.

Most waters and wetland features rely on direct precipitation and surface water runoff. Some wetland seep features receive groundwater discharge as well. Most waters and wetlands in this area lack a direct hydrologic surface connection to Fort Bragg Landing. Pond 6 has a surface flow connection to Fort Bragg Landing via a corrugated high-density polyethylene culvert that discharges through the beach berm separating the OU-E Lowland from Fort Bragg Landing. Runoff into the OU-E Lowland also occurs from impervious surfaces (i.e., asphalt and concrete) in the higher elevation areas located to the north and east. Pond 8 receives runoff from the City stormwater collection system and discharges to Fort Bragg Landing over a spillway built into the mill pond dam.

In the past, the Southern Ponds (Ponds 1 through 4) received water from site operations. Currently, the Southern Ponds capture rainfall, stormwater runoff, and some groundwater seeps. Pond 2 is seasonal, but has some groundwater input as the water table can rise above the pond bottom during the rainy season. The southeastern and northwestern portions of Pond 3 generally have groundwater infiltration year round.

2.2.6 Cultural Resources

TRC Companies, Inc. (TRC; 2003, Undated #1, and Undated #2) conducted archival research and archeological surveys of the site and found that portions of the site are considered likely to contain intact prehistoric deposits, as well as historic sites. Areas that are likely to contain historic deposits are important in understanding the early settlement and development of the local community, as well as the lumber operations onsite.

Within OU-E, TRC identified moderate to high potential for prehistoric resources in the lowland terrestrial area. The area nearest to Fort Bragg Landing was identified as having a high potential for prehistoric cultural resources. Although subsequent industrial activities may have destroyed prehistoric deposits near Fort Bragg Landing, the road and sea wall may have preserved possibly significant prehistoric cultural

resources. OU-E was also identified as having high potential for historic resources. Historic buildings and infrastructure associated with past milling operations are found throughout the lowland terrestrial area (TRC 2003).

TRC considered the wooded area within the Riparian AOI to have a high potential to contain prehistoric cultural remains. This AOI has been largely untouched by the industrial development that occurred on the other portions of the site. Most of the Riparian AOI was categorized as having moderate potential for historic resources, with the exception of a small area on the southwestern boundary of the Riparian AOI. This area may contain debris that may relate to earlier phases of lumber operations (TRC 2003).

2.3 Operational History

A general summary of the operational history of the AOCs/AOIs included in the scope of this RAW is provided below.

2.3.1 Terrestrial Areas

The RI Report (Arcadis 2013a) identified one terrestrial AOC (OU-E Lowland AOC), which encompasses the Water Treatment and Truck Dump AOI, Sawmill #1 AOI, Compressor House and Lath Building AOI, and Powerhouse and Fuel Barn AOI. Terrestrial AOIs within the OU-E Lowland AOC addressed by this RAW are indicated on Figure 2-7 and discussed below. Operational history for terrestrial AOIs in OU-E not included in this RAW is provided in the RI Report.

2.3.1.1 Water Treatment and Truck Dump Area of Interest

The Water Treatment and Truck Dump AOI is located in the northwestern section of OU-E. Former features in the area include the Alum Tank, Water Treatment Plant, Sewage Pump Station, Water Supply Switch Building, Water Valve Shed, Water Tower, Powerhouse Fuel Storage Shed, Chipper Building, Truck Dump, Truck Dump Hydraulic Unit Building, and the Bunker Fuel Aboveground Storage Tank (AST) Area.

Outside the plant, a concrete AST may have held a treated water supply for the Powerhouse. Approximately 300 feet northwest of the plant was a 4,000-gallon AST containing alum[4]. The Alum Tank and Water Treatment Plant foundation were broken up, and the concrete was moved to the concrete storage area in August 2006. After demolition of the foundations, a dry cap[5] was placed in the removal area.

The Chipper Building consisted of a wood structure with a concrete floor. The Truck Dump was located next to the Chipper Building. The Truck Dump included a hydraulic system formerly used to empty trucks of their wood fuel loads (it was assumed to have been built in the mid-1970s); inside the building was a transformer. A concrete slab was used for structural support at this location. The walls of the Chipper

[4] Alum is a combination of an alkali metal (such as sodium, potassium, or ammonium) and a trivalent metal (such as aluminum, iron, or chromium). In water treatment, alum is used as a coagulant, which binds together very fine suspended particles into larger particles that can be removed by settling and filtration.

[5] Dry caps were placed where groundwater was not considered likely to extend to the bottom of excavations. The caps consisted of a geosynthetic clay liner covered with clean fill material.

Building were left in place, as they support a slope north of the building. After demolition of the foundations in June and July 2006, a dry cap was placed in the area. The majority of the dry cap was later excavated with removal of the Fuel Oil Line in 2007 (Arcadis 2008a).

The Sewage Pumping Station consists of a concrete slab and an underground concrete tank.

The Water Supply Switch Building was constructed of corrugated metal with a concrete foundation. The foundation was removed and a dry cap installed in July 2006.

The Powerhouse Fuel Storage Shed was built in 1995 with corrugated metal, had a concrete floor and berm (secondary containment), and was open to the north and east. The shed contained three horizontal ASTs, each with a capacity of 10,000 gallons. In May 1999, 4,000 gallons of fuel spilled within secondary containment and was cleaned up. Soil and groundwater sampling conducted as part of the *Phase II Environmental Site Assessment* (Phase II ESA; TRC 2004b) showed concentrations of total petroleum hydrocarbons (TPH) below screening levels. To the west of the building, there was a 30,000-gallon Water Tower, built from wood with a concrete base. The Water Tower pad and the Fuel Storage Area were removed and a dry cap installed in July 2006.

Backup fuel was stored in two ASTs in the Former Bunker Fuel AST area north of the Powerhouse. Both ASTs had concrete secondary containment and were removed in 1996. Underground piping associated with the ASTs was excavated in 2007 (Arcadis 2008d).

2.3.1.2 Sawmill #1 Area of Interest

Sawmill #1 AOI is an “L”-shaped area located north of the eastern half of Pond 8. Former features in the area include the Sawmill #1 Building, Press Building, Green Chain (and Elevated Roadway), Lath and Shake Mill, Refuse Wood for Fuel Area, Engine House Area, Number 5 Shingle Mill Area, and AST.

The Press Building was constructed of wood with a concrete floor and was located south of the former Sawmill #1 Building. The building contained a sugar cane press until the early 1990s when it was removed. Press Building pad and footings removal occurred in July 2006, followed by placement of a dry cap in the removal area.

The former Lath and Shake Mill, Refuse Wood for Fuel Area, Engine House Area, AST, and Number 5 Shingle Mill Area were also present in the Sawmill #1 AOI.

2.3.1.3 Powerhouse and Fuel Barn Area of Interest

The Powerhouse and Fuel Barn AOI is located directly north of Pond 8. Former features in the area include the Dewatering Slabs, Equipment Fueling Area, Steam Dry Kilns, Former South Pond, Fuel Barn, Powerhouse Building, Transformer Pad, Oil Storage Shed, Chemical Storage Tank, Poly Tanks/Small Transformer Pad to the south, Paint Storage Shed, Fly Ash Reinjection System, Open Refuse Fire Area, and Cooling Towers (including the Poly Tank/Transformer Pad and the Cooling Towers Storage Shed). Features still present include the Concrete Lined Tank and Process Water Pumping Station.

2.3.2 Aquatic Areas

Seven aquatic AOCs were identified in the RI Report (Arcadis 2013a) as indicated on Figure 2-2: Southern Ponds, Pond 5, Pond 6, Pond 7, Pond 8, Pond 9, and North Pond. Aquatic AOCs addressed by this RAW are indicated on Figure 2-2 and discussed below. Operational history for aquatic AOCs not included in this RAW is provided in the RI.

2.3.2.1 Ponds 1 through 4 (Southern Ponds)

Ponds 1 through 4 (a total of 2.8 acres), collectively known as the Southern Ponds, were a series of treatment ponds related to the operation of the former Powerhouse. Ponds 1 through 4 were settling ponds that treated water received from Pond 7 (see Section 2.3.2.2). The Southern Ponds discharge to the southwestern end of Pond 8 through a culvert system.

2.3.2.2 Pond 7

Pond 7 (1 acre) received effluent from the wet scrubbers operating in the former Powerhouse power plant. From approximately the mid-1970s up until 1996, fly ash emissions from the boilers were controlled by multi-cyclone collectors, followed by wet scrubbers. Scrubber water from the boilers contained fly ash and was piped to two dewatering slabs where, after drying the residual, fly ash was placed in a dump hopper for removal and placement at an offsite location. Water on the dewatering slabs that did not evaporate was conveyed to Pond 7, and then pumped to Ponds 1 through 4 for further treatment. Pond 7 also received water from the dewatering slabs and wash water from the Powerhouse, as well as groundwater and surface water runoff from the Powerhouse area.

2.3.3 Riparian Area of Interest

The Riparian AOI was moved from OU-D to be further assessed in the FS (Arcadis 2012). This AOI consists of undeveloped, wooded land along the eastern boundary of the site (Figure 2-2). A riparian wetland and perennial surface drainage are present in the northern end of the AOI, and a seasonal wetland ditch runs along the western perimeter of the AOI. Shallow, unpaved drainage ditches run from the Former Log Storage and Sediment Stockpile AOI into the ditch in the Riparian AOI. Remnants of a corrugated metal drainage pipe have been observed in the stream bed approximately midway in the north-south section of the drainage. A water supply well on the western edge of this AOI contained a pump connected to an aboveground plastic pipeline used to transmit water to the onsite nursery (TRC 2004a). Sanitary sewer lines run through the northern end of this AOI. No other historical uses of this AOI have been identified.

2.4 Characterization History and Interim Remedial Actions

This section presents a brief summary of investigation activities conducted in OU-E to characterize site conditions to-date. This section also provides a discussion of interim remedial actions previously conducted in OU-E and a summary of the BHHERA (Arcadis 2015a). Detailed descriptions are provided in the RI Report (Arcadis 2013a) and BHHERA. These past site characterization and risk assessment activities identified hot spots in the terrestrial and aquatic areas that have been included in this RAW. The RAW RAAs were developed considering the results of the hot spot analysis included in the BHHERA

(Arcadis 2015a), to accelerate remediation within the identified AOCs by removing areas where elevated concentrations of COPCs have been identified, to reduce the risk to human health and the environment, and to support the construction and public use of the central portion of the Fort Bragg Coastal Trail. Once the proposed activities are complete, the risks to public health and the environment identified in the site characterization and risk assessment will be reduced and the areas addressed by the RAW will be acceptable for the planned recreational use.

2.4.1 Environmental Investigations

This section summarizes environmental investigations conducted at the site relevant to OU-E, including lead-based paint (LBP) investigations, Phase I and Phase II environmental assessments, 2004 and 2005 additional site assessments, and groundwater monitoring.

2.4.1.1 Lead-Based Paint Investigation

In January 1998, TRC conducted a preliminary investigation of surface and shallow subsurface soil to evaluate paint on select buildings for elevated lead levels and to evaluate if chemicals associated with site operations were present in subsurface soil in the areas scheduled for demolition in Parcels 3, 4, and 5 (TRC 1998).

2.4.1.2 Phase I Environmental Site Assessment

TRC performed a Phase I environmental site assessment (ESA) of the site between 2002 and 2004 (TRC 2004a). The Phase I ESA included visual inspections of each parcel; a site history survey, including historical Sanborn® maps, historical U.S. Geological Survey maps, and aerial photograph review; personal, telephone, and written communication with local and county regulatory agencies; interviews with current and past Georgia-Pacific employees with historical operational knowledge of the site; and a computer database search of sites with known environmental concerns within a 1-mile radius of the site.

As part of the Phase I ESA, Hygienetics Environmental Services, Inc. (Hygienetics) conducted an additional asbestos and LBP investigation in late 2002. Samples from the upland portion of OU-E were found to contain LBP in the Water Treatment Plant Building, Chipper Building, Sawmill #1 Building, Compressor House 1, and Powerhouse Building at concentrations up to 17,000 parts per million lead (Hygienetics 2003).

2.4.1.3 Phase II Environmental Site Assessment

TRC conducted a Phase II ESA to characterize site soils and groundwater in the AOIs identified in the Phase I ESA (TRC 2004a), and to refine the understanding of the nature and extent of affected media. Preliminary Phase II activities were conducted in March and April 2003. Supplemental Phase II activities were conducted in December 2003 and January 2004. Activities included installation of seven monitoring wells within OU-E. The results are presented in the Phase II ESA (TRC 2004b).

2.4.1.4 2004 Additional Site Assessment

TRC conducted additional assessment activities pursuant to recommendations for follow-up assessment presented in TRC's Phase I and Phase II ESAs (TRC 2014a, 2004b, respectively). The additional site investigation included completion of pothole investigations, geophysical investigation, and soil borings for the purpose of collecting additional soil samples, and to investigate surface anomalies and potential waste deposit areas. The results of the additional site assessment are presented in the *Additional Site Assessment Report* (TRC 2004c).

2.4.1.5 2005 Additional Site Assessment

In 2005 and 2006, Acton•Michelson•Environmental, Inc. (AME) conducted additional site assessment work, including additional soil and groundwater sampling, geophysical surveys, and the installation of additional groundwater monitoring wells. Activities were conducted in general accordance with the *Work Plan for Additional Site Assessment* (AME 2005a). Analytical data were reported in the *Dioxin Sampling and Analysis Report* (AME 2006a) and the *Data Transmittal Report* (AME 2006b).

2.4.1.6 Pond Sediment Investigations

2.4.1.6.1 2008 Pond Sediment Investigations

Arcadis conducted pond sediment sampling activities in March 2008, as described in the *Data Summary Report, Operable Unit E Pond Sediment* (Arcadis 2009). These activities were performed in general accordance with the *Preliminary Site Investigation Work Plan Operable Unit E – Onsite Ponds* (Arcadis BBL 2007). Sediment samples were collected from 26 locations in Ponds 1 through 9 and the North Pond. Sediment samples were collected from the intervals of 0 to 0.5 foot below sediment surface (bss) and 0.5 to 1.5 feet bss and analyzed for COPCs for which a data gap had been identified: metals, TPH as diesel (TPHd), TPH as motor oil, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls, and polychlorinated dibenzo-p-dioxin (dioxins) and polychlorinated dibenzofuran (furans). In some locations, samples were also collected at depths up to 9.5 feet bss. Sample locations were selected to characterize areas not previously addressed during historical investigations and/or to fill data gaps related to the spatial and vertical distribution of specific COPCs.

2.4.2 Biological Assessment

In 2005, WRA conducted a biological assessment at the site to identify biological resources at the site. Fifty-four special status species of wildlife were recorded in the site vicinity, but only three species (double-crested cormorant, California brown pelican, and osprey) have a potential for occurrence in the site vicinity. Although these species may be observed and/or occur at times onsite, these species do not nest onsite, and are not expected to obtain a significant portion of their diet from the site. Forty-seven special status plant species were identified in the site vicinity, 18 of which have a moderate potential to occur at the site. Three sensitive plant species were found onsite during the botanical surveys: Blasdale's bent grass, Mendocino Coast Indian paintbrush, and short-leaved evax; however, none of these special status plant species are likely to occur within OU-E, and monthly surveys conducted in OU-E from February to May 2010 did not identify any special status plant species (WRA 2005, updated 2007).

2.4.3 Interim Remedial Measures

IRM activities as described in the *Final Interim Action Remedial Action Plan and Feasibility Study* (Arcadis 2008b) and *Interim Action Completion Report, Operable Units C & E* (Arcadis 2010a) were initiated in 2008 and completed in 2009. IRM activities include the following:

- Foundation removal and cap placement
- Excavation of the former fuel pipe that extended from the former Fuel Storage Shed to the Powerhouse
- Excavation and disposal of soil impacted with metals near the former Compressor Houses
- Excavation and onsite treatment of TPH-affected soil near the former Compressor Houses
- In-situ groundwater treatment for TPH (biosparging and addition of oxygen-releasing material [ORM] before backfilling) near the former Compressor Houses
- Excavation and onsite treatment of TPH-affected soil within the IRM AOI and the West of IRM AOI
- In-situ groundwater treatment for TPH (biosparging and addition of ORM before backfilling) within the IRM AOI and the West of IRM AOI

2.4.4 Remedial Investigations

In June 2010, additional sampling was conducted at OU-E in accordance with the *Site Investigation Work Plan, Operable Unit E – Upland* (Arcadis 2010b) in preparation of the remedial investigation (RI). In October 2010, Arcadis evaluated the existing historical site data and the June 2010 sampling data, and identified data gaps that required step-out sampling to fully delineate chemical impact (Arcadis 2010c). Additional step-out sampling was conducted in November and December 2010 (Arcadis 2011c). Comprehensive analytical results were discussed in the RI Report to characterize the nature and extent of impacts (Arcadis 2013a).

The RI Report (Arcadis 2013a) recommended four of the five lowland terrestrial AOIs (Water Treatment and Truck Dump AOI, Sawmill #1 AOI, Compressor House and Lath Building AOI, and Powerhouse and Fuel Barn AOI) for further evaluation in the BHHERA (Arcadis 2015a). The RI Report recommended no further action for the Pond 8 Fill Area AOI, due to only a single zinc exceedance of the ecological primary screening level (PSL) and no exceedances of human health PSLs. All 10 OU-E aquatic AOIs (Ponds 1 through 9, and the North Pond) were recommended for further evaluation in the BHHERA. Additional site investigation and risk assessment activities conducted for the BHHERA are further discussed in Section 2.4.5.

The Riparian AOI was originally evaluated in the OU-C/D RI (Arcadis 2011a), and was further delineated during the investigation that accompanied the BHHERA (Arcadis 2015a).

2.4.5 Operable Unit E Baseline Human Health and Ecological Risk Assessment

The BHHERA was conducted to evaluate potential future receptors within OU-E and associated AOIs, including the Riparian AOI, based on reasonable likely future land use in accordance with state and

federal guidance and stakeholder input. Sources of stakeholder input on reasonable likely future land use include the City of Fort Bragg Mill Site Specific Plan (City 2015), City of Fort Bragg Draft Municipal Service Review (City 2013), and the CCC California Coastal Act (2014).

The BHHERA (Arcadis 2015a) relied on data presented in the RI Report (Arcadis 2013a) and additional sediment and porewater data collected in April 2013. Likely and reasonably anticipated current and future human receptors evaluated in the terrestrial exposure area of OU-E included construction workers, maintenance/utility workers, passive (occasional) child and adult recreational visitors, frequent adult recreational visitors, and commercial/industrial workers, while recreational visitors were the human receptors for the aquatic areas. Based on the information presented in DTSC-approved documents for OU-E and City planning documents, ESHA designations of OU-E ponds and wetlands, and state and federal regulations and guidance, residential receptors were not evaluated as an assessment endpoint for OU-E under current or reasonable future land uses. The OU-E ecological risk assessment (ERA) estimated exposure and characterized potential ecological risk in accordance with the methods described in the *Site-Wide Risk Assessment Work Plan* (Arcadis 2008c) and the *Revised Baseline Human Health and Ecological Risk Assessment (BHHERA) Work Plan – Operable Unit E (OU-E) Addendum* (Arcadis 2013b).

A hot spot analysis was also included in the BHHERA (Arcadis 2015a) in accordance with the requested DTSC approach (DTSC 2014) and included a comparison of soil data within the OU-E Lowland AOC to not-to-exceed soil values for benzo(a)pyrene [B(a)P] equivalents (0.90 milligram per kilogram [mg/kg]), dioxin toxicity equivalents (TEQ; 160 parts per trillion), and lead (320 mg/kg). To assess residual risks and hazards assuming hot spot removal, the BHHERA also included a comparison of residual exposure point concentrations (EPCs) to risk-based target levels identified by DTSC (DTSC 2014). A summary of results from the BHHERA pertinent to each RAA is provided in Section 2.5. Estimated risks for the AOCs/AOIs not included in this RAW are further discussed in the BHHERA.

2.5 Nature and Extent of Contaminants

The following subsections provide a summary of the nature and extent of contamination identified during RI activities, a summary of results from the BHHERA (Arcadis 2015a) relevant to this RAW, and volumes proposed for removal actions within each AOC/AOI. The RAW RAAs were developed considering the results of hot spot analysis included in the BHHERA (Arcadis 2015a), to accelerate remediation within the identified AOCs by removing areas where elevated concentrations of COPCs have been identified, to reduce the risk to human health and the environment, and to support the construction and public use of the central portion of the Fort Bragg Coastal Trail. Once the proposed activities are complete, the risks to public health and the environment will be reduced and the areas addressed by the RAW will be acceptable for the planned recreational use. A table summarizing the RAAs and volumes is included as Table 2-1.

2.5.1 Operable Unit E Lowland Area of Concern

As indicated on Figure 2-2, the Water Treatment and Truck Dump AOI, Sawmill #1 AOI, and the Powerhouse and Fuel Barn AOI are located within the OU-E Lowland AOC. Historical analytical data from the RI Report (Arcadis 2013a) and proposed removal areas are indicated on Figures 2-8 through 2-11. Hot spots identified in the BHHERA (Arcadis 2015a) are additionally indicated below.

2.5.1.1 Summary of Baseline Human Health and Ecological Risk Assessment Findings

2.5.1.1.1 Water Treatment and Truck Dump Area of Interest

Based on the RI results, the BHHERA (Arcadis 2015a) identified two hot spots within this AOI based on B(a)P TEQ concentrations (OUE-DP-099 at 0.5 to 1.0 foot bgs and OUE-DP-100 at 2.5 to 3.5 feet bgs) as indicated on Figure 2-8.

2.5.1.1.2 Sawmill #1 Area of Interest

Based on the RI results, the BHHERA (Arcadis 2015a) identified hot spots for lead in soil near two sample locations (OUE-DP-070 from 3 to 4 feet bgs and DP-05.57 from 0.5 to 1 foot bgs) as indicated on Figure 2-9.

The BHHERA identified four hot spots based on B(a)P TEQ concentrations in soil within the Sawmill #1 AOI. The four sample locations (OUE-DP-073, OUE-DP-074, OUE-DP-075, and OUE-DP-026) range in depths from approximately 2 to 3.5 feet bgs as indicated on Figure 2-8. Based on communication with DTSC (DTSC 2016a) and the results of the RI Report (Arcadis 2013a), OUE-DP-025 was also identified as a RAA for TPHd.

2.5.1.1.3 Powerhouse and Fuel Barn Area of Interest

The BHHERA (Arcadis 2015a) identified hot spots for lead near two sample locations (OUE-DP-094 from 5.5 to 6 feet bgs and OUE-DP-090 from 5.5 to 6 feet bgs) as indicated on Figure 2-9. The BHHERA also identified a hot spot for dioxin TEQ (2.729 picograms per kilogram) at OUE-DP-052 from 0.5 to 1.5 feet bgs within the former Open Refuse Fire Area as depicted on Figure 2-11. The maximum B(a)P TEQ concentration detected in the Powerhouse and Fuel Barn AOI was 27 mg/kg at sample location HSA-4.3 from 2 to 2.5 feet bgs, at the northwestern corner of the former fuel barn. This location was identified as a B(a)P TEQ hot spot in the BHHERA as indicated on Figure 2-8.

2.5.1.2 Development of Removal Action Areas

The RAW RAAs were developed considering the results of the hot spot analysis included in the BHHERA (Arcadis 2015a), to accelerate remediation within the identified AOCs by removing areas where elevated concentrations of COPCs have been identified, to reduce the risk to human health and the environment, and to support the construction and public use of the central portion of the Fort Bragg Coastal Trail. Once the proposed activities are complete, the risks to public health and the environment will be reduced and the areas addressed by this RAW will be acceptable for planned recreational use.

Each of the 12 hot spots identified in the OU-E Lowland AOC in the BHERRA (Arcadis 2015a) are RAAs. Four sample locations (OU-E-HA-023B, OU-E-DP-088, OUE-DP-076, and P4-40) were identified with lead concentrations exceeding the not to exceed (NTE) value established in the BHHERA (320 mg/kg). These locations were not previously identified as hot spots, as they are outside the depth interval evaluated in the BHHERA (0 to 6 feet bgs). However, these locations are co-located in the area and selected for removal based on their exceedance of NTE criteria. The area surrounding boring location

OUE-DP-025 is additionally identified for removal based on TPHd concentrations exceeding the soil remedial goal established in the *Remedial Action Plan Operable Units C and D* (OU-C/D RAP; Arcadis 2015b) for the protection of human health (10,772 mg/kg). Based on proximity, these locations have been grouped into 12 distinct RAAs as indicated on Figures 2-7 through 2-11.

The RAAs are listed below, by constituent:

- B(a)P TEQ (Figure 2-8):
    - RAA-B1 (Powerhouse and Fuel Barn AOI): includes one sample location (HSA-4.3 from 2 to 2.5 feet bgs)
    - RAA-B2 (Sawmill #1 AOI): includes four sample locations (OUE-DP-073 from 2 to 3 feet bgs, OUE-DP-074 at 2 to 3 feet bgs, OUE-DP-075 from 2 to 3 feet bgs, and OUE-DP-026 from 2 to 3.5 feet bgs)
    - RAA-B3 (Waste Treatment and Truck Dump AOI): includes two sample locations (OUE-DP-099 from 0.5 to 1.0 foot bgs and OUE-DP-100 from 2.5 to 3.5 feet bgs)
- Lead (Figure 2-9):
    - RAA-L1 (Sawmill #1 AOI): includes one sample location (OUE-DP-070 from 3 to 4 feet bgs)
    - RAA-L2 (Sawmill #1 AOI): includes one sample location (DP-05.57 from 0.5 to 1 foot bgs)
    - RAA-L3 (Powerhouse and Fuel Barn AOI): includes one sample location (OUE-DP-094 from 5.5 to 6 feet bgs)
    - RAA-L4 (Powerhouse and Fuel Barn AOI): includes one sample location (OUE-DP-090 from 5.5 to 6 feet bgs)
    - RAA-L5 (Powerhouse and Fuel Barn AOI): includes one sample location (OUE-DP-088 from 6 to 7 feet bgs)
    - RAA-L6 (Powerhouse and Fuel Barn AOI): includes two sample locations (OUE-HA-023B from 6.5 to 8 feet bgs and OUE-DP-076 from 6 to 7 feet bgs and 8 to 9 feet bgs)
    - RAA-L7 (Powerhouse and Fuel Barn AOI): includes one sample location: (P4-40 from 6.5 to 7 feet bgs)
- TPHd (Figure 2-10):
    - RAA-T1 (Sawmill #1 AOI): includes one sample location (OUE-DP-025 from 1.5 to 5 feet bgs)
- Dioxin TEQ (Figure 2-11):
    - RAA-D1 (Powerhouse and Fuel Barn AOI): includes one sample location (DP-052 from 0 to 0.5 foot bgs and 0.5 to 1.5 feet bgs)

Based on similarities in site conditions, evaluation and implementation of removal action alternatives for the 12 terrestrial RAAs will be addressed collectively as the OU-E Lowland RAA. Based on the nature and extent of COPCs identified above, a cumulative volume of 1,510 cubic yards (CY), with a depth extending to a maximum of 9 feet bgs, is assumed for removal action alternative development within the OU-E Lowland AOC. Dimensions of each RAA are provided on Figures 2-7 through 2-11. A summary of

earthwork is provided in Table 2-1. As summarized in the BHHERA (Arcadis 2015a), removal activities in these RAAs will reduce terrestrial EPCs of the B(a)P TEQ, lead, and dioxin TEQ to levels below the site-specific soil risk-based target levels (RBTLs) developed by DTSC (DTSC 2014).

2.5.2 Southern Ponds Area of Concern

2.5.2.1 Summary of Baseline Human Health and Ecological Risk Assessment Findings

Potential ecological and human health aquatic risks were further evaluated in the BHHERA (Arcadis 2015a). For the human health evaluation of the Southern Ponds AOC, the BHHERA concluded that non-cancer hazards are below 1, while cumulative excess lifetime cancer risks (ELCRs) for an occasional recreator (assuming 50 days per year of exposure) are greater than $1x10^{-6}$. Potential exposure to arsenic and dioxin TEQ from sediment ingestion are primary contributors to the ELCRs, with the COPC-specific ELCRs for arsenic and dioxin TEQ greater than $1x10^{-6}$. The ELCRs for the aquatic recreator receptors in the Southern Ponds AOC were within the risk management range of $1x10^{-4}$ to $1x10^{-6}$ established in the National Contingency Plan (NCP; 40 Code of Federal Regulation [CFR] 300.430; 2014). The ERA concluded that unacceptable ecological risk is not likely for populations of plants, benthic organisms, birds, mammals, and amphibians exposed to sediment and surface water in the Southern Ponds AOC.

2.5.2.2 Development of Removal Action Areas

For aquatic AOCs, RAAs were developed based on risk drivers identified in the BHHERA (Arcadis 2015a). As indicated above, arsenic and dioxin TEQ are the primary risk drivers in the Southern Ponds AOC; therefore, RAAs indicated on Figure 2-12 were defined to target locations with historically elevated concentrations of dioxins and arsenic. Removal activities in these portions of the Southern Ponds AOC will result in the reduction of arsenic and dioxin TEQ EPCs, thereby reducing potential risk.

A cumulative volume of 696 CY extending to a maximum depth of 2 feet bgs is assumed for the removal action alternative development within the Southern Ponds AOC. Dimensions of each RAA are provided on Figure 2-12. A summary of earthwork is provided in Table 2-1. The RAAs within the Southern Ponds AOC will be evaluated collectively for removal alternative development as the Southern Ponds RAA.

Pre-excavation delineation sampling will be conducted prior to excavation within the footprint of the Southern Ponds AOC. Delineation samples will be collected approximately 20 feet from each Southern Pond RAA sample location, at depths consistent with the depths of the existing RAA sample depths. The locations and sampling methods utilized will be detailed and submitted for DTSC approval prior to implementation.

2.5.3 Pond 7 Area of Concern

2.5.3.1 Summary of Baseline Human Health and Ecological Risk Assessment Findings

Pond 7 was evaluated as an individual aquatic AOC in the BHHERA (Arcadis 2015a), assuming an exposure of 50 days per year. For the human health evaluation of the Pond 7 AOC, the BHHERA concluded that non-cancer hazards are below 1, while cumulative ELCRs for an occasional recreator (assuming 50 days per year of exposure) are greater than $1x10^{-6}$. Potential exposure to arsenic and dioxin TEQ from sediment ingestion are primary contributors to the ELCRs, with the COPC-specific ELCRs for arsenic and dioxin TEQ greater than $1x10^{-6}$. The ERA identified barium in Pond 7 sediment and porewater as a potential risk to benthic organisms based on comparison to the surface water screening level.

2.5.3.2 Development of Removal Action Areas

For aquatic AOCs, RAAs will be developed based on risk drivers identified in the BHHERA (Arcadis 2015a). As indicated above, arsenic, dioxin TEQ, and barium are the primary risk drivers in the Pond 7 AOC; therefore, the RAA indicated on Figure 2-13 was defined to target locations with historically elevated concentrations of dioxins and arsenic. Removal activities in this RAA will result in the reduction of arsenic, dioxin TEQ, and barium exposures and thereby a reduction/elimination of potential risk.

A cumulative volume of 1,200 CY extending to a maximum depth of 7.5 feet bgs is assumed for removal action alternative development within the Pond 7 AOC. It is assumed that the entire footprint of Pond 7 will be excavated, as indicated on Figure 2-13. The RAA within the Pond 7 AOC is referred to as the Pond 7 RAA for removal alternative development. A summary of earthwork is provided in Table 2-1.

2.5.4 Riparian Area of Interest

2.5.4.1 Summary of Baseline Human Health and Ecological Risk Assessment Findings

Based on the results of the human health and ERA presented in the OU-C/D RI, the OU-C/D RI recommended that Riparian AOI drainage area sediments should be carried forward into the FS due to potential ecological risk to benthic invertebrates (Arcadis 2011a).

Risks were further evaluated in the BHHERA (Arcadis 2015a), which indicated that the risks posed by metals, dioxin/furans, and PAHs in Riparian AOI sediment were negligible. However, subsequent to the BHHERA, DTSC requested further evaluation for dioxin in the Riparian AOI (DTSC 2016a). Based on the relatively limited extent of concentrations above unrestricted use criteria in the Riparian AOI, RAAs within the Riparian AOI have been evaluated given the potential to meet unrestricted use and achieve No Further Action status in this area.

2.5.4.2 Development of Removal Action Areas

For the Riparian AOI, the RAAs were delineated based on samples OUD-HA-042, OUD-HA-044, OUD-HA-046, and OUD-SED-HA-049, which have dioxin TEQ concentrations that are relatively higher than other sediment samples collected in the Riparian AOI (Figure 2-14). Removal activities in the Riparian AOI will result in the reduction of dioxin TEQ EPCs and thereby a reduction in potential risk.

A cumulative volume of 32 CY, with a depth extending to a maximum of 0.5 foot bgs, is assumed for removal action alternative development within the Riparian AOI. Dimensions of each RAA are provided on Figure 2-14. A summary of earthwork is provided in Table 2-1. The RAAs within the Riparian AOI will be evaluated collectively for removal alternative development as the Riparian RAA.

3 REMOVAL ACTION GOALS

As defined in HSC Section 25323.1, a RAW must present the goals to be achieved by the removal action. The objective of this RAW is to select the appropriate response action to address COPCs in soil and sediment that could pose a significant risk to public health or to the environment. The removal action is focused on the reduction of risk to human health and the environment and to support the construction and public use of the central portion of the Fort Bragg Coastal Trail. Once the proposed activities are complete, the risks to public health and the environment will be reduced and the areas addressed by the RAW will be acceptable for the planned recreational use.

The RAAs identified in Section 2.5 were based on characterization data presented in the RI Report (Arcadis 2013a), as well as the results of the BHHERA (Arcadis 2015a). The primary RAG of this RAW is to accelerate remediation within the identified AOCs by removing areas where elevated concentrations of COPCs have been identified. Following removal of these RAAs, the resultant conditions will be evaluated for remedial alternative development in the forthcoming FS. In some cases, unrestricted use may be obtainable.

3.1 Soil Removal Action Goals

In an *Identification of Presumptive Remedy Areas on Operable Unit E* memorandum (DTSC 2014) and an email dated July 18, 2014, DTSC recommended the following site-specific soil RBTLs and NTE soil values for B(a)P TEQ, dioxin TEQ, and lead for the terrestrial Lowland AOC.

Site-Specific Soil RBTLs and NTE Concentrations[6]

Constituent	Human Health RBTL	Ecological RBTL	Selected RBTL	NTE Value
B(a)P TEQ (mg/kg)	0.3	Not applicable[7]	0.3	0.9
Dioxin TEQ (pg/g)	53	1,920	53	160
Lead (mg/kg)	320	127	127	320

Notes:
pg/g = picograms per gram

The site-specific soil RBTLs for the Lowlands AOC were developed according to the following methods:

- B(a)P TEQ: For the protection of human health, 0.3 mg/kg equates to the current Regional Screening Level for protection of the commercial/industrial worker (U.S. Environmental Protection Agency [USEPA] 2015). Note also that the B(a)P soil goal of 0.40 mg/kg [applicable to B(a)P TEQs for carcinogenic PAHs] was selected as the remedial goal for OU-C and OU-D based on the upper confidence limit (UCL) of urban background levels of PAHs converted to B(a)P TEQ concentrations in northern California (DTSC 2009).

[6] The recommended site-specific soil RBTLs and NTE soil concentrations for B(a)P TEQ, dioxin TEQ, and lead are presented in the BHHERA Section 5.1.1.1 – Hot Spot Analysis (Terrestrial Lowland AOC).

[7] B(a)P TEQ is not considered in the ecological evaluation; B(a)P toxicity to ecological receptors is evaluated as the high molecular weight PAH COPC. Therefore, a B(a)P TEQ RBTL is not calculated for ecological receptors.

- Dioxin TEQ: For the protection of human health, 53 pg/g equates to a soil concentration based on the BHHERA occasional recreator. Table 6-2 of the BHHERA presents the exposure parameters assumed for the occasional recreator in the terrestrial exposure area. For the protection of ecological receptors, 1,920 pg/g is the back-calculated soil concentration using the mammalian lowest observed adverse effect level (LOAEL) (i.e., $1.0x10^{-5}$ milligrams per kilograms per day [mg/kg-day]), assuming 100% bioaccessibility and using a site-specific bioaccumulation regression to estimate uptake into soil invertebrates for the ornate shrew. Appendix F of the *Remedial Investigation Report, Operable Unit A – Coastal Trail and Parkland Zone* presents the site-specific regression equation (Arcadis BBL 2008).
- Lead: For the protection of human health, 320 mg/kg is the concentration recommended for the commercial/industrial worker in the DTSC Human and Ecological Risk Office (HERO) Human Health Risk Assessment Note Number 3 (DTSC/HERO 2015). For the protection of ecological receptors, 127 is the back-calculated soil concentration for the ornate shrew, which uses the mammalian LOAEL (i.e., 8.9 mg/kg-day), 100% bioaccessibility, and the literature-based ecological soil screening level bioaccumulation factor (USEPA 2007) to estimate uptake into soil invertebrates.

Quantile-quantile plots and summary statistics for baseline concentrations of B(a)P TEQ, dioxin TEQ, and lead data in the terrestrial Lowland AOC are presented in Appendix B. The plots highlight soil samples that are within the identified RAAs.

As summarized in the table below, in Appendix B, and in the BHHERA (Arcadis 2015a), removal activities in the identified RAAs in the Lowlands AOC will reduce terrestrial EPCs of B(a)P TEQ, dioxin TEQ, and lead to levels below the site-specific soil RBTLs. Note that, although residential use is not anticipated within OU-E, residual EPCs for lead and dioxin TEQ will also be below the residential use (i.e., unrestricted use) DTSC screening level for lead (80 mg/kg; DTSC Note 3) and the remedial goal for dioxin (50 mg/kg; DTSC Note 2), while the B(a)P TEQ residual EPCs will be below urban background levels of PAHs converted to B(a)P TEQ concentrations in northern California (DTSC 2009).

Site-Specific Soil RBTLs compared to Residual Soil EPCs[8]

Constituent	Selected RBTL	Residual EPCs and Depth Interval**			
		0-0.5 foot bgs	0-2 feet bgs	0-6 feet bgs	1-10 feet bgs
B(a)P TEQ (mg/kg)	0.3	0.04	0.08	0.06	0.06
Dioxin TEQ (pg/g)	53	6.3	4.9	7.2	8.5
Lead (mg/kg)	127/320*	49.5	39.5	48.7	44.9

Notes:
*The ecological lead RBTL of 127 mg/kg applies to soils less than 6 feet bgs, while the lead RBT of 320 applies to soils between 6 and 10 feet bgs.
**Residual soil EPCs are the 95% UCL on the mean for the dataset after removal of the identified RAA samples, with the exception of lead and B(a)P TEQ in the 0-0.5 foot bgs interval, which are the baseline EPCs. Maximum lead and B(a)P TEQ concentrations in the 0-0.5 foot bgs interval are below the NTE levels.

[8] The residual soil EPCs for B(a)P TEQ, dioxin TEQ, and lead are summarized in BHHERA Section 6.4.1.1 – Terrestrial Hot Spot Analysis. The actual residual EPC values are subject to the results of confirmation sampling.

In addition to risk-based goals for the constituents above, the remedial goal for TPHd in soil has been selected as the direct contact and indoor air remedial goal presented in the OU-C/D RAP (Arcadis 2015b) for the protection of human health (10,772 mg/kg).

3.2 Sediment Removal Action Goals

As specified in DTSC (2014), the recommended site-specific soil RBTLs are not applicable to the aquatic AOCs in OU-E. The planned RAAs in the aquatic AOCs have been defined to target locations with concentrations greater than sediment-specific NTE values derived for dioxin TEQ (503 pg/g) and arsenic (67 mg/kg). The site-specific sediment NTE values were developed according to the following methods:

- Dioxin TEQ: For the protection of human health, 503 pg/g equates to a sediment concentration based on the BHHERA passive child/adult recreator, with an assumed exposure to the sediments for a duration of 12 days per year. Table 6-2 of the BHHERA presents the exposure parameters assumed for the passive child/adult recreator in the aquatic AOCs.
- Arsenic: For the protection of human health, 67 mg/kg equates to a sediment concentration based on the BHHERA passive child/adult recreator, with an assumed exposure duration of 12 days per year. Table 6-2 of the BHHERA presents the exposure parameters assumed for the passive child/adult passive recreator in the aquatic AOCs. Consistent with the BHHERA, a relative bioavailability value of 60% was assumed for the soil ingestion pathway in the derivation of the arsenic NTE value.

Quantile-quantile plots and summary statistics for baseline sediment concentrations of dioxin TEQ and arsenic in the Southern Pond AOC and dioxin TEQ in the Riparian AOC are presented in Appendix B. The plots highlight sediment samples that exceed the site-specific NTE values and are, therefore, within the identified RAAs. As noted in the table below and in Appendix B, the targeted RAA will reduce EPCs of primary COPCs in the Southern Pond AOC and the Riparian AOC and thereby reduce potential risks in these areas. Note that residual dioxin TEQ EPCs in the riparian area are below the DTSC risk-based goal for unrestricted use (50 pg/g). Pond 7 is not included in the following table, as sediments in the accessible exposure intervals will be removed, thereby eliminating exposure and potential risk at that location.

Residual sediment EPCs[9]

Aquatic Areas	Dioxin TEQ (pg/g)		Arsenic (mg/kg)	
	BHHERA EPC	Residual EPC	BHHERA EPC	Residual EPC
Southern Ponds (0-2 feet bgs)	441	248 - 390**	46	40
Riparian Area Sediments (0-2 feet bgs)	127	19	NA	NA

Note:

NA = not applicable for this area

**Presented as a range to reflect the ProUCL 95th percentile value KM (Chebyshev) value (248 pg/g) and the recommended ProUCL 99th percentile KM (Chebyshev) value (390 pg/g). The BHHERA EPC of 441 pg/g is the ProUCL 95th percentile recommended value KM (Chebyshev) value.

[9] The actual residual EPC values are subject to the results of confirmation sampling.

As summarized in the BHHERA (Arcadis 2015a) for the 12-day recreator exposure scenario, baseline EPCs of arsenic and dioxin TEQ in the Southern Pond AOC result in compound-specific cancer risks equal to $1x10^{-6}$ and cumulative baseline risks equal to $2x10^{-6}$. The proposed removal actions will reduce risks to recreators in the Southern Pond AOC. Specifically, the proposed removal actions in the Southern Pond AOC decrease cumulative risks in the 0 to 2-foot bgs exposure interval for the 12-day recreator from $2x10^{-6}$ to $1x10^{-6}$ subsequent to the proposed removal actions.

4 EVALUATION AND SELECTION OF REMOVAL ACTIONS

This section identifies and screens possible removal action alternatives that may best achieve the RAGs discussed in Section 3. Based on the number of RAAs, the small volume within each RAA, and similarities between the nature and extent of COPCs, removal action alternatives were developed to address all RAAs with a single remedial approach. During removal action alternative development, several alternatives were preliminarily screened based on implementability and effectiveness and subsequently eliminated. For example, excavation and landfarming was considered as a potential alternative; however, the alternative would only be effective for TPH-related RAAs. Due to the presence of COPCs that would not be effectively reduced through landfarming (e.g., metals) and the small number of TPH-related RAAs, this alternative was deemed ineffective and was eliminated from further evaluation. Cost estimates and feasibility evaluations were based on knowledge of the site and previous experience for all alternatives passing the pre-screening process. Removal action alternatives retained beyond the pre-screening process are presented below.

4.1 Overview and Description of Removal Action Alternatives

The removal action alternatives to address COPCs in the RAAs include no action, vegetative covers, and excavation and offsite disposal. The removal action alternatives are described in more detail in Section 4.1.1 through 4.1.3.

4.1.1 No Action

The No Action Alternative is intended to serve as a baseline by which to compare the risk reduction effectiveness of other removal alternatives, as required by USEPA and NCP regulations (USEPA 1988). In this baseline, no removal actions would be performed. The site would be maintained by Georgia-Pacific in its current condition for the foreseeable future.

4.1.2 Excavation and Disposal

Excavation involves the physical removal of soil using standard excavation practices and equipment. Typical equipment used includes excavators, backhoes, drag lines, clamshells, vacuum trucks, and front-end loaders. Excavated soil is transported to a landfill offsite and is required to meet federal and state transportation and disposal regulations. Backfilling, grading, and revegetation are performed following excavation. Sampling and analysis of the backfill material source is typically performed to determine the acceptability of the backfill material. Suppressant, water spray, and other forms of dust control may be required during excavation, and workers may be required to use personal protective equipment (PPE) to reduce exposure to COPCs.

4.1.3 Vegetative Cover

Vegetative cover involves covering the RAAs with protective layers of liners and soil to isolate COPCs from direct contact with humans or the surrounding ecosystem, thereby mitigating potential risk identified in the BHHERA (Arcadis 2015a). Vegetative cover would include a high-density polyethylene (HDPE) liner, two non-woven geotextile layers, with 1 foot of soil covering the liner to support short-rooted

vegetative growth. The vegetative growth on the soil will prevent gullying and scouring by surface water and wind.

4.2 Evaluation Criteria

Each removal action alternative was independently analyzed without consideration to the other alternatives. Each of the removal action alternatives is screened based on effectiveness, implementability, and cost.

4.2.1 Effectiveness

This criterion evaluates how effectively a removal action alternative achieves the RAGs established in Section 3.

4.2.2 Implementability

This criterion evaluates the technical and administrative feasibility of implementing the alternative, as well as the availability of the necessary equipment and services. This includes the ability to design and perform a removal alternative, ability to obtain services and equipment, ability to monitor the performance and effectiveness of technologies, and the ability to obtain necessary permits and approvals from agencies, and acceptance by the state and the community.

4.2.3 Cost

This criterion evaluates the relative cost of each technology based on fixed cost to implement the remedial alternative for construction or initial implementation and ongoing operations and maintenance costs. The actual costs will depend on true labor and material cost, competitive market conditions, final project scope, and the implementation schedule. Costs were based on earthwork removal action estimates presented in Table 2-1.

4.3 Removal Action Alternative Evaluation

Each alternative for removal action of the collective RAAs is evaluated against the established criteria in the following subsections. Evaluation of cost for each alternative is completed by using the volumetric and excavation footprint estimates presented below and in Table 2-1.

4.3.1 Alternative 1 – No Action

4.3.1.1 Effectiveness

This alternative would prove to be ineffective in mitigating potential human health and ecological risks associated with the COPCs in this RAA. Biodegradation of COPCs may occur; however, there is no certainty associated with this potential biodegradation. This alternative would not be effective in meeting the RAGs.

4.3.1.2 Implementability

This alternative would be easily implementable, as it would require no action.

4.3.1.3 Cost

This alternative would result in zero cost, as no action would be taken.

4.3.2 Alternative 2 – Excavation and Disposal

4.3.2.1 Effectiveness

This alternative would be an effective alternative by immediately removing hot spots defining the RAAs. The removal of hot spots identified in the BHHERA (Arcadis 2015a) within the OU-E Lowland AOC will effectively reduce the potential risk and expedite remediation in OU-E, consistent with the RAGs.

4.3.2.2 Implementability

Excavation and disposal is a well-proven, readily implementable technology that is a common method for remediation of impacted soils. It is a relatively simple process with proven results. Equipment and labor required to implement this alternative are uncomplicated and readily available. The depths of the identified soil for removal make excavation readily implementable. Additionally, implementation can be conducted concurrently with remedy implementation in OU-C/D scheduled to begin toward the end of summer 2016.

4.3.2.3 Cost

Approximately 3,438 CY and a 27,000 square-foot (SF) footprint, with depth extending to a maximum of 9 feet bgs, is planned for removal action in OU-E. Assuming a production of 200 CY per day, 1 day for mobilization/demobilization activities, excavation implementation is expected to have a 19-day duration. Cost assumptions include a design, preparation, and coordination cost of $2.50 per SF; a flat rate of $5,000 for mobilization/demobilization; $230 per CY of excavation, transportation, disposal, and restoration; and a flat rate for reporting, deed restriction, and risk management plan of $15,000 (Arcadis 2012). Given these assumptions, the estimated cost of this alternative is $880,000.

4.3.3 Alternative 3 – Vegetative Cover

4.3.3.1 Effectiveness

This technique of contaminant remediation proves to be effective in mitigating direct contact exposure to the COPCs; however, this technique is ineffective in removing the source and the toxicity and mobility of COPCs. Therefore, this method is an inadequate means of mitigating long-term exposure potential of COPCs.

4.3.3.2 Implementability

This technique would be easily implementable. This alternative would involve placing two non-woven geotextile liners and one 40 mil HDPE liner on each RAA. Approximately 1 foot of nutrient-rich soil will be placed on top of the liners, as to promote vegetative growth.

4.3.3.3 Cost

Approximately 27,000 SF of RAA footprint would be covered by vegetative cover. This would involve purchasing 27,000 SF of 40-mil HDPE liner and two layers of non-woven geotextile liner, 3,400 CY of nutrient-rich soil, and seeds for replanting. The cost for design, preparation, and coordination is assumed to be $4.12 per SF. The cost for installation of the cover, including the cost of HDPE, geotextile layers, soil, and seeds is assumed to be $12.42 per SF. The reporting and deed restriction cost for this alternative is estimated at $0.26 per SF. Given these assumptions, the total cost for this removal action alternative is estimated to be $455,000.

4.4 Comparative Analysis of Removal Action Alternatives

The No Action Alternative is the least desirable alternative when considering long-term effectiveness of risk mitigation. Natural biodegradation could potentially occur with this alternative; however, the degradation may not occur within a reasonable timeframe. Despite this option being the lowest cost alternative for each RAA, the high likelihood of ineffectual removal of COPCs renders this option unpredictable and ineffective in achieving the RAGs.

The Excavation and Disposal Alternative is a highly desirable option to reduce COPCs within the identified RAAs. Despite being comparatively the most expensive option, the Excavation and Disposal Alternative is easily implementable and provides immediate reduction of risks associated with the COPCs. This alternative can be implemented concurrently with excavation activities at OU-C/D; therefore, the removal action can be conducted in 2016 to accelerate remediation in OU-E.

The Vegetative Cover Alternative is an ineffective alternative in reducing long-term toxicity and mobility of COPCs and is solely effective in reducing the direct exposure pathway of COPCs. Given that this alternative would keep the source area of COPCs in place, this removal alternative would be ineffective at achieving the RAGs.

4.5 Selection of Preferred Alternative

Based on the evaluation of the alternatives with the established criteria and comparison between the alternatives, Excavation and Disposal is the preferred alternative for all RAAs identified in this RAW. Although the alternative presents higher costs, the long-term effectiveness and overall reduction of toxicity, mobility, and volume of COPCs within the RAAs offers the most certainty in human health and ecological risk reduction.

5 IMPLEMENTATION

This section summarizes the techniques and methods to be used for the removal action. Because the removal actions in OU-E will be implemented concurrently with the work approved in the OU-C/D RAP (Arcadis 2015b), the Implementation Plan will include design features, permit requirements, best management practices, and sampling requirements for the OU-C, OU-D, and OU-E AOIs recommended for soil excavation and disposal.

5.1 Permitting

Work will be conducted in accordance with applicable federal, state, and local regulations. These include, but are not limited to, the following:

- Section 401 of the Clean Water Act Permit,
- Section 404 of the Clean Water Act Permit,
- Section 1602 Streambed Alteration Agreement Permit,
- General Permit for Discharges of Storm Water Associated with Construction Activity,
- Mendocino County Environmental Health Department Well Destruction Permits
- Occupational Safety and Health Administration (OSHA), Title 29 CFR 1910.120. Regulations applicable to hazardous waste site operations (HAZWOPER)
- HSC Division 20, Chapters 6.5 and 6.8
- Title 8 CCR General Industry Safety Orders 5192 and Title 8 California Code of Regulations (CCR) 1532.1
- Title 22, CCR Sections 66261.2 and 66261.3
- CCC Grading Requirements
- Bay Area Air Quality Management District, Regulation 6

An archaeologist familiar with potential Native American artifacts will be consulted to determine which areas of the site contain moderate or high sensitivity ratings. If determined necessary, a pre-construction meeting will be held with key construction personnel to provide brief discussions pertaining to archeological resource significance, visual identification, and discovery notification procedures. Monitoring of excavation activities in potentially moderate or high sensitivity rating areas by a professional archeologist to identify, collect, curate, and correctly place significant cultural resource material could be required based on the archaeological consultation.

An appropriately qualified biologist will be present to monitor any work within 50 feet of biologically sensitive areas. Plans and measures have been developed for the site to mitigate potential impacts.

A qualified, HAZWOPER-trained, experienced engineering contractor licensed in the State of California will conduct excavation and soil handling using conventional earthwork equipment. The contractor will minimize idling time and maintain equipment properly. Contractors will conduct work in accordance with a

site-specific HASP, which addresses identification of hazards, hazard mitigation, safe work practices, and emergency response procedures for the project.

Prior to conducting the remediation, Underground Service Alert will be contacted to schedule visits by public and private utility companies.

Unauthorized access of vehicles and persons to uncovered hazardous soil at the site will be limited by the existing fencing and access controls around the work areas. There are several distinct areas proposed for soil excavation and removal. Temporary access controls, such as fencing or similar devices, will be used to limit access by non-construction exclusion zones, contaminant reduction zones, and support zones to avoid inadvertent transport of impacted soils beyond the individual construction areas. Traffic routing and controls to and from individual excavation areas within the property will also be established.

5.2 Contractor Health and Safety

A site-specific HASP and subsequent addendums are available for this project and have previously been submitted to DTSC (note, it is updated annually and the most recent update was produced in January 2015 [Arcadis 2015d]). An updated HASP for 2016 will be available prior to removal action implementation. The HASP follows both the California Division of Occupational Safety and Health (Cal/OSHA) and the federal OSHA standards for hazardous waste operations (8 CCR 5192 and 29 CFR 1910.120, respectively) and any other applicable health and safety standards. Among other things, the HASP includes a description of health and safety training requirements for onsite construction personnel, a description of PPE to be used, and any other applicable precautions to be undertaken to minimize direct contact with soil or groundwater. The HASP also includes job safety analyses (JSAs) for each task during construction activities that identifies both the potential hazards of a task and solutions for mitigating these potential hazards. All contractors will hold a joint site safety tailgate meeting each day before the start of work. As part of the safety meeting, JSAs will be reviewed before the start of each new task.

Site workers whose activities could potentially result in contact with contaminated soil and/or groundwater are required to have certification that they have completed OSHA 40-hour HAZWOPER training, annual 8-hour refresher training (as appropriate), and other training and monitoring as needed to meet OSHA and Cal/OSHA requirements. The construction contractor must have the HAZWOPER training certificates of the individual workers onsite during all construction activities.

5.3 Mobilization and Site Preparation

Prior to the removal action, the Contractor will perform mobilization and site preparation activities. At a minimum, it is anticipated that the following site preparation activities will be performed:

- Verify existing site conditions
- Identify the location of aboveground and underground utilities and/or obstructions
- Mobilize personnel, equipment, and materials to the site
- Clear and grub areas as necessary to perform interim remedial action activities
- Construct equipment and material staging/dewatering areas (as necessary)

- Prepare equipment and personnel decontamination areas
- Establish erosion and sedimentation control measures
- Construct temporary access roads (as needed) for ingress and egress of construction equipment, as well as offsite transportation of excavated materials
- Install temporary fencing or barriers as necessary to protect and secure the work areas.

5.4 General Excavation Procedures and Soil Management

The proposed excavation areas, depths, and cumulative volumes are indicated on Figures 2-8 through 2-14. These limits are based on investigation activities previously performed at the site, but may be modified based on field conditions. The proposed OU-E excavation activities amount to removing approximately 3,500 in-place CY at depths between 0.5 and 9 feet deep in an approximate 27,000 SF (0.57 acres) footprint. Excavation procedures are summarized below and will be detailed in the forthcoming Remedial Design and Implementation Plan (RDIP).

5.4.1 Excavation Procedures

Removal actions will be conducted using standard earthmoving equipment (e.g., excavator, backhoe, front-end loader). Following excavation, materials will be temporarily stockpiled for characterization prior to offsite disposal. Stockpiled soil will be placed on plastic sheeting and covered with plastic sheeting when not actively being worked on and at the end of each workday. Sandbags, or other weights, will be used to keep the plastic cover in place. Excavated soil will be segregated based on the COPCs identified within each RAA. Soil stockpile locations will be determined prior to initiation of remedial actions and are anticipated to be located adjacent to the excavation sites.

Sediment and soil removed from ponds or below the groundwater table may require time to drain and dry. Dewatering of sediment, if necessary, will occur in the upland area adjacent to the RAA. Sediment or wet soil will be placed temporarily near the edge of the pond or excavation, such that free flowing water will gravity drain back to excavation areas. After free water is allowed to drain from the excavated material, additional air drying of soil and sediment may be needed in staging and loading areas prior to transport offsite. Wet stockpiles may be uncovered to allow efficient drying. Dust is not expected from wet materials in need of drying, and stockpiles will be covered once materials are sufficiently dry for transportation.

Sediment and soil is planned to be removed below the groundwater table, which may result in accumulated water in the RAA excavations. Groundwater in the excavations with visible sheen or odor will be containerized onsite, sampled, and treated or disposed (if necessary). Water present in excavations without visible sheen or odor will be transferred to an adjacent excavation or pond area to allow backfilling and may be used to moisture condition backfill materials.

If entry into excavations is necessary, sidewalls of excavations extending deeper than 5 feet bgs will be sloped/benched in accordance with OSHA requirements for excavation, as outlined in 29 CFR 1926 Subpart P. In accordance with 8 CCR and the California Business and Professions Code, the sloping method will be approved by a California-registered civil engineer. It is not anticipated that personnel will enter the excavation; however, if personnel must enter the excavation, they will comply with state and

federal confined space requirements. The contractor will minimize idling time and properly maintain equipment.

5.4.2 Confirmation Sampling

Confirmation samples will be collected from the sidewalls and bottoms of excavations to document conditions following the removal activities. Samples will be collected with a frequency of one per sidewall up to 50 linear feet. Additional sidewall samples will be collected for excavation sidewalls longer than 50 feet. Bottom samples will be collected at a frequency of one per 2,500 SF, with a minimum of one sample per excavation. Because of the focused and limited scope of work expected to be implemented under this RAW, significant additional work is not expected based on confirmation sample results. The results will be compiled and presented to DTSC to confirm excavation completion or to initiate discussion of additional activities.

5.4.3 Air Monitoring

Excavation activities have the potential to generate airborne dust. Dust control measures will be performed to protect onsite and offsite receptors from chemicals in soil and nuisance dust. These measures include spraying water on the site, as needed, for dust control and covering stockpiles and trucks. Soils will be wetted as needed to reduce the occurrence of visible dust. Additionally, soil stockpiles and truck beds containing soil will be covered to minimize the potential for dust generation.

Air monitoring for particulates (dust) will be conducted during activities with the potential to generate dust (e.g., excavation, material handling, back filling) in accordance with an addendum to the site-specific HASP. Action levels for airborne monitoring are summarized in the HASP. The presence of airborne dust will be evaluated using real-time personal sampling equipment and perimeter air sampling compared with the site-specific dust action level. Information gathered will be used to confirm the adequacy of the levels of protection being employed at the site, and may be used as the basis for upgrading or downgrading levels of worker personal protection, at the discretion of the Site Safety Officer. Additional dust control methods (i.e., applying water to all disturbed areas) will be implemented if the action level in the site-specific HASP is exceeded. If dust levels cannot be controlled below the action level, work will cease until additional measures can be implemented.

5.4.4 Biological Monitoring

Biological monitoring is required prior to commencement of removal activities. As required by the Coastal Development Permit, monitoring for the presence of nesting birds and wetlands will be conducted prior to beginning work in RAAs. Figures 2-3 and 2-4 show the habitat areas, including rare plants, wetlands, and other features.

5.4.5 Decontamination

Equipment used to excavate and manage the affected soil will be decontaminated prior to leaving the site. The equipment will primarily be decontaminated by sweeping or brushing to remove visible soil. Soil that cannot be removed by this procedure will be removed from equipment by washing in a prepared decontamination area. The decontamination area will consist of a bermed containment pad constructed

using plastic sheeting to provide containment of the decontamination wash water. Decontamination wash water will be collected, characterized, and appropriately disposed or recycled in accordance with applicable federal, state, and local requirements.

5.4.6 Waste Disposal

Soil characterized as California hazardous waste will be transported offsite for disposal. The excavated material will be loaded onto trucks and transported under an appropriate waste manifest or bill-of-lading to an appropriately permitted landfill, depending on the characteristics of the waste. An estimated 175 truckloads will be required to transport the waste soil to the appropriate disposal facility. The soils will be wetted, as necessary, to reduce the potential for dust generation during loading and transportation activities. After each truck is filled, it will be inspected to confirm that the waste soil is securely covered and that the tires of the haul trucks are reasonably free of accumulated soil prior to leaving the site. The anticipated disposal facilities for hazardous and non-hazardous waste will be established in the Transportation Plan to be included in the RDIP. A SAP will also be included in the RDIP for characterization of excavated material prior to disposal. It is anticipated that one four-point composite sample will be collected and submitted for chemical analyses for characterization either at a frequency of one four-point composite sample analyzed for each 500 CY, or at a frequency dictated by the disposal facility.

The anticipated landfill facilities for disposal of non-hazardous excavated soil are the Class III Potrero Hills Landfill in Suisun City, California (Potrero Hills), Waste Management, Inc. Redwood Landfill in Novato, California (Redwood), or the Allied Waste Services Keller Canyon Landfill in Pittsburg, California (Keller Canyon; a Class II, Subtitle D, Comprehensive Environmental Response, Compensation, and Liability Act of 1980-approved landfill). The anticipated facility for disposal/recycling of non-hazardous concrete waste is Norcal Rock in Willits, California. Concrete waste classified as non-hazardous may be crushed and used onsite. The anticipated landfill facility for hazardous excavated soil or concrete is the Class I Waste Management, Inc. Kettleman Hills Landfill in Kettleman City, California. Additional appropriate facilities for each waste type may be proposed depending on factors such as volume and nature of waste to be disposed, availability of transportation services, and cost.

The anticipated facility for disposal of non-hazardous wastewater is the Waste Management, Inc. Altamont Landfill in Livermore, California. The anticipated facility for disposal of hazardous wastewater is the Clean Harbors San Jose Facility in San Jose, California. Additional options for water disposal will be evaluated based on the characteristics of the water. For example, the City wastewater treatment plant may be able to accept water from the site as they have in the past, reducing the need for offsite transportation.

5.4.7 Restoration Activities

Clean fill material will be used to restore the excavated cavities to pre-construction conditions. If suitable, backfill material from a borrow area adjacent to Pond 7 will be used to backfill excavations at the site. This will create additional wetland areas to provide additional mitigation for the temporary loss of function and any minor loss of wetland areas as a result of the work. The borrow area will be restored as emergent wetland similar to the surrounding wetlands present near Ponds 6 and 7. The fill material will be

placed with standard earthmoving equipment and compacted in areas where pedestrian or vehicular traffic is anticipated.

The excavated area will be restored to match existing grade. Backfilled and regraded areas will be revegetated with a native plant seed mix using a hydroseeder, as needed, to restore the RAAs to pre-construction conditions. To mitigate impacts to ecological and biological receptors, enhancement of wetlands present in the Lowland, Pond 2, Pond 3, Pond 7, and Riparian RAAs through removal of invasive/exotic vegetation and planting/seeding of native vegetation will be performed. In addition to RAA wetland enhancement, the borrow area adjacent to Pond 7 will result in the creation of a wetland habitat area. The creation of wetland habitat near Pond 7 will serve to offset any loss of wetlands in other site RAAs. Backfill and plant restoration in wetland and pond areas may be modified from the existing conditions as specified in the Section 401 of the Clean Water Act Permit, Section 404 of the Clean Water Act Permit, Section 1602 Streambed Alteration Agreement Permit to meet permit requirements and promote improvement of habitat.

6 REPORTING AND SCHEDULE

6.1 Reporting

Following implementation of the excavations at the OU-E AOCs/AOIs, a summary report documenting the implementation of removal actions will be submitted. The summary report will include a summary of the work that was performed, deviations from this RAW, and indicate that RAGs were achieved. Copies of field documentation will be submitted in the completion report.

6.2 Public Participation

The public participation process for the RAW process includes the following:

- Conducting a public workshop to provide information about the planned RAW implementation.
- Distributing a fact sheet to parties on the site mailing list describing the proposed remedy and the availability of the RAW.
- Making the draft RAW and other supporting documents (i.e., California Environmental Quality Act [CEQA] document) available for public review at the DTSC office and in the local information repositories.
- Public participation during the permitting process, including City Council and Planning Commission meetings for approval of permits.

6.3 California Environmental Quality Act

The City, as Lead Agency under CEQA, prepared a Subsequent Environmental Impact Report (SEIR) for the coastal trail. DTSC considered the effects described in the City's SEIR and concluded that approval of the draft RAW would not result in significant impacts to the environment. DTSC has prepared an Addendum to the SEIR having determined this as the appropriate document under CEQA. Upon approval of the draft RAW, DTSC will file a Notice of Determination to start the 30-day statute of limitations on court challenges to the approval under CEQA. The Addendum to the SEIR has identified mitigation measures necessary to protect public health (dust control and monitoring), biological resources, and cultural resources. The implementation plan for the RAW will include a Mitigation Monitoring Plan to ensure the implementation of the identified mitigation measures.

DTSC responses to public comments will be provided in the Responsiveness Summary included in Appendix C of the final RAW.

6.4 Schedule

The total duration of removal activities at the excavations is anticipated to last approximately 5 weeks, and will be conducted concurrent with OU-C/D implementation. Remedial construction activities will proceed after all required permits are acquired.

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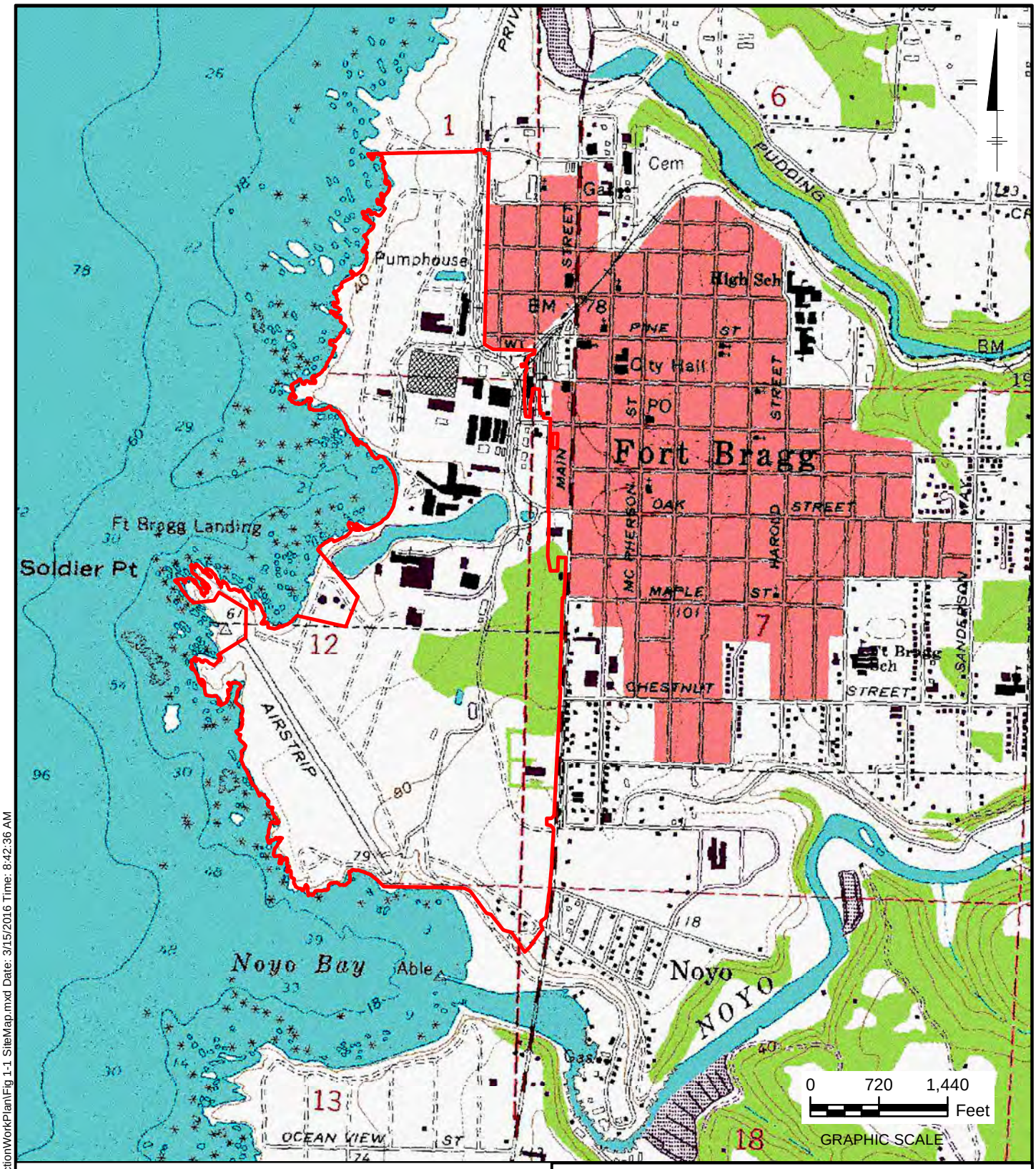
FIGURES



LEGEND:

SITE BOUNDARY

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

REMOVAL ACTION WORKPLAN OPERABLE UNIT E

SITE LOCATION MAP

ARCADIS

FIGURE 1-1

CITY: Highlands Ranch DIV/GROUP: IM GIS DB: Brianna Griffith
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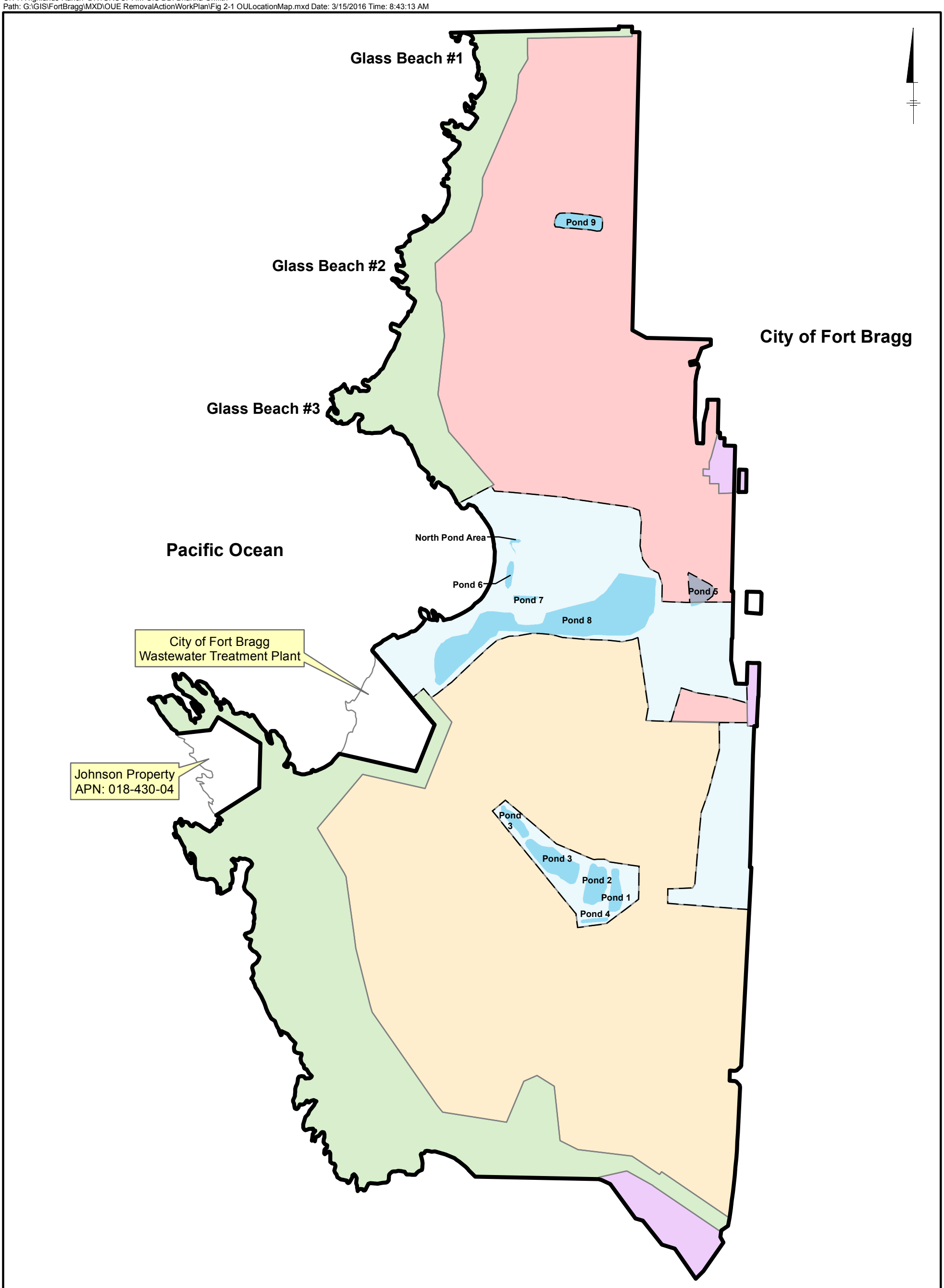

LEGEND:

POND

SITE BOUNDARY

OPERABLE UNITS

OU-A

"OFFSITE" NON-INDUSTRIAL (OU-B)

NORTHERN (OU-C)

SOUTHERN (OU-D)

PONDS (OU-E)

ABBREVIATION:

OU = OPERABLE UNIT

0 620 1,240 Feet

GRAPHIC SCALE

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

REMOVAL ACTION WORKPLAN OPERABLE UNIT E

OPERABLE UNITS LOCATION MAP

ARCADIS

FIGURE 2-1

CITY: Highlands Ranch DIV/GROUP: IM GIS DB: Brianna Griffith
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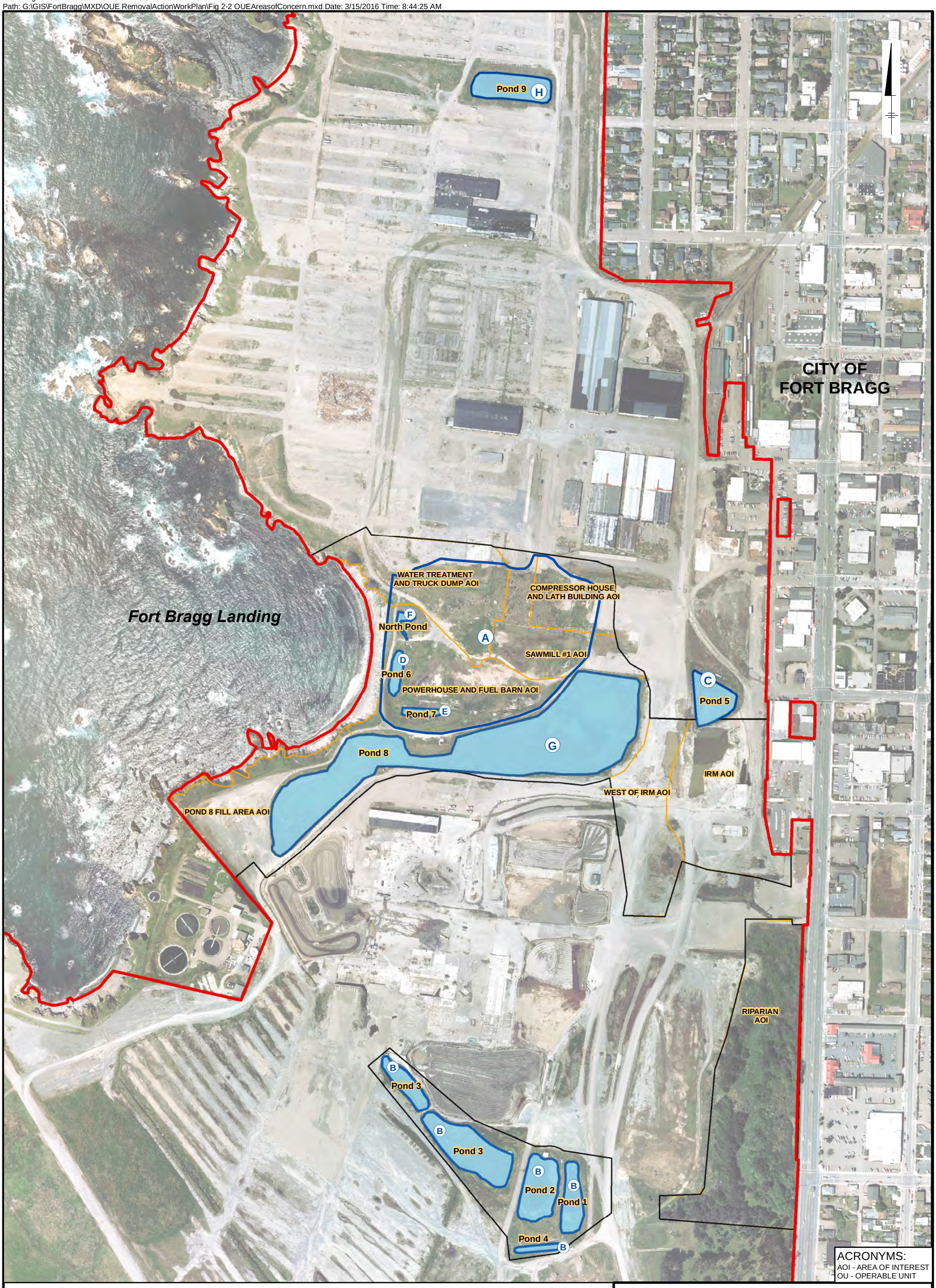

LEGEND:

- SITE BOUNDARY
- AOI BOUNDARY
- OU-E BOUNDARY
- PONDS
- AREA OF CONCERN BOUNDARY

AREAS OF CONCERN:

- A OUE LOWLAND
- B SOUTHERN PONDS
- C POND 5
- D POND 6
- E POND 7
- F NORTH POND
- G POND 8
- H POND 9

0 370 740 Feet
GRAPHIC SCALE

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

REMOVAL ACTION WORKPLAN OPERABLE UNIT E

OPERABLE UNIT E MAP AND AREAS OF CONCERN (AOC)

ARCADIS

FIGURE
2-2

Seep SB-2b
Seep SB-1
Seep SB-2a
Seep SB-3
P-5
Wetland SB-4
Wetland E-7
P-17
North Pond/Wetland F
P-19
Wetland E-8
P-18
Wetland B
Wetland C
Wetland D
P-20
Wetland C3
OU-C
Wetland E-1
P-6
P-7
P-8
Wetland E-5
Wetland E-6
P-16
Pond 6/Wetland G
P-10
Wetland E-2
P-15
P-11
P-14
P-13
P-12
P-9
Pond 7/Wetland H
Wetland E-4
Wetland E-3
Pond 5
Wetland E
Seep SB-5
Seep SB-6
Seep SB-7
Seep SB-8
Seep SB-9
Wetland SB-10
Seep SB-12
Seep SB-11
Pond 8/Wetland I
OU-D

NOTES:
1. NOT ALL DELINEATED WATERS/WETLANDS APPROVED BY THE USACE ARE WATERS/WETLANDS OF THE U.S.
2. ESHA - ENVIRONMENTALLY SENSITIVE HABITAT AREAS
3. THREE-PARAMETER WETLANDS ARE DEFINED AS WETLANDS WHERE:
   1) EVIDENCE OF WETLAND HYDROLOGY, HYDRIC SOIL, AND HYDROPHYTIC VEGETATION WERE PRESENT DURING FIELD INVESTIGATIONS, OR
   2) LACK OF EVIDENCE FROM ONE OR MORE OF THE THREE PARAMETERS WAS DUE TO PROBLEMATIC/DISTURBED CONDITIONS.

LEGEND

- SOIL PIT LOCATION
- OPERATIONAL UNIT

POTENTIAL ENVIRONMENTALLY SENSITIVE HABITAT AREAS (ESHA)

- WIDTH OF DELINEATED GROUNDWATER SEEP/WATERS OF THE STATE (ARCADIS 2010; NOT YET APPROVED)
- DELINEATED WET ESHA (ARCADIS 2010; NOT YET APPROVED)
- DELINEATED WATERS/WETLANDS (WRA 2009; APPROVED BY THE USACE 3/15/10)
- SEASONAL WETLAND
- WETLAND SEEP
- INDUSTRIAL POND
- BEDROCK GROUNDWATER SEEP
- THREE-PARAMETER WETLAND

0 170 340 Feet
GRAPHIC SCALE

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

REMOVAL ACTION WORKPLAN OPERABLE UNIT E

WETLANDS AND OTHER WET ENVIRONMENTALLY SENSITIVE HABITAT AREA - CENTRAL

ARCADIS

FIGURE 2-3

CITY: Highlands Ranch DIVGROUP: IM GIS DB: Brianna Griffith
Project B0066142.2012 Task AS010
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CITY: Highlands Ranch DIV/GROUP: IM GIS DB: Brianna Griffith
Path: G:\GIS\FortBragg\MXD\OUE RemovalActionWorkPlan\Fig 2-4 WetlandsOtherEnviroSenHabitat_South.mxd Date: 4/20/2016 Time: 12:06:52 PM

Soldier Bay
OU-E
OU-D
Drainage D1
Wetland D-1c
Wetland D-1b
Wetland L
Wetland J
Wetland D-1
Wetland D-1a
Wetland K
Wetland D-2*
P-21
P-22
Flow Direction of Riparian Creek
Riparian Area
Wetland P
Wetland R
Wetland O
Wetland N
Wetland M
Wetland Q
Wetland S

NOTES:
1. NOT ALL DELINEATED WATERS/WETLANDS APPROVED BY THE USACE ARE WATERS/WETLANDS OF THE U.S.
2. THREE-PARAMETER WETLANDS ARE DEFINED AS WETLANDS WHERE:
   1) EVIDENCE OF WETLAND HYDROLOGY, HYDRIC SOIL, AND HYDROPHYTIC VEGETATION WERE PRESENT DURING FIELD INVESTIGATIONS, OR
   2) LACK OF EVIDENCE FROM ONE OR MORE OF THE THREE PARAMETERS WAS DUE TO PROBLEMATIC/DISTURBED CONDITIONS.

* WETLAND CHARACTERISTICS FOR WETLAND D-2 WERE ASSESSED FROM SOIL BORING P-22. DUE TO THE PRESENCE OF DENSE SHRUB AND BRAMBLE, WETLAND BOUNDARIES FOR WETLAND D-2 WERE DELINEATED FROM SOIL BORINGS P-21 AND P-22 AND VEGETATIVE CHARACTERISTICS IN AERIAL PHOTOGRAPHY. THEREFORE, THE BOUNDARIES OF WETLAND D-2 MAY CONTAIN AN UPLAND AND WETLAND MOSAIC.

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LEGEND

- SOIL PIT LOCATION
- OPERATIONAL UNIT
- RIPARIAN AREA

POTENTIAL ENVIRONMENTALLY SENSITIVE HABITAT AREAS (ESHA)

- WIDTH OF DELINEATED GROUNDWATER SEEP/WATERS OF THE STATE (ARCADIS 2011; NOT YET APPROVED)
- DELINEATED WET ESHA (ARCADIS 2011; NOT YET APPROVED)
- DELINEATED WATERS/ WETLANDS (WRA 2009; APPROVED BY THE USACE 3/15/10)
- SEASONAL WETLAND
- WETLAND SEEP
- INDUSTRIAL POND
- SEASONAL WETLAND DITCH
- RIPARIAN WETLAND
- BEDROCK GROUNDWATER SEEP
- PERENNIAL WATERS
- THREE-PARAMETER WETLAND
- AREA NOT EVALUATED BASED ON ONGOING CONSTRUCTION ACTIVITIES
- FLOW DIRECTION OF RIPARIAN CREEK

0 300 600 Feet
GRAPHIC SCALE

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA
REMOVAL ACTION WORKPLAN OPERABLE UNIT E

WETLANDS AND OTHER WET ENVIRONMENTALLY SENSITIVE HABITAT AREA - SOUTHERN

ARCADIS

FIGURE
2-4

CITY: Highlands Ranch DIV/GROUP: IM GIS DB: Brianna Griffith
Project B0066142.2012 Task AS010
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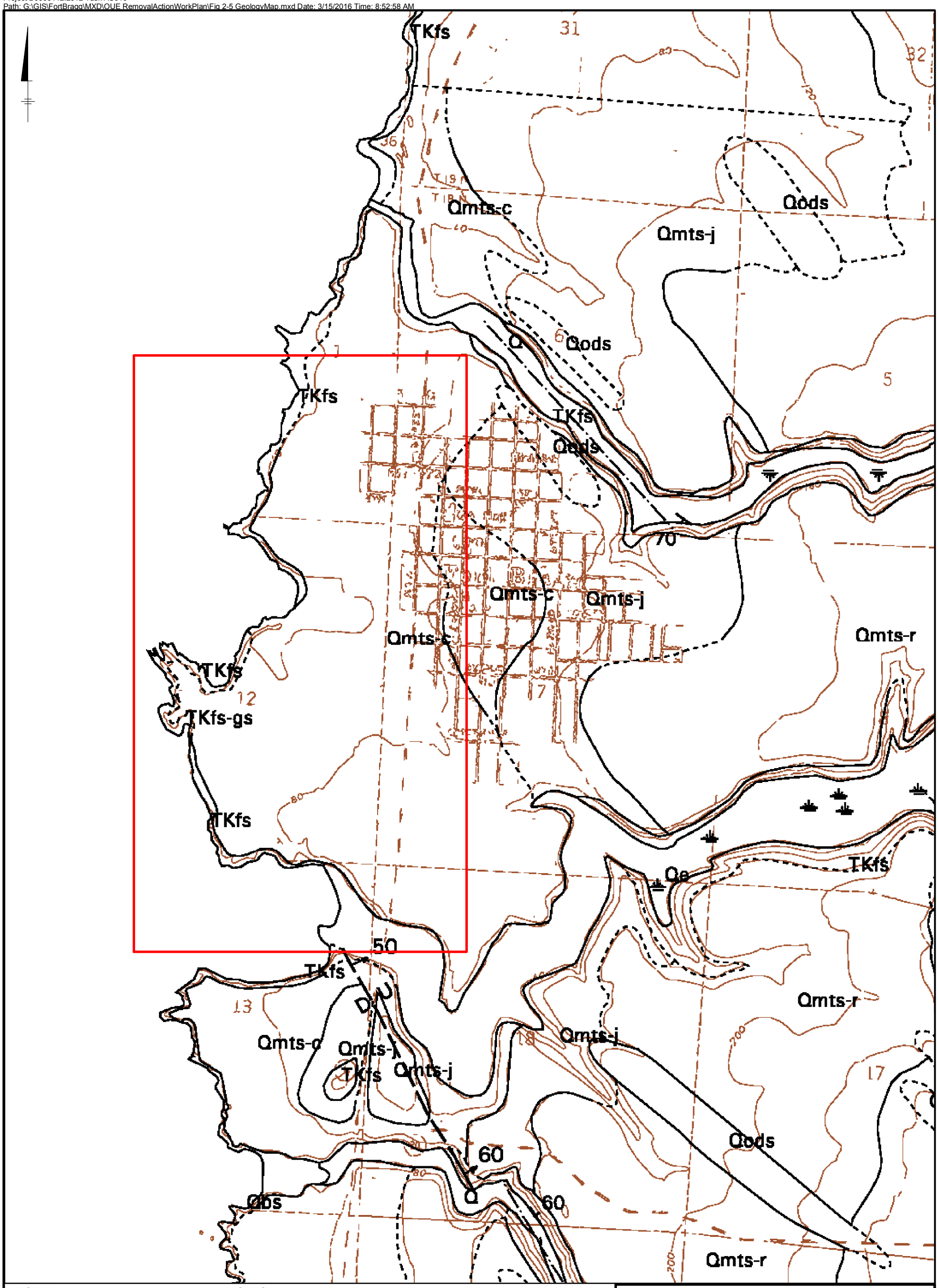


LEGEND:

APPROXIMATE SITE AREA

NOTES:

1. SOURCE: 1983, DMG OPEN-FILE REPORT 83-05, GEOLOGY AND GEOMORPHIC FEATURES RELATED TO LANDSLIDING, FORT BRAGG 7.5' QUADRANGLE, MENDOCINO COUNTY, CALIFORNIA

2. TKfs = COASTAL BELT FRANCISCAN COMPLEX
   TKfs-gs = COASTAL BELT FRANCISCAN COMPLEX, GREENSTONE
   Qmts-c = MARINE TERRACE DEPOSITS, CASPAR POINT
   Qmts-r = MARINE TERRACE DEPOSITS, CASPAR RAILROAD
   Qmts-j = MARINE TERRACE DEPOSITS, JUG HANDLE FARM
   Qods = OLDER DUNE SANDS

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

REMOVAL ACTION WORKPLAN OPERABLE UNIT E

GEOLOGY MAP

ARCADIS

FIGURE
2-5

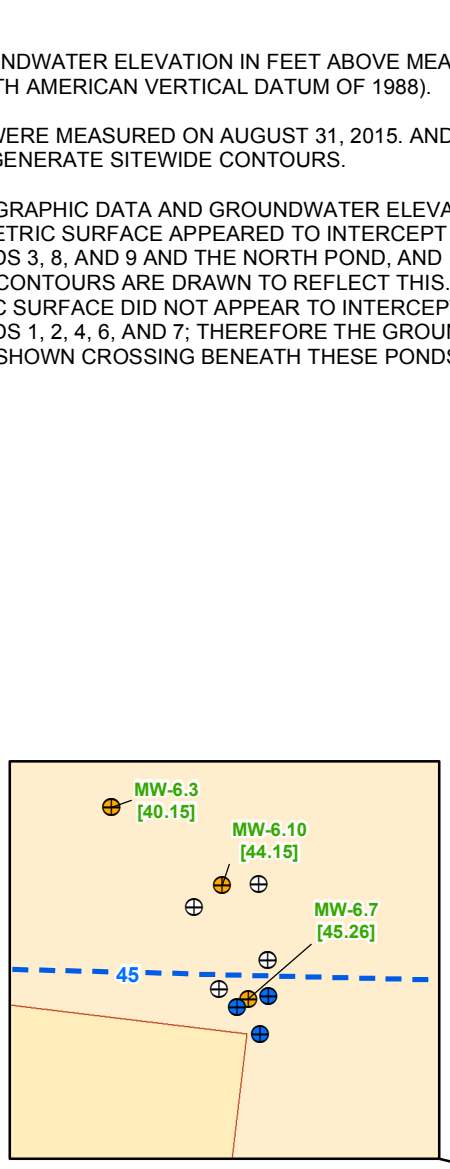
CITY: Highlands Ranch DIV/GROUP: AIT GIS DB:Brianna Griffith
Project # B0066142.0003.00002
Path: G:\GIS\FortBragg\MXD\OUE RemovalActionWorkPlan\Fig 2-6 SecondSemiAnnualEvent2015_GWContourMap.mxd Date: 5/11/2016 Time: 11:32:38 AM

NOTES:

1. "[XX.XX]" = GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (NORTH AMERICAN VERTICAL DATUM OF 1988).

2. WATER LEVELS WERE MEASURED ON AUGUST 31, 2015. AND WERE USED TO GENERATE SITEWIDE CONTOURS.

3. BASED ON TOPOGRAPHIC DATA AND GROUNDWATER ELEVATIONS, THE POTENTIOMETRIC SURFACE APPEARED TO INTERCEPT THE FLOORS OF PONDS 3, 8, AND 9 AND THE NORTH POND, AND GROUNDWATER CONTOURS ARE DRAWN TO REFLECT THIS. THE POTENTIOMETRIC SURFACE DID NOT APPEAR TO INTERCEPT THE FLOORS OF PONDS 1, 2, 4, 6, AND 7; THEREFORE THE GROUNDWATER CONTOURS ARE SHOWN CROSSING BENEATH THESE PONDS AS APPROPRIATE.



LEGEND:

- MONITORING WELL
- MONITORING WELL (SAMPLING DISCONTINUED)
- MONITORING WELL (DESTROYED)
- INJECTION WELL
- PIEZOMETER (SAMPLING DISCONTINUED)
- PIEZOMETER (ABANDONED)
- SPRING (SAMPLING DISCONTINUED)
- DRAINAGE (SAMPLING DISCONTINUED)
- STORM DRAIN (SAMPLING DISCONTINUED)
- FORMER WATER SUPPLY WELL (SAMPLING DISCONTINUED)

LEGEND:

- POND
- STRUCTURE
- FORMER STRUCTURE
- FACILITY PARCEL

OPERABLE UNITS

- COASTAL TRAIL/PARK ACQUISITION (OU-A)
- "OFFSITE" NON-INDUSTRIAL (OU-B)
- NORTHERN (OU-C)
- SOUTHERN (OU-D)
- PONDS/PARK (OU-E)

- PROPERTY OWNED BY OTHERS

0 620 1,240 Feet
GRAPHIC SCALE

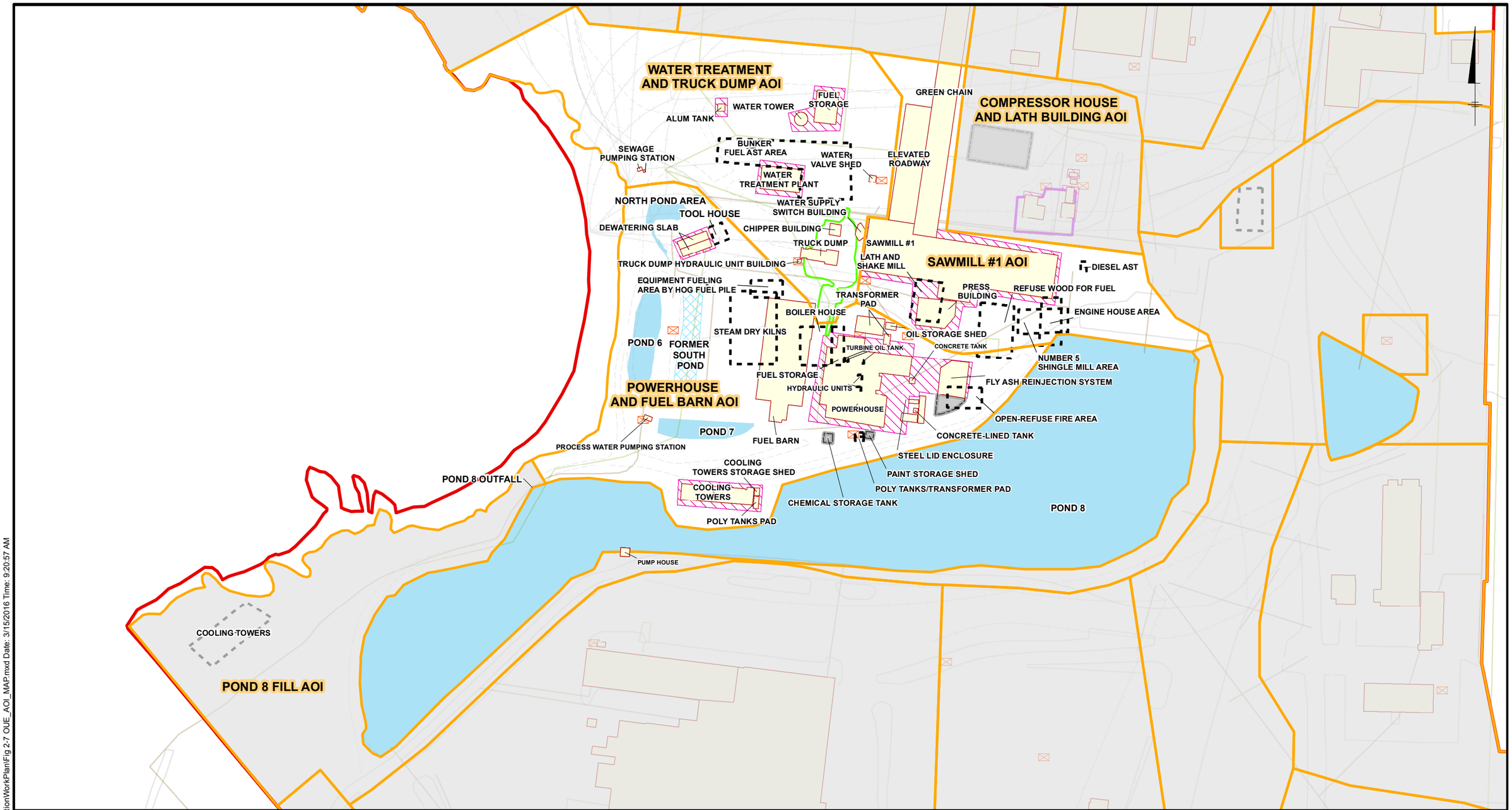
FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

REMOVAL ACTION WORKPLAN OPERABLE UNIT E

SECOND SEMI-ANNUAL EVENT 2015 GROUNDWATER CONTOUR MAP

ARCADIS

FIGURE
2-6



LEGEND:

- AOI BOUNDARY
- SITE BOUNDARY
- STRUCTURE
- FORMER STRUCTURE
- FORMER STRUCTURE-FOUNDATION INTACT
- OTHER OPERABLE UNITS/AOIs
- POND
- FORMER POND
- COMPRESSOR HOUSE EXCAVATION BOUNDARY
- FUEL LINE EXCAVATION BOUNDARY
- APPROXIMATE CAP BOUNDARIES
- FORMER INDUSTRIAL USE (APPROXIMATE LOCATION)
- PLANT DRAIN SYSTEM LINE
- SANITARY SEWER LINE
- UNPAVED ROADWAY
- PAVED ROADWAY
- FORMER RAIL LINES
- FORMER TRANSFORMER LOCATION (APPROXIMATE)

ABBREVIATIONS:

AOI = AREA OF INTEREST
AST = ABOVEGROUND STORAGE TANK

0 170 340 Feet

GRAPHIC SCALE

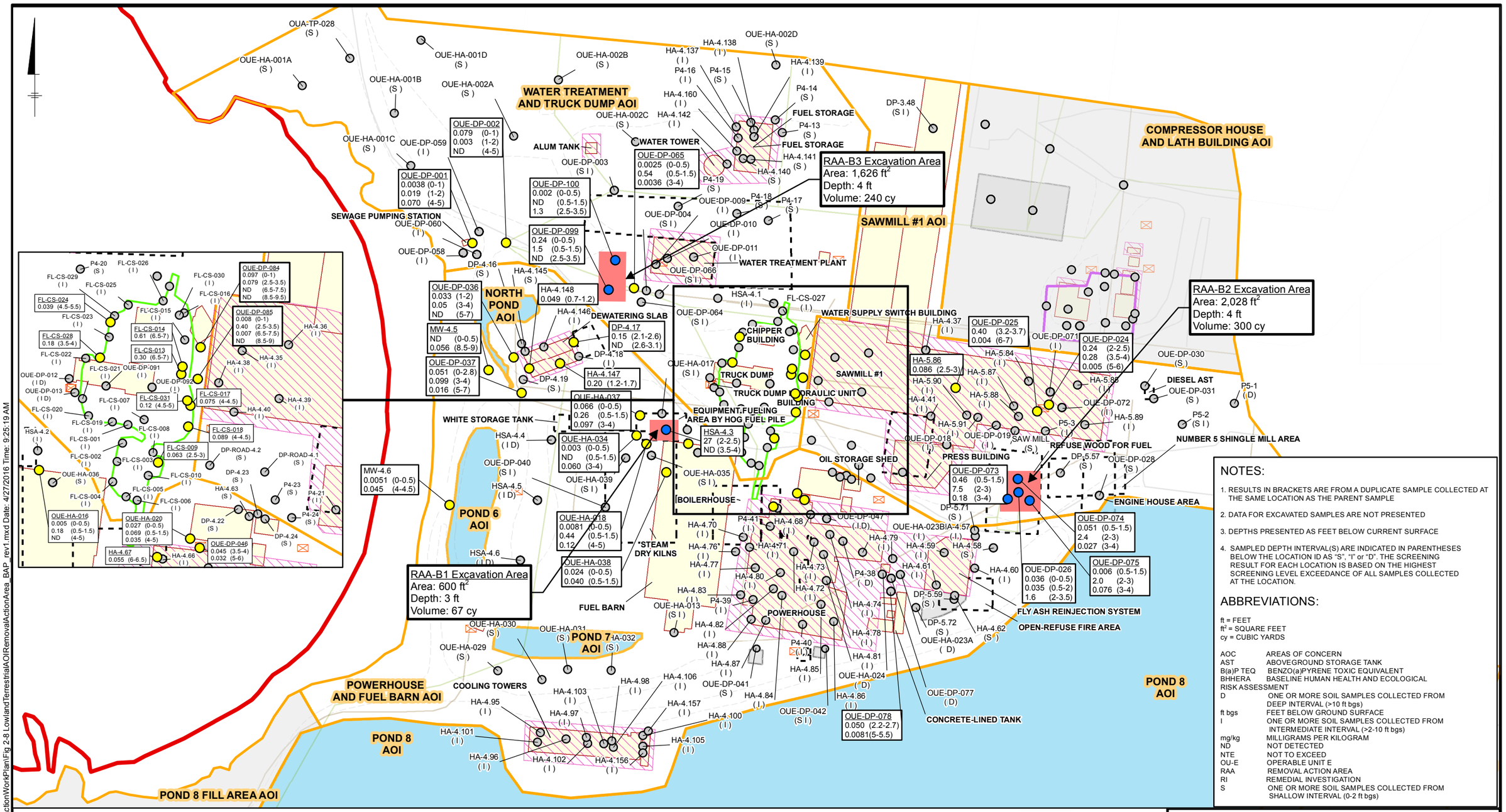
FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA
REMOVAL ACTION WORKPLAN OPERABLE UNIT E

OU-E TERRESTRIAL AOIs INCLUDED IN THE RAW

ARCADIS

FIGURE 2-7

CITY: Highlands Ranch DIV/GROUP: IM GIS DB: Brianna Griffith
Project B0066142.2012 Task AS010
Path: G:\GIS\FortBragg\MXD\OUE RemovalActionWorkPlan\Fig 2-7 OUE_AOI_MAP.mxd Date: 3/15/2016 Time: 9:20:57 AM



NOTES:

1. RESULTS IN BRACKETS ARE FROM A DUPLICATE SAMPLE COLLECTED AT THE SAME LOCATION AS THE PARENT SAMPLE
2. DATA FOR EXCAVATED SAMPLES ARE NOT PRESENTED
3. DEPTHS PRESENTED AS FEET BELOW CURRENT SURFACE
4. SAMPLED DEPTH INTERVAL(S) ARE INDICATED IN PARENTHESES BELOW THE LOCATION ID AS "S", "I" or "D". THE SCREENING RESULT FOR EACH LOCATION IS BASED ON THE HIGHEST SCREENING LEVEL EXCEEDANCE OF ALL SAMPLES COLLECTED AT THE LOCATION.

ABBREVIATIONS:

ft = FEET
ft² = SQUARE FEET
cy = CUBIC YARDS

AOC	AREAS OF CONCERN
AST	ABOVEGROUND STORAGE TANK
B(a)P TEQ	BENZO(a)PYRENE TOXIC EQUIVALENT
BHHERA	BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
D	ONE OR MORE SOIL SAMPLES COLLECTED FROM DEEP INTERVAL (>10 ft bgs)
ft bgs	FEET BELOW GROUND SURFACE
I	ONE OR MORE SOIL SAMPLES COLLECTED FROM INTERMEDIATE INTERVAL (>2-10 ft bgs)
mg/kg	MILLIGRAMS PER KILOGRAM
ND	NOT DETECTED
NTE	NOT TO EXCEED
OU-E	OPERABLE UNIT E
RAA	REMOVAL ACTION AREA
RI	REMEDIAL INVESTIGATION
S	ONE OR MORE SOIL SAMPLES COLLECTED FROM SHALLOW INTERVAL (0-2 ft bgs)

LEGEND:

- NOT DETECTED OR DETECTED BELOW SCREENING LEVELS USED IN THE OU-E RI
- DETECTED ABOVE SCREENING LEVELS USED IN THE OU-E RI, BUT BELOW NTE VALUES PRESENTED IN THE OU-E BHHERA
- SAMPLE LOCATION FOR REMOVAL ACTION
- SITE BOUNDARY
- OU-E BOUNDARY
- AOI BOUNDARY
- EXISTING STRUCTURE
- FORMER STRUCTURE
- FORMER STRUCTURE - FOUNDATION INTACT
- OTHER OPERABLE UNITS/AOIs
- POND
- COMPRESSOR HOUSE EXCAVATION BOUNDARY
- FUEL LINE EXCAVATION BOUNDARY
- APPROXIMATE CAP BOUNDARIES
- FORMER INDUSTRIAL USE (APPROXIMATE LOCATION)
- PLANT DRAIN SYSTEM LINE
- SANITARY SEWER LINE
- UNPAVED ROADWAY
- PAVED ROADWAY
- FORMER TRANSFORMER LOCATION (APPROXIMATE)
- PROPOSED REMOVAL ACTION AREAS

Sample ID: FL-CS-014 — 0.61 (6.5 - 7) — Depth (ft bgs) — B(a)P TEQ in mg/kg

0 110 220 Feet
GRAPHIC SCALE

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

REMOVAL ACTION WORKPLAN OPERABLE UNIT E

LOWLAND TERRESTRIAL AOIs REMOVAL ACTION AREAS (B(a)P)

ARCADIS

FIGURE 2-8

CITY: Highlands Ranch DIV/GROUP: IM GIS DB: Brianna Griffith
Path: G:\GIS\FortBragg\MXD\OUE RemovalActionWorkPlan\Fig 2-8 LowlandTerrestrialAOIRemovalActionArea_BAP_rev1.mxd Date: 4/27/2016 Time: 9:25:19 AM

WATER TREATMENT AND TRUCK DUMP AOI

SAWMILL #1 AOI

COMPRESSOR HOUSE AND LATH BUILDING AOI

POWERHOUSE AND FUEL BARN AOI

West of IRM AOI

IRM AOI

REA AOI

GREEN CHAIN

ELEVATED ROADWAY

SAWMILL #1

DEWATERING SLAB

North Pond Area

TOOL HOUSE

TRUCK DUMP HYDRAULIC UNIT BUILDING

EQUIPMENT FUELING AREA BY HOG FUEL PILE

WHITE STORAGE TANK

STEAM DRY KILNS

BOILERHOUSE

FUEL BARN

PROCESS WATER PUMPING STATION

Pond 6

Pond 7

Pond 8

Pond 8 Outfall

TURBINE OIL TANK

HYDRAULIC UNIT TANK

CONCRETE TANK

POWERHOUSE CHEMICAL STORAGE TANK

POLY TANKS/ TRANSFORMER PAD PAINT STORAGE SHED

COOLING TOWERS

COOLING TOWERS STORAGE SHED

CONCRETE PAD

CONCRETE SLAB

STEEL LID ENCLOSURE CONCRETE-LINED TANK

POLY TANKS PAD

TRANSFORMER PAD

LATH & SHAKE MILL

PRESS BUILDING

OIL STORAGE SHED

ENGINE HOUSE AREA

REFUSE WOOD FOR FUEL

DIESEL AST

NUMBER 5 SHINGLE MILL AREA

OPEN-REFUSE FIRE AREA

FLY ASH REINJECTION SYSTEM

SAWMILL

RAA-L1 Excavation Area
Area: 459 ft²
Depth: 4 ft
Volume: 68 cy

RAA-L2 Excavation Area
Area: 396 ft²
Depth: 1 ft
Volume: 15 cy

RAA-L3 Excavation Area
Area: 425 ft²
Depth: 6 ft
Volume: 95 cy

RAA-L4 Excavation Area
Area: 271 ft²
Depth: 6 ft
Volume: 60 cy

RAA-L5 Excavation Area
Area: 438 ft²
Depth: 7 ft
Volume: 114 cy

RAA-L6 Excavation Area
Area: 655 ft²
Depth: 9 ft
Volume: 218 cy

RAA-L7 Excavation Area
Area: 371 ft²
Depth: 7 ft
Volume: 96 cy

OUE-DP-086 8.1 (0-0.5) 93 (0.5-1.5) 4.2 (3-3.5) 24 (5-6)

OUE-DP-087 10 (0-0.5) 27 (0.5-1.5) 260 (3.5-4.5) 160 (5-6)

OUE-DP-095 9.3 (0-0.5) 50 (2.5-3) 130 (5.5-6) 33 (7.5-8.5)

OUE-DP-101 70 (1.2-1.7) 8.9 (2-2.5) 120 (3.5-4) 8.6 (4.5-5)

OUE-DP-070 54 (1.2-1.7) 300 (2.5-3) 3800 (3-4)

OUE-DP-024 190 (2-2.5) 5.1 (5-6)

OUE-DP-094 4.4 (2.5-3) 4.9 (3.5-4) 2100 (5.5-6) 22 (7-7.5)

OUE-DP-088 12 (0-0.5) 13 (0.5-1.5) 4.2 (3-4) 380 (6-7)

OUE-DP-076 130 (5-6) 530 (6-7) 1200 (8-9)

OUE-DP-089 110 (5.4-5.9) 110 (5.9-6.7)

OUE-DP-080 70 (5-5.5) 110 (5.5-6.5)

OUE-DP-090 11 (1-1.5) 37 (2-2.5) 13 (3-3.5) 1500 (5.5-6)

OUE-DP-078 70 (2.2-2.7) 290 (5-5.5)

OUE-DP-023B 100 (5-6.5) 3600 (6.5-8)

HA-4.68 140 (5-5.5)

HA-4.66 200 (6-6.5)

HA-4.67 150 (6-6.5)

HA-4.76 150 (3.5-4)

HA-4.73 120 (8-8.5)

HA-4.146 HA-4.16 HA-4.145 OUE-DP-036 HA-4.148 MW-4.5 DP-4.19 180 (1-1.5) OUE-DP-037 DP-4.17 DP-4.18 HA-4.147

OUE-DP-046 170 (3.5-4) 130 (5-6)

OUE-DP-016 88 (2-2.5)

OUE-DP-017 160 (1-1.5)

SAWMILL 130 (0-0.5)

DP-5.57 360 (0.5-1)

DP-5.54 93 (1-1.5) 4.6 (5-5.5)

P4-40 400 (6.5-7)

HSA-4.4 HSA-4.5 HSA-4.6 MW-4.6 OUE-DP-040 OUE-HA-019 OUE-HA-016 OUE-HA-015 OUE-HA-014 OUE-HA-012 OUE-HA-013 OUE-HA-029 OUE-HA-031 OUE-HA-030 OUE-HA-032 OUE-HA-020 OUE-HA-023A OUE-HA-027 OUE-HA-028 OUE-HA-003

OUE-DP-072 OUE-DP-071 OUE-DP-025 OUE-DP-014 OUE-DP-015 OUE-DP-022 OUE-DP-023 OUE-DP-019 OUE-DP-020 OUE-DP-069 OUE-DP-018 OUE-DP-068 OUE-DP-026 OUE-DP-028 OUE-DP-047 OUE-DP-048 OUE-DP-045 OUE-DP-049 OUE-DP-024 OUE-DP-081 OUE-DP-079 OUE-DP-093 OUE-DP-050 OUE-DP-077 OUE-DP-030 OUE-DP-031

DP-ROAD-4.2 DP-ROAD-4.1 DP-4.22 DP-4.23 DP-4.24 DP-4.41 DP-4.38 DP-4.39 DP-5.55 DP-5.56 DP-5.71 DP-5.59 DP-5.72

HA-4.70 HA-4.72 HA-4.74 HA-4.80 HA-4.79 HA-4.78 HA-4.81 HA-4.85 HA-4.84 HA-4.83 HA-4.82 HA-4.88 HA-4.87 HA-4.86 HA-4.63 HA-4.59 HA-4.58 HA-4.57 HA-4.60 HA-4.61 HA-4.62 HA-4.95 HA-4.97 HA-4.103 HA-4.98 HA-4.157 HA-4.100 HA-4.105 HA-4.156 HA-4.101 HA-4.96 HA-4.102

P4-41

NOTES:

1. LEAD PRAs WERE IDENTIFIED AS SAMPLES WITH CONCENTRATIONS GREATER THAN 320 mg/kg (NTE VALUE PRESENTED IN THE OU-E BHHERA)
2. DATA FOR EXCAVATED SAMPLES ARE NOT PRESENTED
3. DEPTHS PRESENTED AS FEET BELOW CURRENT SURFACE
4. RESULTS IN BRACKETS ARE FROM A DUPLICATE SAMPLE COLLECTED AT THE SAME LOCATION AS PARENT SAMPLE
5. DATA ORIGINALLY PRESENTED IN OU-E RI ON FIGURE 4-15b

ABBREVIATIONS:

ft = FEET
ft² = SQUARE FEET
cy = CUBIC YARDS

AOI AREA OF INTEREST
BHHERA BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
mg/kg MILLIGRAMS PER KILOGRAM
ft bgs FEET BELOW GROUND SURFACE
RAA REMOVAL ACTION AREA
RI REMEDIAL INVESTIGATION
NTE NOT TO EXCEED

LEGEND:

- NOT DETECTED OR DETECTED BELOW SCREENING LEVELS USED IN THE OU-E RI
- DETECTED ABOVE SCREENING LEVELS USED IN THE OU-E RI, BUT BELOW NTE VALUES PRESENTED IN THE OU-E BHHERA
- SAMPLE LOCATION FOR REMOVAL ACTION
- PROPOSED REMOVAL ACTION AREAS
- AOI BOUNDARY
- SITE BOUNDARY
- OUE BOUNDARY
- EXISTING STRUCTURE
- FORMER STRUCTURE
- FORMER STRUCTURE - FOUNDATION INTACT
- OTHER OPERABLE UNITS/AOIs
- POND
- COMPRESSOR HOUSE EXCAVATION BOUNDARY
- FUEL LINE EXCAVATION BOUNDARY
- APPROXIMATE CAP BOUNDARIES
- FORMER INDUSTRIAL USE (APPROXIMATE LOCATION)
- PLANT DRAIN SYSTEM LINE
- SANITARY SEWER LINE
- UNPAVED ROADWAY
- PAVED ROADWAY
- FORMER TRANSFORMER LOCATION APPROXIMATE)

HA-4.68 140 (5.5-6)
Sample ID
Depth (ft bgs)
Lead Concentration in mg/kg

0 110 220
GRAPHIC SCALE
Feet

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA
REMOVAL ACTION WORKPLAN OPERABLE UNIT E

LOWLAND TERRESTRIAL AOIs REMOVAL ACTION AREAS (LEAD)

ARCADIS

FIGURE 2-9

CITY: HR DIV/GROUP: GIS DB: BG
Document Path: G:\GIS\FortBragg\MXD\OUE RemovalActionWorkPlan\Fig 2-9 LowlandTerrestrialAOIRemovalActionArea_Lead_rev2.mxd Date: 4/28/2016 Time: 12:01:49 PM

NOTES:

1. DATA FOR EXCAVATED SAMPLES ARE NOT PRESENTED
2. DEPTHS PRESENTED AS FEET BELOW CURRENT SURFACE ELEVATION
3. DATA FOR ALL SAMPLES REPORTED AS TOTAL (C10-C24)
4. SAMPLED DEPTH INTERVAL(S) ARE INDICATED IN PARENTHESES BELOW THE LOCATION ID AS "S", "I" or "D".
5. EXCAVATION EXTENT, DEPTH, AND VOLUME ARE APPROXIMATE VALUES, TO BE DETERMINED BY FIELD CONDITIONS

ABBREVIATIONS:

ft = FEET
ft² = SQUARE FEET
cy = CUBIC YARDS

AOI	AREA OF INTEREST
BHHERA	BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
D	ONE OR MORE SOIL SAMPLES COLLECTED FROM DEEP INTERVAL (>10 ft bgs)
cy	CUBIC YARD
ft	FOOT/FEET
ft2	FOOT/FEET SQUARED
ft bgs	FEET BELOW GROUND SURFACE
I	ONE OR MORE SOIL SAMPLES COLLECTED FROM INTERMEDIATE INTERVAL (>2-10 ft bgs)
mg/kg	MILLIGRAMS PER KILOGRAM
OU-E	OPERABLE UNIT E
RAA	REMOVAL ACTION AREA
RI	REMEDIAL INVESTIGATION
NTE	NOT TO EXCEED
S	ONE OR MORE SOIL SAMPLES COLLECTED FROM SHALLOW INTERVAL (0-2 ft bgs)
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL

TOTAL TPHd: TOTAL TPHd (C10-C24)

LEGEND:

- NOT DETECTED OR DETECTED BELOW SCREENING LEVELS USED IN THE OU-E RI
- DETECTED ABOVE SCREENING LEVELS USED IN THE OU-E RI, BUT BELOW NTE VALUES PRESENTED IN THE OU-E BHHERA
- SAMPLE LOCATION FOR REMOVAL ACTION

- AOI BOUNDARY
- EXISTING STRUCTURE
- FORMER STRUCTURE
- FORMER STRUCTURE - FOUNDATION INTACT
- OTHER OPERABLE UNITS/AOIs
- POND
- COMPRESSOR HOUSE EXCAVATION BOUNDARY
- FUEL LINE EXCAVATION BOUNDARY
- APPROXIMATE CAP BOUNDARIES
- FORMER INDUSTRIAL USE (APPROXIMATE LOCATION)
- PROPOSED REMOVAL ACTION AREA
- PLANT DRAIN SYSTEM LINE
- SANITARY SEWER LINE
- UNPAVED ROADWAY
- PAVED ROADWAY
- FORMER TRANSFORMER LOCATION (APPROXIMATE)
- SITE BOUNDARY
- OU-E BOUNDARY

Sample ID
HA-4.37
308 (3-3.5)
Depth (ft bgs)
Total TPHd Concentration (C10-C24) in mg/kg

0 110 220 Feet
GRAPHIC SCALE

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA
REMOVAL ACTION WORKPLAN OPERABLE UNIT E

LOWLAND TERRESTRIAL AOIs REMOVAL ACTION AREAS (TPH(d))

ARCADIS

FIGURE 2-10

CITY: Highlands Ranch DIV/GROUP: IM GIS DB: Brianna Griffith
Path: G:\GIS\FortBragg\MXD\OUE RemovalActionWorkPlan\Fig 2-10 LowlandTerrestrialAOIRemovalActionArea_TPHd_rev1.mxd Date: 4/27/2016 Time: 9:25:09 AM

NORTH POND AOI
TOOL HOUSE
DP-4.17
DEWATERING SLABS
OUE-SS-001
OUE-DP-036
HA-4.147
MW-4.5
9.07 (0-0.5)
0.001 (8.5-9)
DP-4.19
OUE-DP-037
OUE-SS-002
6.26 (0-0.5)
WHITE STORAGE TANK
WATER TREATMENT AND TRUCK DUMP AOI
COMPRESSOR HOUSE AND LATH BUILDING AOI
SAWMILL #1 AOI
EQUIPMENT FUELING AREA BY HOG FUEL PILE
OUE-T2-2a
31.63 (6-6.5)
OUE-T2-2b
36.0 (6-6.5)
TRANSFORMER PAD
OIL STORAGE SHED
OUE-SS-003
OUE-DP-038
STEAM DRY KILNS
FUEL STORAGE
MW-4.6
9.48 (0-0.5)
2.51 (4-4.5)
POND 6 AOI
HSA-4.5
BOILERHOUSE
OUE-DP-051
11.4 (1.5-2)
0.16 (3-3.5)
OUE-HA-015
TRANSFORMER PAD
TURBINE OIL TANK
HA-4.68
33.1 (5.5-5)
OUE-HA-023B
11.08 (5.5-6)
0.09 (6.5-8)
DP-5.71
OUE-DP-045
6.82 (5-5.5)
OUE-DP-048
CONCRETE TANK
FLY ASH REINJECTION SYSTEM
OUE-DP-039
8.93 (2-2.7)
6.9 (5-5.5)
13.0 (10-11.5)
0.05 (16.5-17)
OUE-DP-076
OUE-DP-049
OUE-DP-088
9.57 (0-0.5)
0.05 (0.5-1.5)
HYDRAULIC UNITS
OUE-HA-024
OUE-DP-080
OUE-DP-053
OUE-SS-004
OUE-DP-057
6.01 (0-1)
ND (5-5.8)
0.002 (10.5-11)
FUEL BARN
OUE-T1-1
HA-4.90
504 (13.5-14)
OPEN-REFUSE FIRE AREA
POWERHOUSE
OUE-DP-077
OUE-DP-078
RAA-D1 Excavation Area
Area: 390 ft²
Depth: 3 ft
Volume: 43 cy
PROCESS WATER PUMPING STATION
OUE-DP-093
OUE-DP-052
203 (0-0.5)
2729 (0.5-1.5)
2.15 (3-4)
OUE-DP-050
OUE-DP-081
POND 7 AOI
OUE-HA-029
5.82 (0-1)
OUE-HA-031
OUE-HA-032
OUE-DP-089
0.32 (5.4-5.9)
11.94 (5.9-6.7)
OUE-HA-030
CHEMICAL STORAGE TANK
POLY TANKS/TRANSFORMER PAD
PAINT STORAGE SHED
OUE-DP-079
DP-5.72
CONCRETE PAD
CONCRETE SLAB
STEEL LID ENCLOSURE
OUE-DP-090
POWERHOUSE AND FUEL BARN AOI
OUE-HA-023A
CONCRETE-LINED TANK
COOLING TOWERS
COOLING TOWERS STORAGE SHED
POND 8 AOI
POLY TANKS PAD

NOTES:

1. DATA FOR EXCAVATED SAMPLES ARE NOT PRESENTED
2. DEPTHS PRESENTED AS FEET BELOW CURRENT SURFACE

ABBREVIATIONS:

ft = FEET
ft² = SQUARE FEET
cy = CUBIC YARDS

2,3,7,8- TCDD	2 3 7 8-TETRACHLORODIBENZO-P-DIOXIN
AOC	AREAS OF CONCERN
AOI	AREA OF INTEREST
AST	ABOVEGROUND STORAGE TANK
BHHERA	BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
ft bgs	FEET BELOW GROUND SURFACE
NTE	NOT TO EXCEED
RAA	REMOVAL ACTION AREA
RI	REMEDIAL INVESTIGATION
pg/g	PICOGRAMS PER GRAM
TEQ	TOXIC EQUIVALENT

LEGEND:

- NOT DETECTED OR DETECTED BELOW SCREENING LEVELS USED IN THE OU-E RI
- DETECTED ABOVE SCREENING LEVELS USED IN THE OU-E RI, BUT BELOW NTE VALUES PRESENTED IN THE OU-E BHHERA
- SAMPLE LOCATION FOR REMOVAL ACTION

- AOI BOUNDARY
- EXISTING STRUCTURE
- FORMER STRUCTURE
- FORMER STRUCTURE - FOUNDATION INTACT
- OTHER OPERABLE UNITS/AOIs
- POND
- FUEL LINE EXCAVATION BOUNDARY
- APPROXIMATE CAP BOUNDARIES
- FORMER INDUSTRIAL USE (APPROXIMATE LOCATION)
- FORMER TRANSFORMER LOCATION (APPROXIMATE)
- SITE BOUNDARY
- PLANT DRAIN SYSTEM LINE
- SANITARY SEWER LINE
- UNPAVED ROADWAY
- PAVED ROADWAY
- PROPOSED REMOVAL ACTION AREAS
- OU-E BOUNDARY

Sample ID
HA-4.90
504 (2-2.5)
Depth (ft bgs)
2,3,7,8-TCDD TEQ Concentration in pg/g

0 80 160 Feet
GRAPHIC SCALE

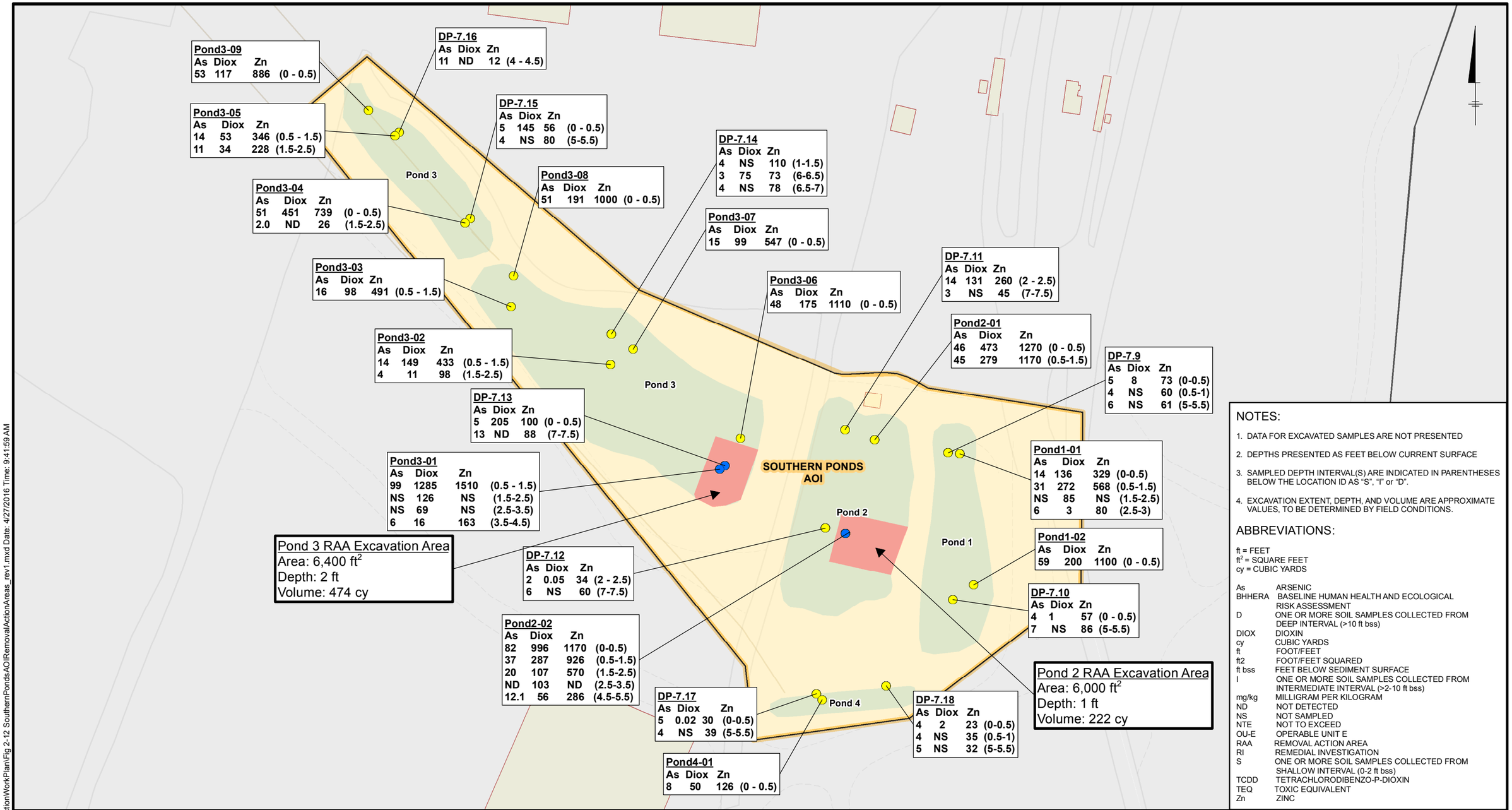
FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA
REMOVAL ACTION WORKPLAN OPERABLE UNIT E

LOWLAND TERRESTRIAL AOIs REMOVAL ACTION AREA (DIOXIN)

ARCADIS

FIGURE 2-11

CITY: HR DIV/GROUP: GIS DB: BG
Project #B0066142.0006.00001
Path: G:\GIS\Fort Bragg\MXD\OUE RemovalActionWorkPlan\Fig 2-11 LowlandTerrestrialAOIRemovalActionArea_Dioxin_rev1.mxd Date: 4/27/2016 Time: 9:30:02 AM



NOTES:

1. DATA FOR EXCAVATED SAMPLES ARE NOT PRESENTED
2. DEPTHS PRESENTED AS FEET BELOW CURRENT SURFACE
3. SAMPLED DEPTH INTERVAL(S) ARE INDICATED IN PARENTHESES BELOW THE LOCATION ID AS "S", "I" or "D".
4. EXCAVATION EXTENT, DEPTH, AND VOLUME ARE APPROXIMATE VALUES, TO BE DETERMINED BY FIELD CONDITIONS.

ABBREVIATIONS:

ft = FEET
ft^2 = SQUARE FEET
cy = CUBIC YARDS

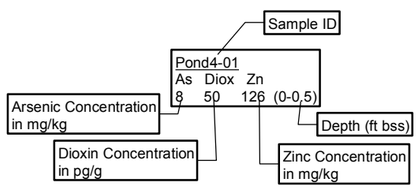
As	ARSENIC
BHHERA	BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
D	ONE OR MORE SOIL SAMPLES COLLECTED FROM DEEP INTERVAL (>10 ft bss)
DIOX	DIOXIN
cy	CUBIC YARDS
ft	FOOT/FEET
ft2	FOOT/FEET SQUARED
ft bss	FEET BELOW SEDIMENT SURFACE
I	ONE OR MORE SOIL SAMPLES COLLECTED FROM INTERMEDIATE INTERVAL (>2-10 ft bss)
mg/kg	MILLIGRAM PER KILOGRAM
ND	NOT DETECTED
NS	NOT SAMPLED
NTE	NOT TO EXCEED
OU-E	OPERABLE UNIT E
RAA	REMOVAL ACTION AREA
RI	REMEDIAL INVESTIGATION
S	ONE OR MORE SOIL SAMPLES COLLECTED FROM SHALLOW INTERVAL (0-2 ft bss)
TCDD	TETRACHLORODIBENZO-P-DIOXIN
TEQ	TOXIC EQUIVALENT
Zn	ZINC

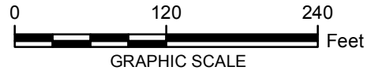
LEGEND:

- NOT DETECTED OR DETECTED BELOW SCREENING LEVELS USED IN THE OU-E RI
- DETECTED ABOVE SCREENING LEVELS USED IN THE OU-E RI, BUT BELOW NTE VALUES PRESENTED IN THE OU-E BHHERA
- SAMPLE LOCATION FOR REMOVAL ACTION

- OU-E BOUNDARY
- POND
- SOUTHERN PONDS
- PROPOSED REMOVAL ACTION AREAS
- OTHER OPERABLE UNITS/AOIs

- PLANT DRAIN SYSTEM LINE
- SANITARY SEWER LINE
- UNPAVED ROADWAY
- PAVED ROADWAY
- EXISTING STRUCTURE
- FORMER STRUCTURE





FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

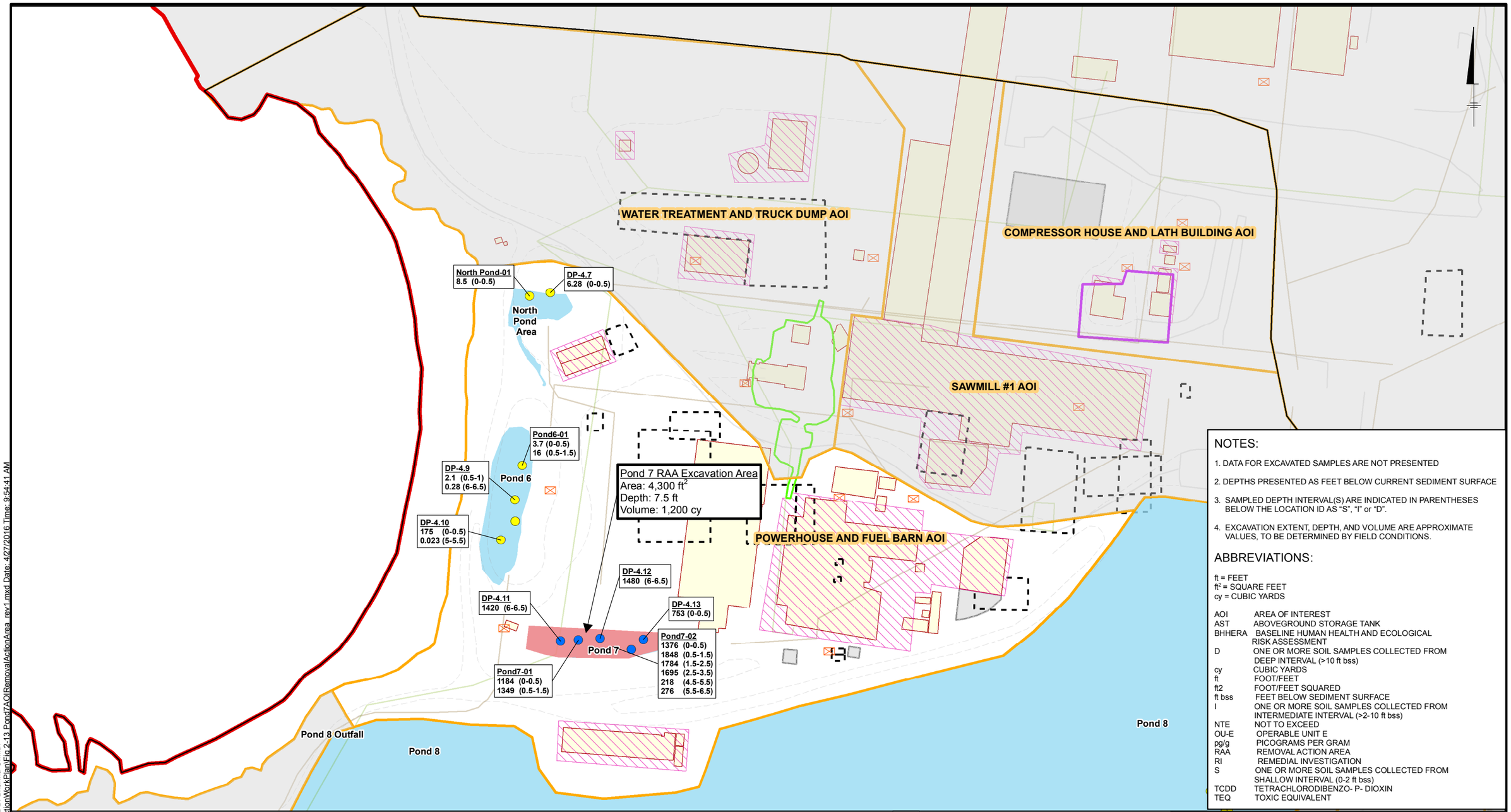
REMOVAL ACTION WORKPLAN OPERABLE UNIT E

SOUTHERN PONDS AOI REMOVAL ACTION AREAS

ARCADIS

FIGURE 2-12

CITY: Highlands Ranch DIV/GROUP: IM GIS DB: Brianna Griffith
Project B0066138.0006 task 1
Path: G:\GIS\FortBragg\MXD\OUE RemovalActionWorkPlan\Fig 2-12 SouthernPondsAOIRemovalActionAreas_rev1.mxd Date: 4/27/2016 Time: 9:41:59 AM



NOTES:

1. DATA FOR EXCAVATED SAMPLES ARE NOT PRESENTED
2. DEPTHS PRESENTED AS FEET BELOW CURRENT SEDIMENT SURFACE
3. SAMPLED DEPTH INTERVAL(S) ARE INDICATED IN PARENTHESES BELOW THE LOCATION ID AS "S", "I" or "D".
4. EXCAVATION EXTENT, DEPTH, AND VOLUME ARE APPROXIMATE VALUES, TO BE DETERMINED BY FIELD CONDITIONS.

ABBREVIATIONS:

ft = FEET
ft^2 = SQUARE FEET
cy = CUBIC YARDS

AOI	AREA OF INTEREST
AST	ABOVEGROUND STORAGE TANK
BHHERA	BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
D	ONE OR MORE SOIL SAMPLES COLLECTED FROM DEEP INTERVAL (>10 ft bss)
cy	CUBIC YARDS
ft	FOOT/FEET
ft2	FOOT/FEET SQUARED
ft bss	FEET BELOW SEDIMENT SURFACE
I	ONE OR MORE SOIL SAMPLES COLLECTED FROM INTERMEDIATE INTERVAL (>2-10 ft bss)
NTE	NOT TO EXCEED
OU-E	OPERABLE UNIT E
pg/g	PICOGRAMS PER GRAM
RAA	REMOVAL ACTION AREA
RI	REMEDIAL INVESTIGATION
S	ONE OR MORE SOIL SAMPLES COLLECTED FROM SHALLOW INTERVAL (0-2 ft bss)
TCDD	TETRACHLORODIBENZO- P- DIOXIN
TEQ	TOXIC EQUIVALENT

LEGEND:

- NOT DETECTED OR DETECTED BELOW SCREENING LEVELS USED IN THE OU-E RI
- DETECTED ABOVE SCREENING LEVELS USED IN THE OU-E RI, BUT BELOW NTE VALUES PRESENTED IN THE OU-E BHHERA
- SAMPLE LOCATION FOR REMOVAL ACTION
- AOI BOUNDARY
- EXISTING STRUCTURE
- FORMER STRUCTURE
- FORMER STRUCTURE - FOUNDATION INTACT
- OTHER OPERABLE UNITS/AOIs
- POND
- COMPRESSOR HOUSE EXCAVATION BOUNDARY
- FUEL LINE EXCAVATION BOUNDARY
- APPROXIMATE CAP BOUNDARIES
- PROPOSED REMOVAL ACTION AREA
- FORMER INDUSTRIAL USE (APPROXIMATE LOCATION)
- PLANT DRAIN SYSTEM LINE
- SANITARY SEWER LINE
- UNPAVED ROADWAY
- PAVED ROADWAY
- FORMER TRANSFORMER LOCATION (APPROXIMATE)
- SITE BOUNDARY
- OU-E BOUNDARY

Pond8-14 (Sample ID)
85.7 (0-0.5) (Depth (ft bss))
2,3,7,8-TCDD TEQ Concentration in pg/g

0 110 220 Feet
GRAPHIC SCALE

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

REMOVAL ACTION WORKPLAN OPERABLE UNIT E

POND 7 AOI REMOVAL ACTION AREA

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FIGURE
2-13

CITY: Highlands Ranch DIV/GROUP: IM GIS DB: Brianna Griffith
Path: G:\GIS\FortBragg\MXD\OUE RemovalActionWorkPlan\Fig 2-13 Pond7AOIRemovalActionArea_rev1.mxd Date: 4/27/2016 Time: 9:54:41 AM

CITY: Highlands Ranch DIV/GROUP: AIT GIS DB:BCG
Path: G:\GIS\FortBragg\MXD\OUE RemovalActionWorkPlan\Fig 2-14 RiparianAOIRemovalActionAreas_rev1.mxd Date: 4/27/2016 Time: 10:21:32 AM

OUD-HA-049
28 (0-0.5)
8.2 (0.5-1.5)

OUD-HA-041
4.6 (0-0.5)

OUD-SED-HA-047
21 (0-0.5)

OUD-HA-040
20.5 (0-0.5)
0.247 (0.5-1.5)

Riparian - 4 RAA Excavation Area
Area : 430 ft^2
Depth: 0.5 ft
Volume: 8 cy

OUD-HA-070
(S)

OUD-HA-042
95 (0-0.5)
3.6 (0.5-1.5)

FORMER LOG STORAGE AND SEDIMENT STOCKPILE AOI

OUD-SED-HA-048
33 (0-0.5)

OUD-HA-048
(S)

OUD-HA-043
23 (0-0.5)
0.2 (0.5-1.5)

Riparian - 3 RAA Excavation Area
Area : 430 ft^2
Depth: 0.5 ft
Volume: 8 cy

OUD-HA-071
6.4 (0-0.5)

RIPARIAN AOI

FLOW DIRECTION OF RIPARIAN CREEK

FORMER SEDIMENT STORAGE AREA

OUD-SED-HA-049
98 (0-0.5)

OUD-HA-044
210 (0-0.5)
5.6 (0.5-1.5)

Riparian-1 RAA Excavation Area
Area: 430 ft^2
Depth: 0.5 ft
Volume: 8 cy

OUD-HA-047
22 (0-0.5)
12 (0.5-1.5)

OUD-HA-045
30 (0-0.5)
0.05 (0.5-1.5)

FORMER ASH STOCKPILE

OUD-HA-090
7.3 (0-0.5)

Riparian-2 RAA Excavation Area
Area: 430 ft^2
Depth: 0.5 ft
Volume: 8 cy

OUD-HA-046
315 (0-0.5)
26 (0.5-0.85)

OUD-HA-072
11 (0-0.5)

OUD-SED-HA-050
7.4 (0-0.5)

NOTES:
1. SAMPLED DEPTH INTERVAL(S) IS INDICATED IN PARENTHESES BELOW THE LOCATION ID AS "S", "I" or "D".
2. HISTORICAL DATASET INCLUDES ALL SOIL SAMPLES COLLECTED THROUGH DECEMBER 2007.

ft = FEET
ft^2 = SQUARE FEET
cy = CUBIC YARDS

ACRONYMS:

AOI	AREA OF INTEREST
BHHERA	BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
D	ONE OR MORE SOIL SAMPLES COLLECTED FROM DEEP INTERVAL (>10 ft bgs)
cy	CUBIC YARDS
ft	FOOT/FEET
ft2	FOOT/FEET SQUARED
ft bgs	FEET BELOW GROUND SURFACE
ft bss	FEET BELOW SEDIMENT SURFAC
I	ONE OR MORE SOIL SAMPLES COLLECTED FROM INTERMEDIATE INTERVAL (>2-10 ft bgs)
NTE	NOT TO EXCEED
pg/g	PICOGRAMS PER GRAM
RAA	REMOVAL ACTION AREA
RI	REMEDIAL INVESTIGATION
S	ONE OR MORE SOIL SAMPLES COLLECTED FROM SHALLOW INTERVAL (0-2 ft bgs)
TEQ	TOXIC EQUIVALENT

NOT DETECTED OR DETECTED BELOW SCREENING LEVELS USED IN THE OU-E RI

DETECTED ABOVE SCREENING LEVELS USED IN THE OU-E RI, BUT BELOW NTE VALUES PRESENTED IN THE OU-E BHHERA

SAMPLE LOCATION FOR REMOVAL ACTION

SAMPLE ID
OUD-HA-046
315 (0-0.5)
26 (0.5-0.85)
Depth ft bgs or bss
DIOXIN CONCENTRATION IN pg/g

LEGEND:

- SITE BOUNDARY
- AOI BOUNDARY
- OTHER OPERABLE UNIT/AOIs
- POND
- ASH PILE REMOVAL AREA
- PREVIOUS GEOPHYSICAL INVESTIGATION
- PROPOSED REMOVAL ACTION AREA
- FORMER STRUCTURE
- STRUCTURE
- (FORMER) INDUSTRIAL USE
- PAVED ROADWAY
- UNPAVED ROADWAY
- FLOW DIRECTION OF RIPARIAN CREEK
- PLANT DRAIN SYSTEM LINE
- SANITARY SEWER LINE
- PERENNIAL DRAINAGE
- RIPARIAN WETLAND
- SEASONAL WETLAND DITCH

0 130 260 Feet
GRAPHIC SCALE

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

REMOVAL ACTION WORKPLAN OPERABLE UNIT E

RIPARIAN AOI REMOVAL ACTION AREAS

ARCADIS

FIGURE 2-14

TABLES

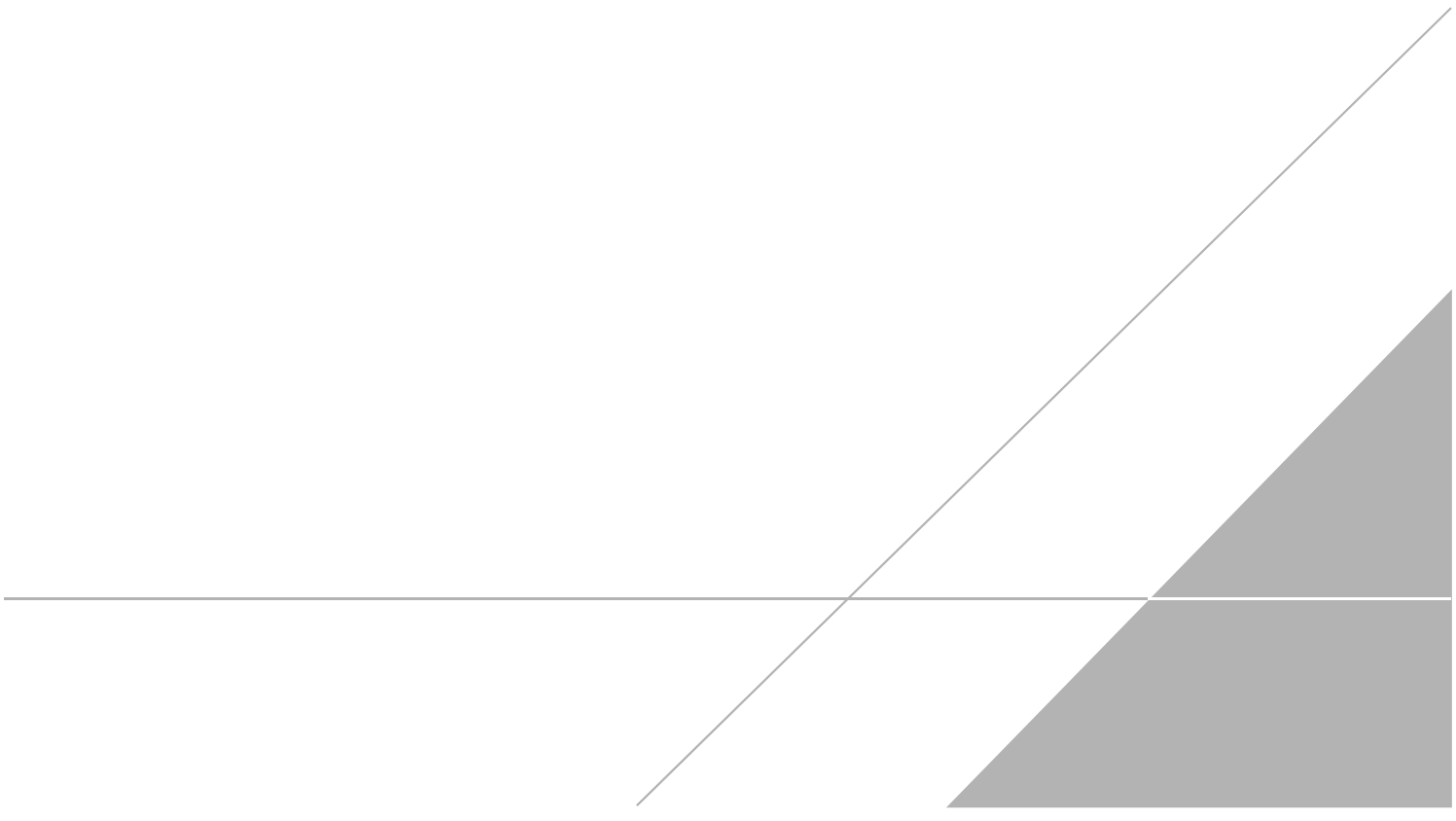


Table 2-1
Earthwork Estimates
Removal Action Work Plan, Operable Unit E
Former Georgia-Pacific Wood Products Facility
Fort Bragg, California

Removal Action Area	Surface Area (ft^2)	Depth (ft)	Volume (CY)
RAA-B1	600	3.0	67
RAA-B2	2,028	4.0	300
RAA-B3	1,626	4.0	240
RAA-L1	459	4.0	68
RAA-L2	396	1.0	15
RAA-L3	425	6.0	95
RAA-L4	271	6.0	60
RAA-L5	438	7.0	114
RAA-L6	655	9.0	218
RAA-L7	371	7.0	96
RAA-T1	875	6.0	194
RAA-D1	390	3.0	43
Pond 2 RAA	6,000	1.0	222
Pond 3 RAA	6,400	2.0	474
Pond 7 (pond area only)	4,300	7.5	1,200
Riparian-1 RAA	430	0.5	8
Riparian-2 RAA	430	0.5	8
Riparian-3 RAA	430	0.5	8
Riparian-4 RAA	430	0.5	8
		Subtotal (Soil)	1,510
		Subtotal (Sediment)	1,928
		TOTAL	3,438

Notes:
CY = cubic yards
ft^2 = square feet
ft = feet

APPENDIX A
Administrative Record

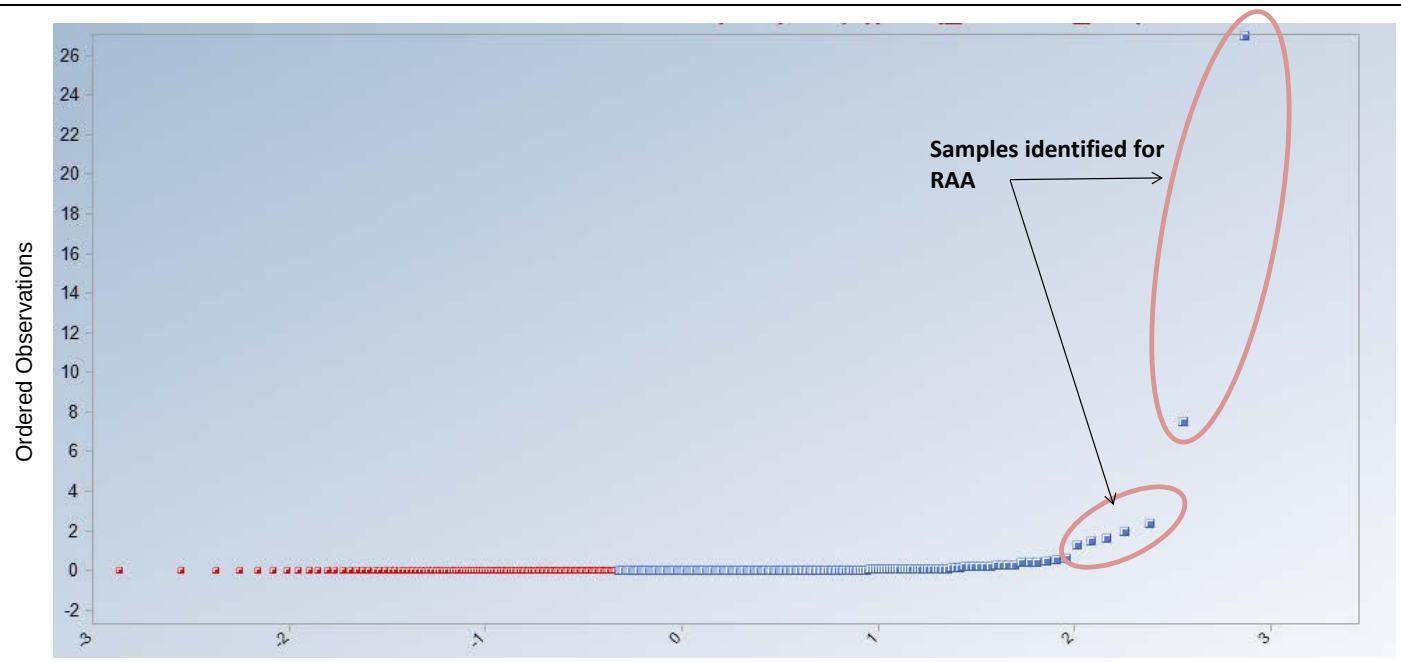
Date	Author	Receiver	Title of Document
Undated #1	TRC Companies, Inc.	North Coast Regional Water Quality Control Board	Phase II Determination of Significance Standing Structures Georgia Pacific Lumber Mill Fort Bragg, California. TRC Companies, Inc. Draft Report.
Undated #2	TRC Companies, Inc.	North Coast Regional Water Quality Control Board	Site Specific Treatment Plan for Cultural Resources. TRC Companies, Inc. Draft Report
06/1982	California Coastal Commission	Public	Mendocino County Coastal Ground Water Study
10/1988	U.S. Environmental Protection Agency (USEPA)	Public	Guidance for Conducting Remedial Investigations and Feasibility Studies (RI/FS) under CERCLA. EPA/540/G-89/004.
10/1994	U.S. Environmental Protection Agency (USEPA)	Public	How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites: A Guide for Corrective Action Plan Reviewers. EPA 510-B-94-003. Available online at: http://www.epa.gov/swerust1/pubs/tum_ch5.pdf .
04/01/1998	TRC Companies, Inc.	Georgia-Pacific Corporation	Letter from Mr. Mohammad Bazargani, Project Manager, and Dr. Jonathan Scheiner, Senior Project Scientist, to Mr. Larry L. Lake, Environmental Site Coordinator, Georgia-Pacific Corporation, re: Report of Findings, Preliminary Investigation Demolition Support Services, Georgia-Pacific Fort Bragg Facility, Fort Bragg, California. Project No. 97 734.
06/13/2002	California Coastal Commission	Public	Statewide Interpretive Guidelines. Revised June 13, 2000. California Department of Water Resources. 1982. Mendocino County Coastal Ground Water Study.
02/2003	Hygienetics Environmental Services, Inc	North Coast Regional Water Quality Control Board	Asbestos and Lead Based Paint Inspection Report, Georgia Pacific Site, 90 West Redwood Avenue, Fort Bragg, California
03/2003	TRC Companies, Inc.	North Coast Regional Water Quality Control Board	Archaeological Survey of the Georgia Pacific Lumber Mill Fort Bragg, California.
03/2004	TRC Companies, Inc.	North Coast Regional Water Quality Control Board	Phase I Environmental Site Assessment, Georgia-Pacific California Wood Products Manufacturing Division, 90 West Redwood Avenue, Fort Bragg, California. Prepared for Georgia-Pacific Corporation, 133 Peachtree Street, NE, Atlanta, Georgia. Project No. 41 041901.
05/14/2004	TRC Companies, Inc.	North Coast Regional Water Quality Control Board	Phase II Environmental Site Assessment, Georgia-Pacific, 90 West Redwood Avenue, Fort Bragg, California 95437. Prepared for Georgia-Pacific, 133 Peachtree Street, NE, Atlanta, Georgia. Project No. 41 041908.
10/2004	TRC Companies, Inc.	North Coast Regional Water Quality Control Board	Additional Site Assessment Report, Georgia Pacific Former Sawmill Site, 90 West Redwood Avenue, Fort Bragg, California. Prepared for Georgia-Pacific, 133 Peachtree Street, NE, Atlanta, Georgia.
06/2005	Acton•Mickelson•Environmental, Inc.	North Coast Regional Water Quality Control Board	Work Plan for Additional Site Assessment, Georgia-Pacific California Wood Products Manufacturing Facility, 90 West Redwood Avenue, Fort Bragg, California.
02/2006	BACE Geotechnical, a division of Brunsing Associates, Inc	North Coast Regional Water Quality Control Board	Engineering Geologic Reconnaissance Report, Planned Blufftop Access Trail, Georgia-Pacific Property, Fort Bragg, California.
02/2006	Blackburn Consulting, Inc.	Acton•Mickelson•Environmental, Inc.	Letter from Mr. Rick Sowers, PE, CEG, Senior Project Manager, and Mr. Tom Blackburn, GE, Principal, to Mr. John Mattey, Acton•Mickelson•Environmental, Inc., re: Geotechnical Evaluation, Bearing Support for Heavy Equipment Loads, Georgia-Pacific Mill Site, Fort Bragg, California.
07/2006	Acton•Mickelson•Environmental, Inc.	North Coast Regional Water Quality Control Board	Dioxin Sampling and Analysis Report, Georgia-Pacific California Wood Products Manufacturing Facility, 90 West Redwood Avenue, Fort Bragg, California.
08/14/2006	Acton•Mickelson•Environmental, Inc.	North Coast Regional Water Quality Control Board	Data Transmittal Report, Georgia-Pacific California Wood Products Manufacturing Facility, 90 West Redwood Avenue, Fort Bragg, California.
11/2005 (Species list updated 2007)	WRA Environmental Consultants (WRA)	Georgia-Pacific Corporation	Biological Assessment, Georgia Pacific Fort Bragg Sawmill Factory, Fort Bragg, Mendocino County, California. Prepared for Georgia Pacific, Atlanta, Georgia. WRA Environmental Consultants, Inc.
12/2007 (Revised 05/2008)	ARCADIS BBL	California Department of Toxic Substances Control (DTSC)	Preliminary Site Investigation Work Plan Operable Unit E – Onsite Ponds, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
05/2008	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Site-Wide Risk Assessment Work Plan (Site-Wide RAWP), Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
06/2008	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Interim Action Remedial Action Plan, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
06/2008	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Final Interim Action Remedial Action Plan and Feasibility Study, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.

Date	Author	Receiver	Title of Document
05/2009	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Data Summary Report, Operable Unit E Pond Sediment, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
11/2009	WRA Environmental Consultants (WRA)	Georgia-Pacific Corporation	Delineation of Potential Section 404 Jurisdictional Wetlands and Waters, Former Georgia-Pacific Wood Products Facility, Fort Bragg, Mendocino County, California.
04/2010	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Interim Action Completion Report, Operable Units C & E, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
05/2010	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Site Investigation Work Plan, Operable Unit E – Upland, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
10/2010	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Site Investigation Summary and Step-out Evaluation, Operable Unit E, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
2011	U.S. Environmental Protection Agency (USEPA)	Public	ProUCL Version 4.1.00. U.S. Environmental Protection Agency. Available online at http://www.epa.gov/esd/tsc/software.htm
03/02/2011	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Operable Unit E Upland – Site Investigation Sampling Summary, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
04/2011	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Remedial Investigation Operable Units C and D, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
04/2011	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Environmentally Sensitive Habitat Areas Delineation Report, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
04/2011	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Data Summary Report – Additional Investigation Pond 8 Sediment, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
01/2012	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Feasibility Study, Operable Units C and D, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
01/2012	Mill Site Coordinating Committee	Public	Mill Site Specific Plan Preliminary. Prepared for Georgia-Pacific Sawmill Facility, Fort Bragg, California. Available online at: http://ca-fortbragg.civicplus.com/DocumentCenter/Home/View/1786.
12/2012	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Mill Pond (Pond 8) Geotechnical and Chemical Characterization Results, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
01/2013	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Final Remedial Investigation Report Operable Unit E (RI Report), Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
02/2013	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Revised Baseline Human Health and Ecological Risk Assessment (BHHERA) Work Plan – Operable Unit E (OU-E) Addendum, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
06/25/2014	California Department of Toxic Substances Control (DTSC)		Identification of Presumptive Remedy Areas on Operable Unit E Georgia Pacific Former Sawmill Site, Fort Bragg. PCA: 11018. Site Code: 200402-00.
08/2015	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Baseline Human Health and Ecological Risk Assessment – Operable Unit E, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
12/2015	ARCADIS U.S., Inc.	California Department of Toxic Substances Control (DTSC)	Remedial Action Plan Operable Units C and D, Former Georgia-Pacific Wood Products Facility. Fort Bragg, California. Prepared for Georgia-Pacific LLC.
01/20/2016	California Department of Toxic Substances Control (DTSC)	Mr. Dave Massengill, Senior Director, Georgia-Pacific LLC	Letter from Mr. Thomas P. Lanphar, Senior Environmental Scientist, Brownfields and Environmental Restoration Branch – Berkeley, to Mr. Dave Massengill, Senior Director, Georgia-Pacific LLC, re: Draft Operable Unit E Feasibility Study, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California.
02/24/2016	California Department of Toxic Substances Control (DTSC)	Mr. Dave Massengill, Senior Director, Georgia-Pacific LLC	Letter from Mr. Thomas P. Lanphar, Senior Environmental Scientist, Brownfields and Environmental Restoration Branch – Berkeley, to Mr. Dave Massengill, Senior Director, Georgia-Pacific LLC, re: Proposed Removal Action for Sites Within Operable Unit E Feasibility Study, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

Date	Author	Receiver	Title of Document
03/07/2016	State of California	Public	California Health and Safety Code (HSC) 2016. Chapter 6.8, Section 25323.1. Available online at: http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25310-25327

APPENDIX B
Quantile-Quantile Plots for Terrestrial Lowlands AOC, Southern Ponds AOC, and Riparian AOC

OU-E Hotspot evaluation
OU-E Lowland AOC (0-6 ft bgs)
Former Georgia-Pacific Wood Products Facility
Fort Bragg, CA



ARCADIS Design & Consultancy for natural and built assets

Normal Quantile-Quantile Plot
B(a)P TEQ
Terrestrial (0 - 10 ft)
Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

Figure 1

Constituent	Units	Sample Size			ND Range (mg/kg)		Detects (mg/kg)					Percentiles in mg/kg (All Data)			
		NDs	Detects	Total	Min	Max	Min	Max	Mean	Median	SD	25th	50th	75th	95th (EPC)
USEPA B(a)P TEQ	mg/kg	112	189	301	9.3E-06	9.3E-06	9.3E-06	27	0.275	0.013	2.049	9.3E-06	0.003	0.023	0.759

Notes:
Normal Q-Q plot generated using ProUCL version 4.1.00. Reporting limit used for non-detects
Sample identifed for RAA based on outlier analysis and exceedance of the soil not-to-exceed value (0.9 mg/kg).
Samples identifed for RAA based on exceedance of soil not-to-exceed value (0.9 mg/kg).
Non-detect Detect

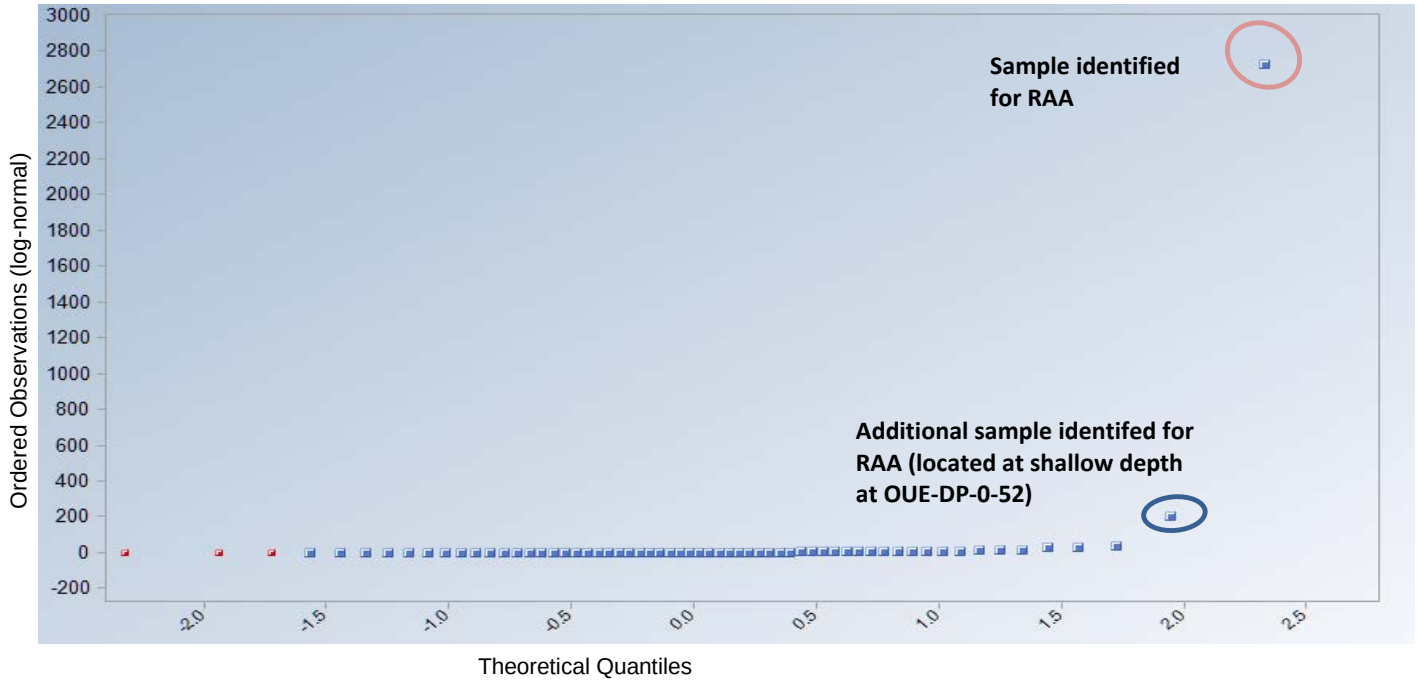
Abbreviations:
bgs = below ground surface
EPC = exposure point concentration
ft = feet
mg/kg = milligrams(s) per kilogram
NA = not available
ND = nondetect
RAA = Removal Action Area
RBTL = Risk Based Target Level
SD = standard deviation

Reference: DTSC. 2014. Identification of Presumptive Remedy Areas on Operable Unit E Georgia Pacific Former Sawmill Site, Fort Bragg. June 25.

OU-E Lowland AOC (0-10 ft bgs): 10 Highest Detects Rank Ordered

Rank Order	Units	Result (mg/kg)	Sample ID	Depth Interval (feet bgs)	Post removal EPC (mg/kg)	No. of Samples in EPC	EPC Notes
1	mg/kg	27	HSA-4.3	2 - 2.5			Removal of RAA samples results in an EPC less than the soil RBTL (0.3 mg/kg) and a maximum concentration less than the not-to-exceed value (0.9 mg/kg; DTSC 2014).
2	mg/kg	7.5	OUE-DP-073	2 - 3			
3	mg/kg	2.4	OUE-DP-074	2 - 3			
4	mg/kg	2	OUE-DP-075	2 - 3			
5	mg/kg	1.6	OUE-DP-026	2 - 3.5			
6	mg/kg	1.5	OUE-DP-099	0.5 - 1.5			
7	mg/kg	1.3	OUE-DP-100	2.5 - 3.5			
8	mg/kg	0.61	FL-CS-014	6.5-7	0.059	294	Assumes removal of the 7 highest samples.
9	mg/kg	0.54	OUE-DP-065	0.5 - 1.5			
10	mg/kg	0.46	OUE-DP-073	0.5 - 1.5			

OU-E Hotspot evaluation
OU-E Lowland AOC (0-6 ft bgs)
Former Georgia-Pacific Wood Products Facility
Fort Bragg, CA



ARCADIS Design & Consultancy for natural and built assets

Lognormal Quantile-Quantile Plot
2,3,7,8-TCDD TEQ (Human/Mammal)
Terrestrial (0 - 10 ft)
Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

Figure 2

Constituent	Units	Sample Size			ND Range (pg/g)		Detects (pg/g)					Percentiles in pg/g (All Data)			
		NDs	Detects	Total	Min	Max	Min	Max	Mean	Median	SD	25th	50th	75th	95th (EPC)
2,3,7,8-TCDD TEQ (Human/Mammal)	pg/g	3	59	62	0.0010	0.0010	0.001	2,729	54.03	1.65	355	0.32	1.5	6.0	326

Notes:

Normal Q-Q plot generated using ProUCL version 4.1.00. Reporting limit used for non-detects

Sample identified for RAA based on outlier analysis and exceedance of the soil not-to-exceed value (160 pg/g).

Sample located for RAA based on exceedance of the soil not-to-exceed value (160 pg/g). Sample at the same location at a shallower depth.

Non-detect Detect

Abbreviations:

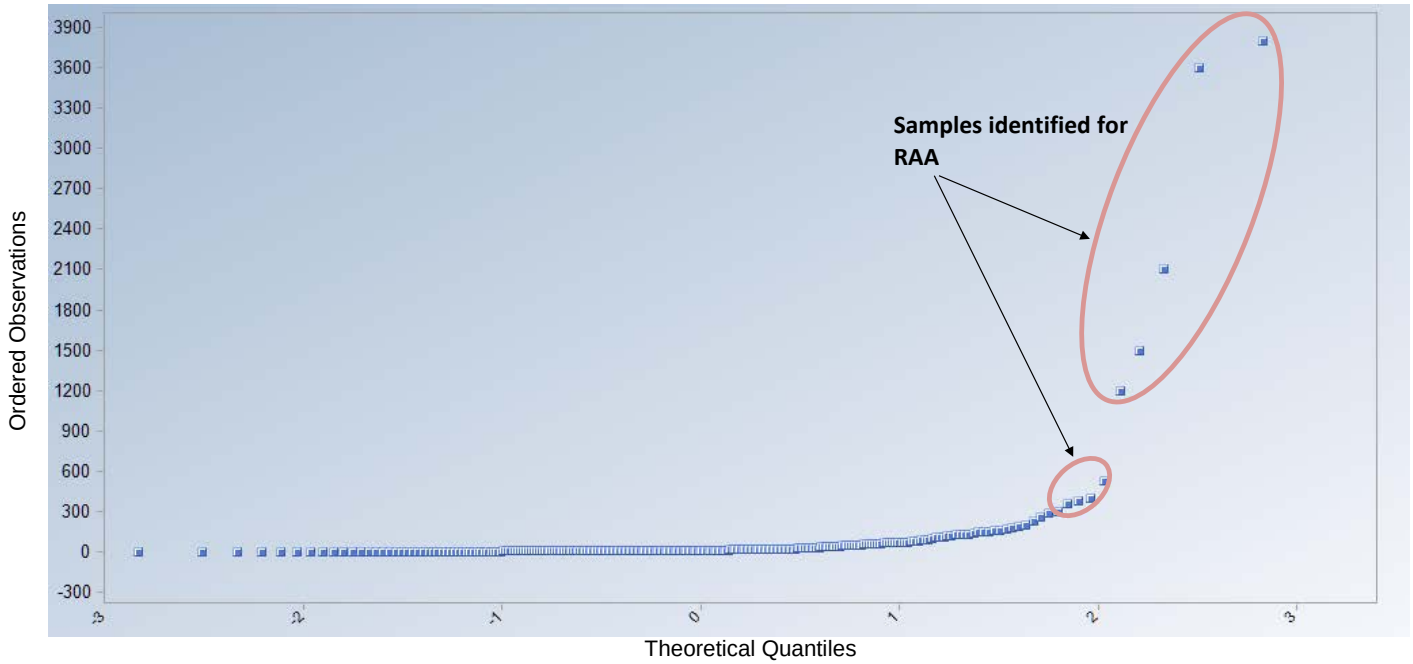
2,3,7,8-TCDD = 2,3,7,8-Tetrachlorodibenzo-p-dioxin
bgs = below ground surface
EPC = exposure point concentration
ft = feet
NA = not available
ND = nondetect
pg/g = picrogram(s) per gram
RAA = Removal Action Area
RBTL = Risk Based Target Level
SD = standard deviation
TEQ = toxic equivalent

Reference: DTSC. 2014. Identification of Presumptive Remedy Areas on Operable Unit E Georgia Pacific Former Sawmill Site, Fort Bragg. June 25.

OU-E Lowland AOC (0-10 ft bgs): 10 Highest Detects Rank Ordered

Same location

Rank Order	Units	Result (pg/g)	Sample ID	Depth Interval (feet bgs)	Post removal EPC (pg/g)	No. of Samples in EPC	EPC Notes
1	pg/g	2729	OUE-DP-052	0.5 - 1.5			Removal of RAA samples results in EPC less than the soil RBTL (53 pg/g) and maximum concentration less than the not-to-exceed value (160 pg/g; DTSC 2014).
2	pg/g	203	OUE-DP-052	0 - 0.5			
3	pg/g	36	OUE-T2-2b	6-6.5	8.5	60	Assumes removal of the 2 highest samples.
4	pg/g	33	HA-4.068	5-5.5			
5	pg/g	32	OUE-T2-2a	6-6.5			
6	pg/g	12	OUE-DP-089	5.9-6.8			
7	pg/g	11	OUE-DP-051	1.5-2			
8	pg/g	11	OUE-HA-023B	5-6.5			
9	pg/g	9.6	OUE-DP-088	0-0.5			
10	pg/g	9.5	MW-4.6	0-0.5			



ARCADIS Design & Consultancy for natural and built assets

Normal Quantile-Quantile Plot
Lead
Terrestrial (0 - 10 ft)
Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

Figure 3

Constituent	Units	Sample Size			ND Range		Detects (mg/kg)					Percentiles in mg/kg (All Data)			
		NDs	Detects	Total	Min	Max	Min	Max	Mean	Median	SD	25th	50th	75th	95th (EPC)
Lead	mg/kg	0	266	266	NA	NA	0.93	3,800	84.23	13	365	8.1	13	43	182

Notes:

Normal Q-Q plot generated using ProUCL version 4.1.00. Reporting limit used for non-detects

Sample identified for the RAA based on outlier analysis and exceedance of the soil not-to-exceed value (320 mg/kg).

Sample identified for the RAA based on exceedance of the soil not-to-exceed value (320 mg/kg).

Sample identified for RAA based on co-location with other sample identified for removal.

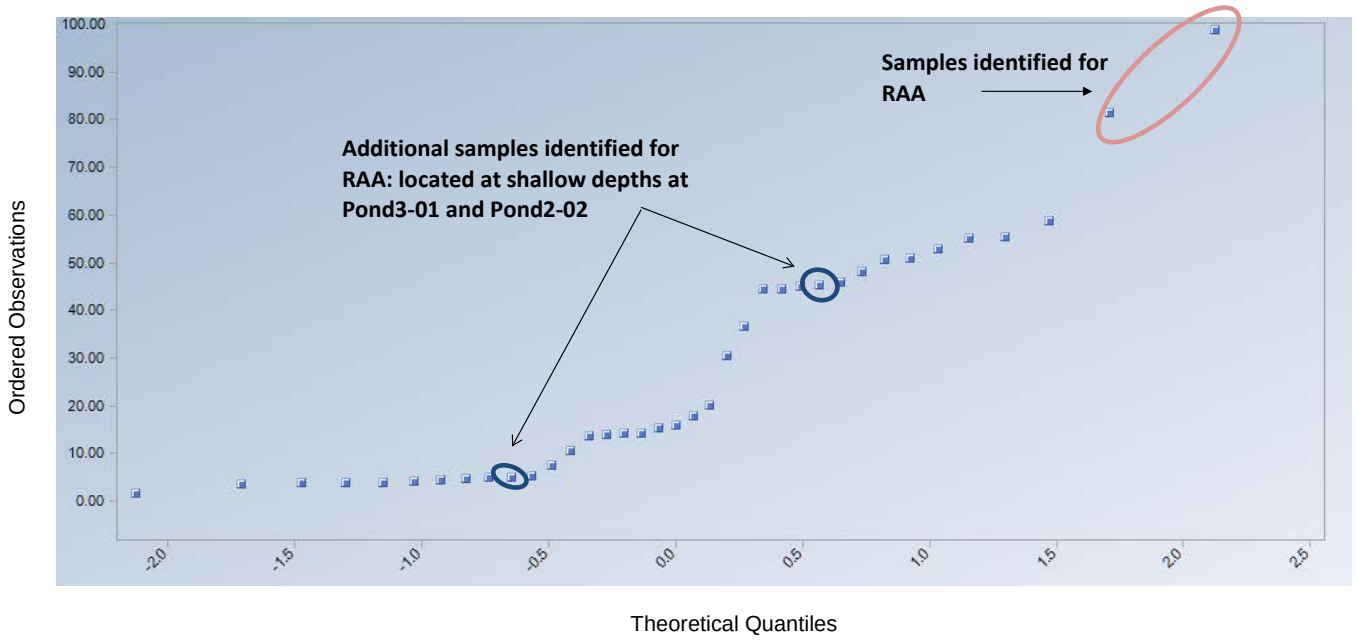
Detect

Abbreviations:
bgs = below ground surface
EPC = exposure point concentration
ft = feet
mg/kg = milligrams(s) per kilogram
NA = not available
ND = nondetect
RAA = Removal Action Area
RBTL = site-specific risk-based target level
SD = standard deviation

Reference: DTSC. 2014. Identification of Presumptive Remedy Areas on Operable Unit E Georgia Pacific Former Sawmill Site, Fort Bragg. June 25.

OU-E Lowland AOC (0-10 ft bgs): 10 Highest Detects Rank Ordered

Rank Order	Units	Result (mg/kg)	Sample ID	Depth Interval (feet bgs)	Post Removal EPC (mg/kg)	No. of Samples in EPC	EPC Notes
1	mg/kg	3800	OUE-DP-070	3-4			Removal of RAA samples results in EPC less than the soil RBTL (127 mg/kg) and a maximum concentration less than the not-to-exceed value (320 mg/kg; DTSC 2014).
2	mg/kg	3600	OUE-HA-023B	6.5-8			
3	mg/kg	2100	OUE-DP-094	5.5-6			
4	mg/kg	1500	OUE-DP-090	5.5-6			
5	mg/kg	1200	OUE-DP-076	8-9			Assumes removal of the 9 samples above the NTE value and associated shallow samples at the same locations (shallow samples are not all shown within top ten ranked data).
6	mg/kg	530	OUE-DP-076	6-7			
7	mg/kg	400	P04-40	6.5-7			
8	mg/kg	380	OUE-DP-088	6-7			
9	mg/kg	360	DP-05.57	0.5-1			
10	mg/kg	300	OUE-DP-070	2.5-3	45	244	



ARCADIS Design & Consultancy for natural and built assets

Normal Quantile-Quantile Plot
Arsenic
Southern Ponds Aquatic (0 - 2 ft)
Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

Figure 4

Constituent	Units	Sample Size			ND Range		Detects (mg/kg)					Percentiles in mg/kg (All Data)			
		NDs	Detects	Total	Min	Max	Min	Max	Mean	Median	SD	25th	50th	75th	95th (EPC)
Arsenic	mg/kg	0	37	37	NA	NA	1.66	98.9	28.03	15.9	24.8	5.2	15.9	46	46

Notes:
Normal Q-Q plot generated using ProUCL version 4.1.00. Reporting limit used for non-detects
Sample identified for RAA based on exceedance of the not-to-exceed value (57 mg/kg).
Detect

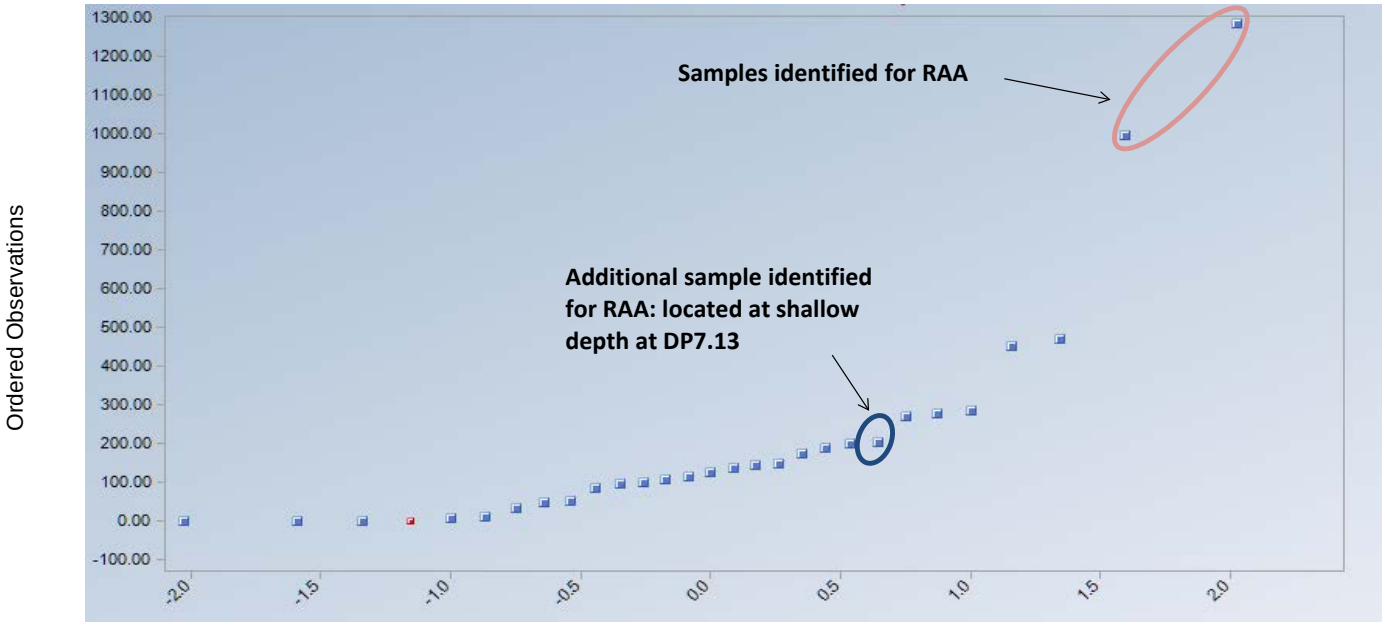
Abbreviations:

bgs = below ground surface
EPC = exposure point concentration
ft = feet
NA = not available
ND = nondetect
mg/kg = milligram(s) per kilogram
RAA = remedial action area
SD = standard deviation

OU-E Southern Ponds (Ponds 1, 2, 3, 4) AOC (0-2 ft bgs): 10 Highest Detects Rank Ordered

Rank Order	Units	Result (mg/kg)	Sample ID	Depth Interval (feet bgs)	Post Removal EPC (mg/kg)	No. of Samples in EPC	EPC Notes
1	mg/kg	99	Pond3-01	0.5-1.5			Sample removals result in maximum concentration less than the not-to-exceed value (67 mg/kg).
2	mg/kg	82	Pond2-02	0-0.5			
3	mg/kg	59	Pond1-02	0-0.5	40	33	Assumes the removal of four samples: Pond3-01, two samples collected at Pond2-02 (one ranked at 11), and one additional sample (DP7.13@0-0.5ft)
4	mg/kg	55	Pond3-07 (2013)	0-0.5			
5	mg/kg	55	Pond1-02 (2013)	0-0.5			
6	mg/kg	53	Pond3-09	0-0.5			
7	mg/kg	51	Pond3-04	0-0.5			
8	mg/kg	51	Pond3-08	0-0.5			
9	mg/kg	48	Pond3-06	0-0.5			
10	mg/kg	46	Pond2-01	0-0.5			

OU-E Hotspot evaluation
OU-E Lowland AOC (0-6 ft bgs)
Former Georgia-Pacific Wood Products Facility
Fort Bragg, CA



ARCADIS Design & Consultancy for natural and built assets

Normal Quantile-Quantile Plot
2,3,7,8-TCDD TEQ (Human/Mammal)
Southern Ponds: Aquatic (0 - 2 ft)
Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

Figure 5

Constituent	Units	Sample Size			ND Range		Detects (mg/kg)					Percentiles in mg/kg (All Data)			
		NDs	Detects	Total	Min	Max	Min	Max	Mean	Median	SD	25th	50th	75th	95th (EPC)
2,3,7,8- tcdd teq (human/mammal)	pg/g	1	28	29	1.81	1.81	0.02	1285	215.6	131.1	291.1	50.48	125.9	205	441.9

Notes:

Normal Q-Q plot generated using ProUCL version 4.1.00. Reporting limit used for non-detects

Sample identified fpr RAA based on exceedance of the not-to-exceed value (503 mg/kg).

Sample identified fpr RAA based on co-location with other samples identfied for RAA.

Detect Non-detect

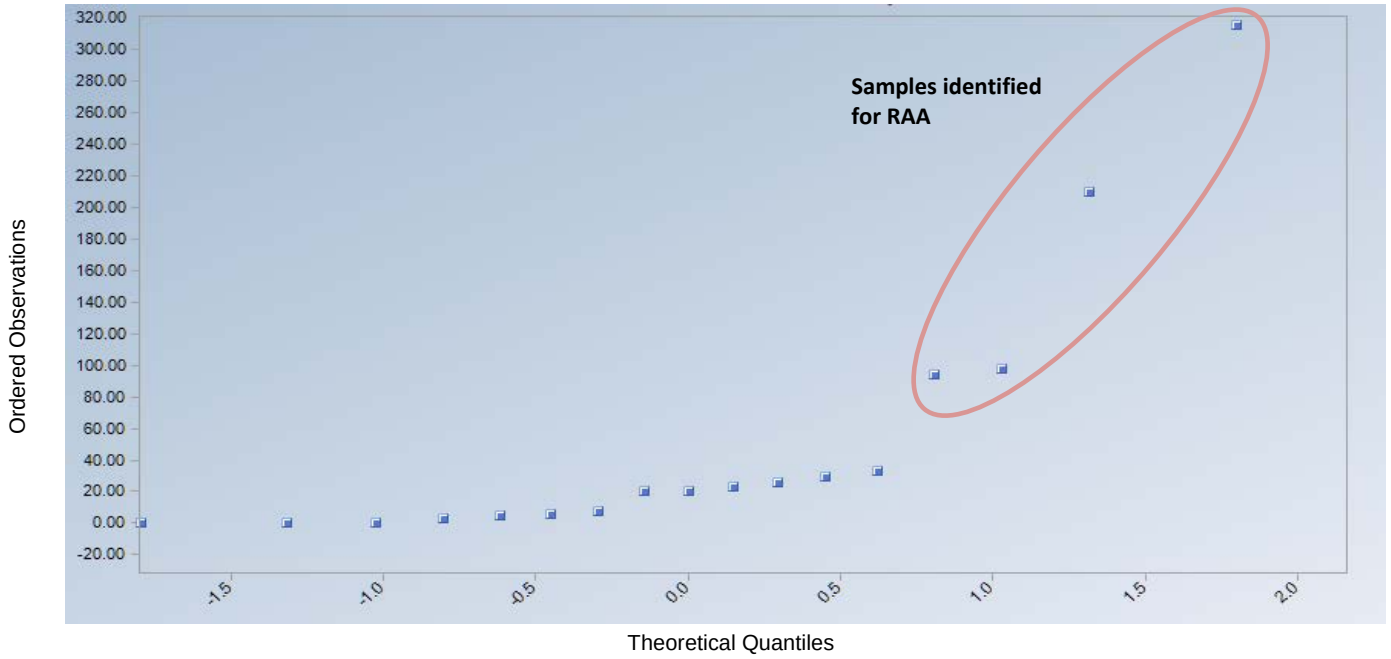
Abbreviations:

2,3,7,8-TCDD = 2,3,7,8-Tetrachlorodibenzo-p-dioxin
bgs = below ground surface
EPC = exposure point concentration
ft = feet
NA = not available
ND = nondetect
pg/g = picrogram(s) per gram
RAA = remedial action area
SD = standard deviation
TEQ = toxic equivalent

OU-E Southern Ponds (Ponds 1, 2, 3, 4) AOC (0-2 ft bgs): 10 Highest Detects Rank Ordered

Rank Order	Units	Result (mg/kg)	Sample ID	Depth Interval (feet bgs)	Post Removal EPC (mg/kg)	No. of Samples in EPC	EPC Notes
1	pg/g	1285	Pond3-01	0.5-1.5			Sample removals result in maximum concentration less than the not-to-exceed value (503 pg/g).
2	pg/g	996	Pond2-02	0-0.5			
3	pg/g	473	Pond2-01	0-0.5			
4	pg/g	451	Pond3-04	0-0.5			
5	pg/g	287	Pond2-02	0.5-1.5			
6	pg/g	279	Pond2-01	0.5-1.5			
7	pg/g	272	Pond1-01	0.5-1.5			
8	pg/g	205	DP7.13	0-0.5			Sample colocated with Pond2-02
9	pg/g	200	Pond1-02	0-0.5	390	26	Assumes removal of three samples (Pond2-02, Pond3-01, and DP7.13)
10	pg/g	191	Pond3-08	0-0.5			

OU-E Hotspot evaluation
OU-E Lowland AOC (0-6 ft bgs)
Former Georgia-Pacific Wood Products Facility
Fort Bragg, CA



ARCADIS Design & Consultancy for natural and built assets

Normal Quantile-Quantile Plot
2,3,7,8-TCDD TEQ (Human/Mammal)
Riparian: Aquatic (0 - 2 ft)
Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

Figure 6

Constituent	Units	Sample Size			ND Range		Detects (mg/kg)					Percentiles in mg/kg (All Data)			
		NDs	Detects	Total	Min	Max	Min	Max	Mean	Median	SD	25th	50th	75th	95th (EPC)
2,3,7,8- tcdd teq (human/mammal)	pg/g	0	17	17	NA	NA	0.052	315	52.46	20.9	86.31	4.69	20.9	33	127.1

Notes:
Normal Q-Q plot generated using ProUCL version 4.1.00. Reporting limit used for non-detects
Samples identified for RAA
Detect

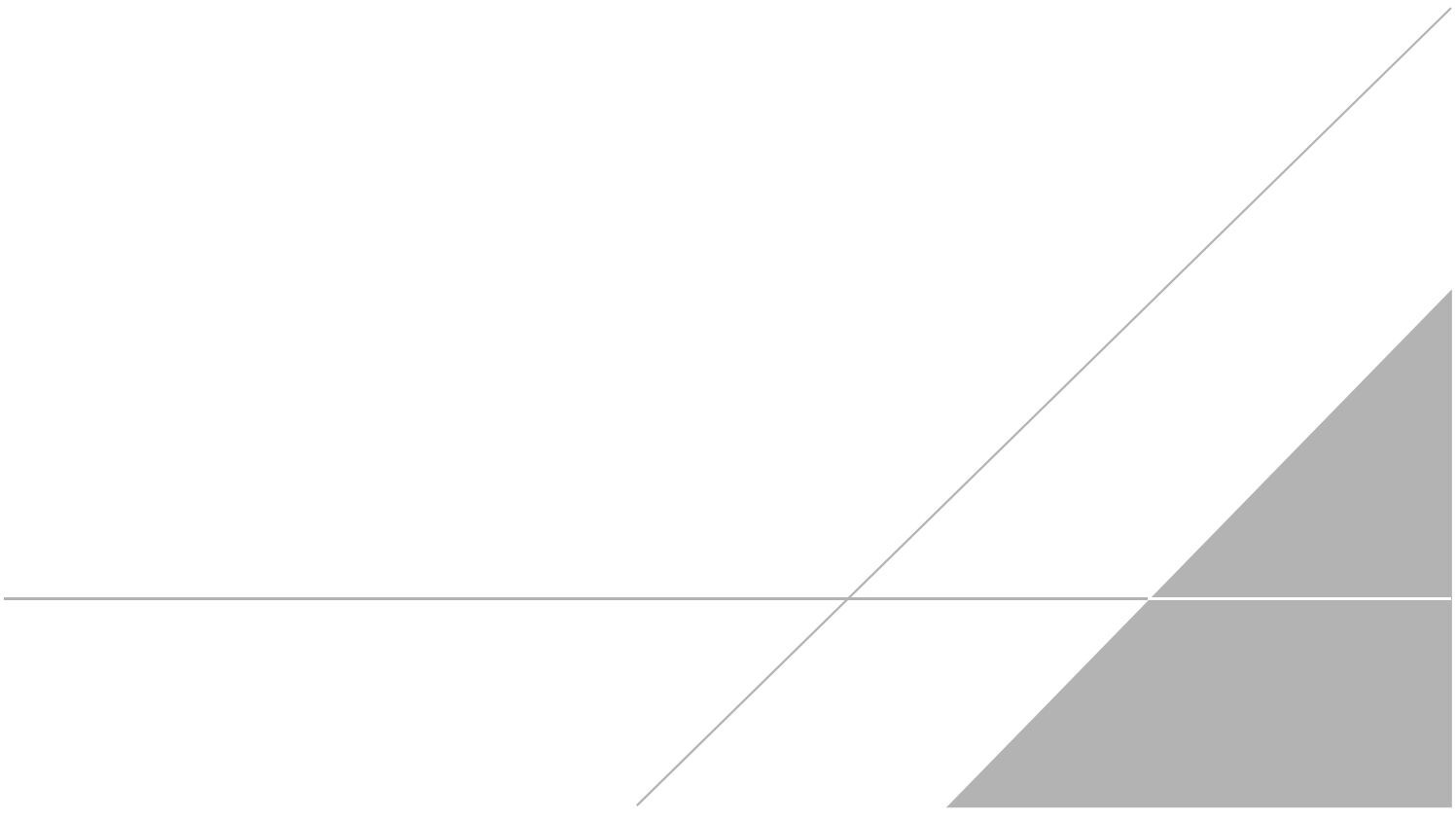
Abbreviations:

2,3,7,8-TCDD = 2,3,7,8-Tetrachlorodibenzo-p-dioxin
bgs = below ground surface
EPC = exposure point concentration
ft = feet
NA = not available
ND = nondetect
pg/g = picrogram(s) per gram
RAA = Remedy Action Area
RBTL = site-specific risk-based target level
SD = standard deviation

OU-D Riparian Area (0-2 ft bgs): 10 Highest Detects Rank Ordered

Rank Order	Units	Result (mg/kg)	Sample ID	Depth Interval (feet bgs)	Post Removal EPC (mg/kg)	No. of Samples in EPC	EPC Notes
1	mg/kg	315	OUD-HA-046	0-0.5			
2	mg/kg	210	OUD-HA-044	0-0.5			
3	mg/kg	97.9	OUD-SED-HA-049	0-0.5			
4	mg/kg	94.6	OUD-HA-042	0-0.5			
5	mg/kg	33	OUD-SED-HA-048	0-0.5	19	13	Assumes removal of the 4 highest samples.
6	mg/kg	29.5	OUD-HA-045	0-0.5			
7	mg/kg	25.5	OUD-HA-046	0.5-0.8			
8	mg/kg	23.2	OUD-HA-043	0-0.5			
9	mg/kg	20.9	OUD-SED-HA-047	0-0.5			
10	mg/kg	20.5	OUD-HA-040	0-0.5			

APPENDIX C
Responsiveness Summary (to be included in final RAW)



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