HRS DOCUMENTATION RECORD – REVIEW COVER SHEET

Name of Site: Astoria Marine Construction Company

Contact Persons:

Site Inspection: Ecology and Environment, Inc., June 2010, Site Inspection, Astoria Marine Construction Company, Astoria, Oregon.

Documentation Record: Linda Costello, Ecology & Environment Inc., Seattle, WA

Ken Marcy, U.S. Environmental Protection Agency, Seattle, WA

Pathways, Components, or Threats Not Scored

The ground water migration pathway, ground water-to-surface water component of the surface water migration pathway, soil exposure pathway, and air migration pathway were not scored as part of this Hazard Ranking System (HRS) evaluation. These pathways/components were not included because a release to these media does not significantly affect the overall site score and because the overland flow/flood component of the surface water migration pathway produces an overall site score well above the minimum required for the site to qualify for inclusion on the National Priorities List. These pathways are of concern to the U.S. Environmental Protection Agency (EPA) and may be evaluated during future investigations.

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HRS DOCUMENTATION RECORD

Name of Site: Astoria Marine Construction Company

EPA Region 10 Date Prepared: March 2011

CERCLIS No.: OR0002392793

Street Address of Site*: 92134 Front Road, Astoria, Oregon 97103

County and State: Clatsop, Oregon

General Location in the State: Northwest

Topographic Map: Astoria, Oregon-Washington, 1949, photorevised 1984 (Ref. 3).

Latitude: 46° 08' 43.113" North Longitude: 123° 51' 40.439" West (Ref. 3 as determined at the location of the covered marine ways)

Scores	
Ground Water Pathway	NS
Surface Water Pathway	100.00
Soil Exposure Pathway	NS
Air Pathway	NS
HRS SITE SCORE	50.00

NS = Not Scored

* - *The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.*

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENTS SCORESHEET

Factor categories and factors			Maximum Value	Value Assigned	
	Drinking Water Threat				
Likelihood of Release:					
	1. Observed Release		550		550
	2. Potential to Release by Overland Flow:				
		2a. Containment	10		
		2b. Runoff	25		
		2c. Distance to Surface Water	25		
		2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	500		
	3.Potential to Release by Flood:				
		3a. Containment (Flood)	10		
		3b. Flood Frequency	50		
		3c. Potential to Release by Flood (lines 3a x 3b)	500		
	4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)		500		NS
	5. Likelihood of Release (higher of lines 1 and 4)		550		550
Waste Characteristics:					
	6. Toxicity/Persistence		(a)		
	7. Hazardous Waste Quantity		(a)		
	8. Waste Characteristics		100		
Targets:					
	9. Nearest Intake		50		
	10. Population:				
		10a. Level I Concentrations	(b)		
		10b. Level II Concentrations	(b)		
		10c. Potential Contamination	(b)		
		10d. Population (lines 10a + 10b + 10c)	(b)		
	11. Resources		5		
	12. Targets (lines 9 + 10d + 11)		(b)		
Drinking Water Threat Score:					
	13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]		100		NS

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENTS SCORESHEET

Factor categories and factors			Maximum Value	Value Assigned	
Human Food Chain Threat					
Likelihood of Release:					
	14. Likelihood of Release (same value as line 5)		550		550
Waste Characteristics:					
	15. Toxicity/Persistence/Bioaccumulation		(a)	5×10^8	
	16. Hazardous Waste Quantity		(a)	100	
	17. Waste Characteristics		1,000		320
Targets:					
	18. Food Chain Individual		50	45	
	19. Population				
		19a. Level I Concentrations	(b)	0	
		19b. Level II Concentrations	(b)	0.03	
		19c. Potential Human Food Chain Contamination	(b)	0.031003	
		19d. Population (lines 19a + 19b + 19c)	(b)	0.061003	
	20. Targets (lines 18 + 19d)		(b)		45.061003
Human Food Chain Threat Score:					
	21. Human Food Chain Threat Score [(lines 14x17x20)/82,500, subject to max of 100]		100		96.13

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENTS SCORESHEET

Factor categories and factors			Maximum Value	Value Assigned	
Environmental Threat					
Likelihood of Release:					
	22. Likelihood of Release (same value as line 5)		550		550
Waste Characteristics:					
	23. Ecosystem Toxicity/Persistence/Bioaccumulation		(a)	5×10^8	
	24. Hazardous Waste Quantity		(a)	100	
	25. Waste Characteristics		1,000		320
Targets:					
	26. Sensitive Environments				
		26a. Level I Concentrations	(b)	0	
		26b. Level II Concentrations	(b)	225	
		26c. Potential Contamination	(b)	0	
		26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	225	
	27. Targets (value from line 26d)		(b)		225
Environmental Threat Score:					
	28. Environmental Threat Score [(lines 22x25x27)/82,500, subject to a max of 60]		60		60.00
	29. Watershed Score[c] (lines 13 + 21 + 28, subject to a maximum of 100)		100		100.00
	30. Component Score (S_{of})[c] (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)		100		100.00

[a] Maximum value applies to waste characteristics category.
[b] Maximum value not applicable.
[c] Do not round to nearest integer.

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	NS	NS
Surface Water Migration Pathway Score (S_{sw})	100.00	10,000
Soil Exposure Pathway Score (S_s)	NS	NS
Air Migration Score (S_a)	NS	NS
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		10,000
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		2,500
$/ (S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		50.00

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ASTORIA MARINE CONSTRUCTION COMPANY SUMMARY:

The Astoria Marine Construction Company (AMCCO) is an active marine shipyard located at the confluence of Jeffers Slough and the Lewis and Clark River within the city limits of Astoria, Oregon (Ref. 4, p. 15). A map depicting features at the shipyard follows this section (Figure 1). The facility occupies approximately 8 acres of low-lying land adjacent to tidal flats along the Lewis and Clark River (Ref. 4, p. 15).

The facility has been active since 1924 (Ref. 4, p. 16). The shipyard primarily constructed wooden boats and ships, except for brief periods during World War II (WW II) and the Korean Conflict, when the company had major contracts with the military to construct metal-armored warships and to refurbish previously mothballed warships (Ref. 15, p. 1).

The AMCCO property includes one ship-sized assembly/maintenance building, storage areas, various work shops, and administrative offices (Ref. 4, p. 15). Formerly, a large boathouse was located near the center of the property; this building burned down in 1962 (Ref. 7, p. 9; Ref. 23, p. 1). Four marine ways (Marine Ways 1 through 4) extend from the west side of the property into the Lewis and Clark River (Ref. 4, p. 15). Marine Ways 3 and 4 are covered (Ref. 4, p. 15). A dike adjacent to the Lewis and Clark River begins just north of the main building, the covered marine ways, and work space areas, and extends north along the river toward Highway 101 (Ref. 4, pp. 15 and 16). The southern side of the property is adjacent to Jeffers Slough and has been configured as a dock along the entire south-side frontage (Ref. 4, p. 16). The flow of Jeffers Slough into the Lewis and Clark River is controlled through a tide box that closes at high tide and allows the slough to flow one way into the river (Ref. 4, p. 16).

Until 1989, AMCCO used copper-based paints containing tributyltin (Ref. 7, p. 10). Tributyltin is used as an anti-fouling agent to keep grass, marine organisms, and barnacles off of the bottom of boats (Ref. 7, p. 10). Tributyltin is known to be toxic to marine organisms and in approximately 1989, it became illegal to use paints containing this compound, except in small quantities (Ref. 7, p. 10).

Until approximately 1997, a portion of the repair and maintenance operations at the facility consisted of sandblasting old paint off ships and boats; the paint typically contained cupric oxide (i.e., a copper compound), lead, and tributyltin (Ref. 7, p. 10; Ref. 14, p. 1). AMCCO stored spent sandblast grit, which contained paint chip residue, in two distinct piles immediately south of the main building (Ref. 7, p. 10). The piles were not lined or covered (Ref. 7, p. 10).

By the end of June 1997, AMCCO had removed both waste grit piles and disposed of them at the Hillsboro Landfill in Hillsboro, Oregon (Ref. 18, p. 1; 19; and 20). However, some grit remained beneath these former piles and also was present in several other areas in the middle of the property (Ref. 18, p. 1).

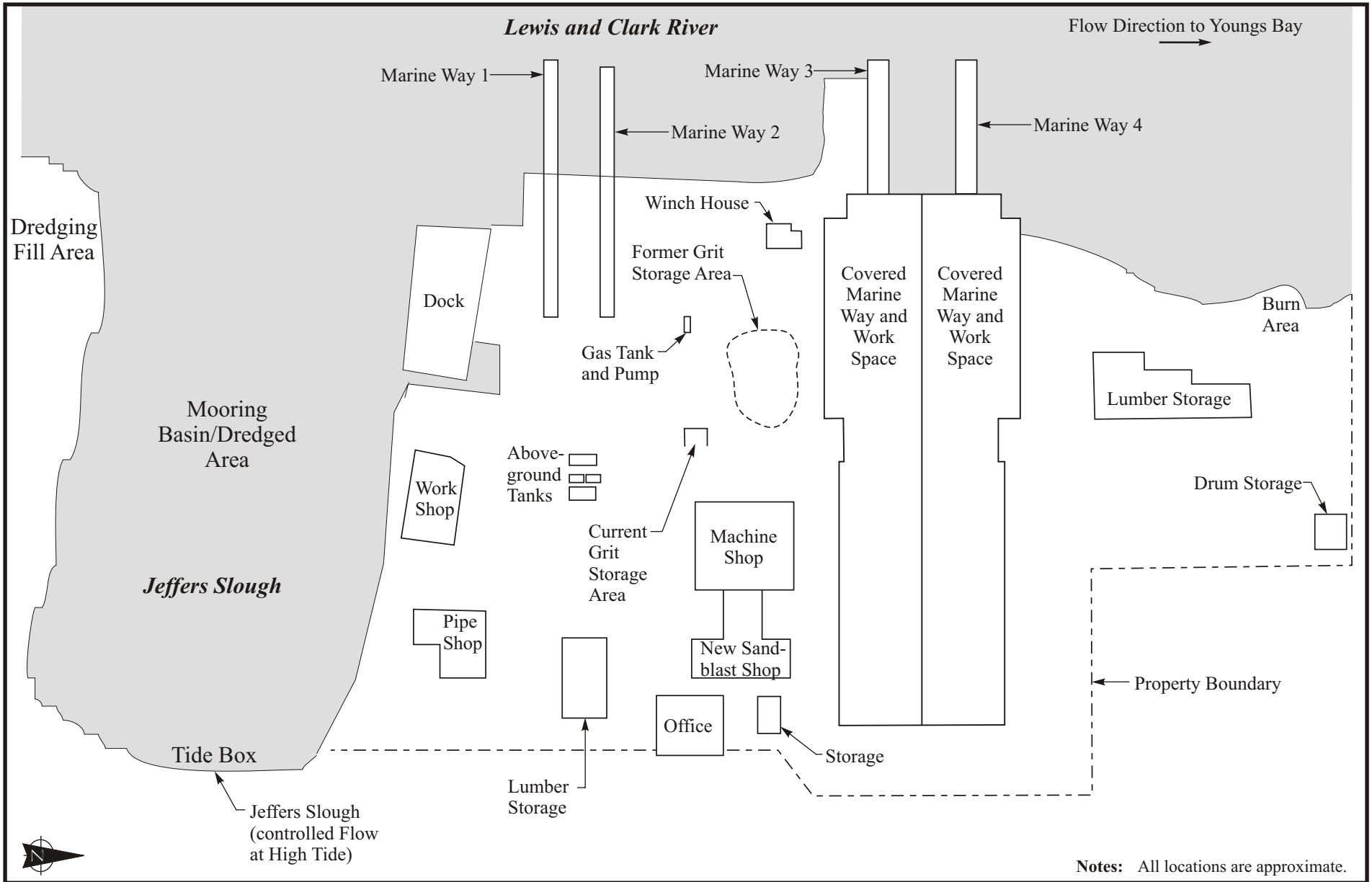
A burn area (also called a burn pit) is present near the northwest corner of the property where excess solvents and waste petroleum have been burned (Ref. 7, p. 13). AMCCO is known to have been in the practice of burning waste paint thinner since at least 1997 (Ref. 43, p. 1 and 2).

The EPA has conducted a site inspection (SI) of the AMCCO facility (Ref. 4). The SI was conducted in two field events (Ref. 4, p. 12). The SI Phase I field work was conducted in 2008 and included sampling of possible sources on the AMCCO property including the former grit piles area, the current grit pile area, the burn area, and areas of petroleum-stained soil; sampling ground water on the property, and sampling sediments from adjacent surface water bodies (Ref. 4, pp. 22, 23, and 28). The SI Phase II field work was conducted in 2009 and included sampling possible sources of contamination outside of the AMCCO property and expanded sampling of sediments immediately offshore of the AMCCO facility as well as sediments further downstream (Ref. 4, pp. 23, 24, 25, and 28).

The site as scored includes the Former Grit Storage Area (Source 1) and the Burn Area (Source 2), and associated releases from AMCCO to the Lewis and Clark River and Jeffers Slough. In relation to targets in the surface water migration pathway, it has been documented that fishing is occurring on the Columbia River and Youngs Bay within the Target Distance Limit (TDL) (see Section 4.1.3.3.2.3) and that fishing occurs within the zone of actual contamination (see Section 4.1.3.3.2.2). Additionally, Federal-listed threatened salmon habitat is located within the zone of actual contamination (see Section 4.1.4.3.1.2).

The ground water-to-surface water component of the surface water migration pathway was not scored because the overland flow/flood component of the surface water migration pathway generated a higher score. However, the ground water-to-surface water component of the surface water migration pathway is of concern since it is known that contaminated ground water underlying the AMCCO property is present. This contaminated ground water may be impacting adjacent surface water features. The average annual precipitation near AMCCO of 66.4 inches per year recharges the alluvial aquifers with fresh water (Ref. 4, p. 59). An upper, perched water table exists, which is subject to extremes of seasonal variations in rainfall (Ref. 4, p. 59). Six temporary well points (MW01GW through MW05GW and BK01GW) were installed into the shallow ground water zone for collection of ground water samples during Phase I of the SI (Ref. 4, pp. 48 and 60). All ground water samples were analyzed for organotins, Target Analyte List (TAL) Metals, and volatile organic compounds (VOCs) (Ref. 4, pp. 48 and 60).

Sample results from the 2008 EPA Phase I SI indicated the presence of one organotin (tributyltin), 10 TAL Metals (arsenic, barium, chromium, cobalt, copper, lead, manganese, nickel, vanadium, and zinc), and two VOCs (toluene and m,p-xylenes) at elevated concentrations with respect to background concentrations in shallow ground water at AMCCO (Ref. 4, p. 60). Chromium, copper, manganese, nickel, and zinc were detected at elevated concentrations in all five ground water samples, while arsenic, barium, lead, and vanadium were detected at elevated concentrations in four of the five ground water samples (Ref. 4, p. 60). The elevated concentrations of organotins and the two VOCs were found in sample MW02GW, collected from the burn area (Ref. 4, p. 60). The VOCs detected at elevated concentrations are associated with petroleum products (Ref. 4, p. 60). In addition, the highest metals concentrations observed in ground water at AMCCO were primarily those detected in this sample (MW02GW) (Ref. 4, p. 60). All of the detected contaminants (with the exception of vanadium and toluene) were similarly detected in source samples and can be attributed to AMCCO (Ref. 4, p. 60).



Notes: All locations are approximate.

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

ASTORIA MARINE CONSTRUCTION CO.
Astoria, Oregon

Figure 1
SITE MAP

0 25 50
Approximate Scale in Feet

Date:	Drawn by:	
9/22/10	AES	10:START-3\07080005\fig 1

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SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Number of the Source: 1

Name and description of the source: Former Grit Storage Area (Contaminated Soil)
Source 1 consists of contaminated soil in the former grit storage area. Until approximately 1997, a portion of the repair and maintenance operations at the AMCCO facility consisted of sandblasting old paint off ships and boats; the paint typically contained cupric oxide (i.e., a copper compound), lead, and tributyltin (Ref. 7, p. 10; Ref. 14, p. 1). In June 1996, it was observed that AMCCO stored spent sandblast grit, which contained paint chip residue, in two distinct piles immediately south of the main building (Ref. 7, p. 10; Ref. 14, pp. 1, 2, 6, and 7). One was an historic or "former" waste grit pile and one was a newer "current" waste grit pile (Ref. 4, p. 17; Ref. 14, p. 2). These piles are also referred to as the "old" or "sandblast drench pile" and "new" or "sandblast newer material" piles, respectively (Ref. 14, pp. 2 and 4; Ref. 21, p. 1). The piles were not lined or covered (Ref. 7, p. 10). The lack of a cover can be viewed in photographs of the piles taken in 1996 (Ref. 14, pp. 1, 2, 6, and 7).

In June 1996, the Oregon Department of Environmental Quality visited AMCCO and collected one sample from each of these waste sandblast grit pile for toxicity characteristics leaching procedure (TCLP) and Aquatic Toxicity tests (Ref. 14, pp. 1, 2, and 3). TCLP results indicated the presence of barium at 0.5 milligrams per liter (mg/L) and lead at 0.1 mg/L in the sample from the old grit pile (sandblast drench pile on the laboratory data sheet); and barium at 0.6 mg/L, chromium at 0.13 mg/L and lead at 0.1 mg/L in the sample from the new grit pile (sandblast newer material on the laboratory data sheet) (Ref. 14, pp. 2 and 4). The sample from the old waste grit pile failed the Aquatic Toxicity test by killing more than 50 percent of the test organisms within 96 hours; and in fact killing 100 percent of the test organisms in that time frame (Ref. 16, p. 2).

In March 1997, AMCCO submitted two waste grit samples to a fixed laboratory for TCLP analysis (Ref. 21, pp. 3 and 5). It is speculated that these samples were collected as a preliminary step toward disposing of this waste (Ref. 21). TCLP results indicate the presence of barium at 1.0 mg/L, cadmium at 0.02 mg/L, chromium at 0.03 mg/L, and lead at 0.19 mg/L in the sample from the old grit pile; and barium at 0.7 mg/L and chromium at 0.11 mg/L in the sample from the new grit pile (Ref. 21, pp. 1 and 5).

By the end of June 1997, AMCCO had removed both waste grit piles and disposed of them at the Hillsboro Landfill in Hillsboro, Oregon (Ref. 18, p. 1; Ref. 19; Ref. 20). However, some grit remained beneath these former piles and also was present in several other areas in the middle of the property (Ref. 18, p. 1).

Since the grit removal action in 1997, new grit piles have been placed west of the Former Grit Storage Area (Ref. 4, p. 20). These piles consist primarily of green diamond grit and mill scale (i.e., removed iron oxide) (Ref. 4, p. 20). On Figure 1 of this HRS documentation record, these piles are located in the area labeled the Current Grit Storage Area.

During the EPA Phase I SI conducted in April and May 2008, six surface soil samples (FG01SS through FG06SS) were collected from the former grit storage area (Ref. 4, pp. 28 and 53; Ref. 10, Logbook 2, p. 6). Each sample contained visible grit (Ref. 4, p. 53; Ref. 10, Logbook 2, p. 6). A background soil sample (BK01SS) was in an area outside of the operational areas of the facility (Ref. 4, pp. 36 and 48; Ref. 10, Logbook 1, p. 4). The samples from the Former Grit Storage Area were collected on May 2, 2008 (Ref. 10, Logbook 2, p. 6). The background sample was collected on May 1, 2008 (Ref. 10, Logbook 1, p. 4).

Sampling for the EPA 2008 Phase I SI was conducted in accordance with EPA-approved Sampling and Quality Assurance Plans (SQAPs) (Ref. 4, p. 28; Ref. 5; Ref. 6). All surface soil samples were collected using dedicated stainless steel spoons (Ref. 4, p. 29). Collected sample material was placed into a dedicated stainless steel bowl, thoroughly homogenized, and then placed into a pre-labeled container (Ref. 4, p. 29). Samples FG01SS through FG06SS were collected from 0 to 3 inches below ground surface (bgs) (Ref. 10, Logbook 2, p. 6). The background sample was collected from 0 to 6 inches bgs (Ref. 10, Logbook 1, p. 4).

All samples were stored on ice in coolers continuously maintained under the custody of the sample team (Ref. 4, p. 29; Ref. 46, pp. 4, 5, 15, and 16). All data underwent data validation. Analytical results were validated by EPA chemists and reviewed by an E & E chemist (Ref. 4, pp. 32, 323 through 326, and 376 through 381).

Former grit storage area samples and the background sample were analyzed for organotins (Krone Method) and TAL Metals (EPA ILM05.4) (Ref. 4, pp. 32, 48, 53, 323, and 376; Ref. 45). Results of samples from the former grit storage area indicate the presence of several organotins (butyltin trichloride, dibutyltin dichloride, and tributyltin chloride) and several metals (chromium, copper, and nickel) at significant concentrations with respect to background concentrations (Ref. 4, p. 53).

Location of the source, with reference to a map:
Contaminated soil in the former grit storage area is located approximately 15 feet south of the covered marine way and work space building (Ref. 4, p. 36).

Containment
Release to Surface Water via Overland Migration and/or Flood: The source consists of contaminated soil. The soil is exposed and can be viewed to contain grit (Ref. 10, Logbook 2, p. 6). Photographs of samples collected from the former grit storage area provide evidence that soil at this location is exposed (Ref. 4, pp. 121, 122, and 123). A surface water containment factor value of 10 is assigned because there is no evidence of maintained engineered cover, or functioning and maintained run-on control system and runoff management system (Ref. 1, p. 51609, Table 4-2; Ref. 4, p. 53; Ref. 10, Logbook 2, p. 6).

Containment Value: 10

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

EPA Site Inspection (Ref. 4):

- Source Samples: Six surface soil samples were collected from the former grit storage area during the EPA 2008 Phase I SI as presented in Table 1 below:

Table 1
EPA 2008 Phase I SI

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Quantitation Limit[a]	Reference
FG01SS (MJ8GN1) (08184105)	Soil	5/2/2008	Butyltin Trichloride	770 ug/kg	5 ug/kg	Ref. 4, pp. 32, 331, and 386; Ref. 41, p. 2
			Tributyltin Chloride	330 ug/kg	5 ug/kg	
			Copper	485 mg/kg	2.79 mg/kg	
FG02SS (MJ8GN2) (08184106)	Soil	5/2/2008	Butyltin Trichloride	490 ug/kg	5 ug/kg	Ref. 4, pp. 32, 332, and 387; Ref. 41, p. 2
			Tributyltin Chloride	160 ug/kg	5 ug/kg	
			Copper	293 mg/kg	2.68 mg/kg	
FG03SS (MJ8GN3) (08184107)	Soil	5/2/2008	Butyltin Trichloride	1300 ug/kg	5 ug/kg	Ref. 4, pp. 32, 333, and 388; Ref. 41, p. 2
			Dibutyltin Dichloride	760 JL ug/kg	5 ug/kg	
			Tributyltin Chloride	430 ug/kg	5 ug/kg	
			Copper	386 mg/kg	2.94 mg/kg	
			Nickel	754 JH mg/kg (AC = 559 mg/kg)	4.70 mg/kg	
FG04SS (MJ8GN4) (08184108)	Soil	5/2/2008	Butyltin Trichloride	2100 ug/kg	5 ug/kg	Ref. 4, pp. 32, 334, and 389; Ref. 41, pp. 2 and 3
			Dibutyltin Dichloride	3300 JL ug/kg	5 ug/kg	
			Tributyltin Chloride	1500 ug/kg	5 ug/kg	
			Chromium	769 JH mg/kg (AC = 596 mg/kg)	1.20 mg/kg	
			Copper	793 mg/kg	3.01 mg/kg	
			Nickel	377 JH mg/kg (AC = 279 mg/kg)	4.81 mg/kg	
FG05SS (MJ8GN5) (08184109)	Soil	5/2/2008	Butyltin Trichloride	1900 ug/kg	5 ug/kg	Ref. 4, pp. 32, 335, and 390; Ref. 41, p. 3
			Dibutyltin Dichloride	1300 JL ug/kg	5 ug/kg	
			Tributyltin Chloride	320 ug/kg	5 ug/kg	
			Chromium	1500 JH mg/kg (AC = 1163 mg/kg)	1.07 mg/kg	
			Copper	546 mg/kg	2.68 mg/kg	

Table 1 EPA 2008 Phase I SI						
Sample ID	**Sample Type**	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Quantitation Limit[a]**	**Reference**
			Nickel	845 JH mg/kg (AC = 626 mg/kg)	4.28 mg/kg	
FG06SS (MJ8GN6) (08184110)	Soil	5/2/2008	Butyltin Trichloride	2900 ug/kg	5 ug/kg	Ref. 4, pp. 32, 336, and 391; Ref. 41, p. 3
			Dibutyltin Dichloride	2300 JL ug/kg	5 ug/kg	
			Tributyltin Chloride	600 ug/kg	5 ug/kg	
			Chromium	984 JH mg/kg (AC = 763 mg/kg)	1.04 mg/kg	
			Copper	424 mg/kg	2.60 mg/kg	
			Nickel	985 JH mg/kg (AC = 730 mg/kg)	4.16 mg/kg	
Notes: a – The sample quantitation limit used meets the definition provided in Ref. 1, p. 51586 (Ref. 41, p. 1).						
Key: AC = Adjusted concentration as per Ref. 12, pp. 8 and 18. H = High bias (Ref. 4, p. 326). J = The associated value is an estimated quantity (Ref. 4, p. 326). L = Low bias (Ref. 4. p. 326). mg/kg = Milligrams per kilogram. ug/kg = Micrograms per kilogram.						

EPA SI (Ref. 4):

- Background Concentrations: For illustration purposes, "native" soil samples are presented to demonstrate that the levels of naturally occurring metals in the former grit storage area soil samples are higher than they are in the surrounding surface soils, One background soil sample was collected during the EPA SI as presented in Table 2 below:

Table 2 EPA 2008 Phase I SI Background Sample						
Sample ID	**Sample Type**	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Quantitation Limit[a]**	**Reference**
BK01SS (MJ8GN0) (08184104)	Native Soil	5/1/2008	Butyltin Trichloride	91 ug/kg	5 ug/kg	Ref. 4, pp. 32, 330, and 385; Ref. 10, Logbook 1, p. 4; Ref. 41, p. 3
			Dibutyltin Dichloride	65 JL ug/kg (AC = 650 ug/kg)	5 ug/kg	
			Tributyltin Chloride	38 ug/kg	5 ug/kg	
			Chromium	144 JH mg/kg	1.09 mg/kg	
			Copper	95.3 mg/kg	2.73 mg/kg	
			Nickel	71.2 JH mg/kg	4.37 mg/kg	

Table 2
EPA 2008 Phase I SI
Background Sample

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Quantitation Limit[a]	Reference

Notes:
a – The sample quantitation limit used meets the definition provided in Ref. 1, p. 51586 (Ref. 41, p. 1).

Key:

AC = Adjusted concentration as per Ref. 12, pp. 7 and 8.
H = High bias (Ref. 4, p. 326).
J = The associated value is an estimated quantity (Ref. 4, p. 326).
L = Low bias (Ref. 4. p. 326).
mg/kg = Milligrams per kilogram.
ug/kg = Micrograms per kilogram.

List of Hazardous Substances Associated with Source

Butyltin trichloride, dibutyltin dichloride, tributyltin chloride, chromium, copper, and nickel.

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

Available data are insufficient to document a hazardous constituent quantity (Ref. 1, p. 51590, Section 2.4.2.1.1).

Hazardous Constituent Quantity Value (S): NS

2.4.2.1.2 Hazardous Wastestream Quantity

Available data are insufficient to document a hazardous wastestream quantity (Ref. 1, p. 51591, Section 2.4.2.1.2).

Hazardous Wastestream Quantity (W): NS

2.4.2.1.3 Volume

Available data are insufficient to document a volume measure (Ref. 1, p. 51591, Section 2.4.2.1.3).

Volume Assigned Value (V): 0

2.4.2.1.4 Area

The area described by contaminated soil points FG01SS through FG06SS is approximately 530 square feet (Ref. 13).

The value assigned to the area measure is calculated as follows:

530 square feet / 34,000 = 0.016

Area Assigned Value (A): 0.016

Source Hazardous Waste Quantity Value (Ref. 1, p. 51591): 0.016

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Number of the source: 2

Name and description of the source: Burn Area (Contaminated Soil)

Source 2 consists of contaminated soil. A burn area (also called a burn pit) is present near the northwest corner of the property where excess solvents and waste petroleum have been burned (Ref. 7, p. 13). AMCCO is known to have been in the practice of burning waste paint thinner since at least 1997 (Ref. 43, p. 2). During the site visit conducted in 2007 for the SI, the property owner indicated that AMCCO was still in the practice of applying solvents to this area to help start fires (Ref. 4, p. 20; Ref. 44, p. 3). This area was estimated during the SI site visit to measure approximately 50 feet in diameter and was estimated to be within 30 to 40 feet of the Lewis and Clark River (Ref. 4, p. 20; Ref. 44, p. 3).

During the EPA Phase I SI conducted in April and May 2008, four surface soil samples were collected from the burn area (BA01SS through BA04SS; Ref. 4, pp. 28 and 52; Ref. 10, Logbook 2, p. 3). A background soil sample (BK01SS) was in an area outside of the operational areas of the facility (Ref. 4, pp. 36 and 48; Ref. 10, Logbook 1, p. 4). All of these samples were collected on May 1, 2008 (Ref. 4, p. 32; Ref. 10, Logbook 1, p. 4; Ref. 10, Logbook 2, p. 3). The burn area samples and the background sample were all described as consisting of dry, dark-brown or dark gray soil with some organic material present (Ref. 4, p. 32).

Sampling for the EPA 2008 Phase I SI was conducted in accordance with EPA-approved SQAPs (Ref. 4, p. 28; Ref. 5; Ref. 6). All surface soil samples were collected using dedicated stainless steel spoons (Ref. 4, p. 29). Collected sample material was placed into a dedicated stainless steel bowl, thoroughly homogenized, and then placed into a pre-labeled container (Ref. 4, p. 29). Sample BA01SS was collected from 0 to 3 inches bgs, sample BA02SS was collected from 0 to 2 inches bgs, sample BA03SS was collected from 0 to 4 inches bgs, and sample BA04SS was collected from 0 to 3 inches bgs (Ref. 10, Logbook 2, p. 3). The background sample was collected from 0 to 6 inches bgs (Ref. 10, Logbook 1, p. 4).

All samples were stored on ice in coolers continuously maintained under the custody of the sample team (Ref. 4, p. 29; Ref. 46, pp. 3, 4, and 15). All data underwent data validation. Analytical results were validated by EPA chemists and reviewed by an E & E chemist (Ref. 4, pp. 32, 183 through 189, 323 through 326, and 376 through 381).

The burn area had an odor that would be expected from a burn pile (Ref. 4, p. 52). Burn area samples and the background sample were analyzed for organotins (Krone Method), semivolatile organic compounds (SVOCs; EPA SOM01.2), TAL Metals (EPA ILM05.4), and VOCs (EPA SOM01.2) (Ref. 4, pp. 32, 48, 52, 183, 323, and 376; Ref. 45). Results of samples from the burn area indicate the presence of three organotins (butyltin trichloride, dibutyltin dichloride, and tributyltin chloride), 11 TAL Metals (antimony, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, nickel, silver, and zinc), and four VOCs (methylcyclohexane, ethylbenzene, m,p-xylenes, and o-xylene) at significant concentrations with respect to background concentrations (Ref. 4, p. 52).

Location of the source, with reference to a map:
Contaminated soil in the burn area is on the northwestern portion of the property near the Lewis and Clark River (Ref. 4, p. 36).

Containment:
Release to Surface Water via Overland Migration and/or Flood: The source consists of contaminated soil. Photographs of samples collected from the burn area provide evidence that soil at this location is exposed (Ref. 4, pp. 114 and 115). A surface water containment factor value of 10 is assigned because there is no evidence of maintained engineered cover, or functioning and maintained run-on control system and runoff management system (Ref. 1, p. 51609, Table 4-2; Ref. 4, p. 114).

Containment Value: 10

2.2.2 Hazardous Substances

EPA Site Inspection (Ref. 4):

- Source Samples: Four surface soil samples were collected from the burn area during the EPA 2008 Phase I SI as presented in Table 3 below:

Table 3
EPA 2008 Phase I SI

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Quantitation Limit[a]	Reference
BA01SS (MJ8GM6) (08184100)	Soil	5/1/2008	Butyltin Trichloride	440 ug/kg	5 ug/kg	Ref. 4, pp. 32, 191, 327, and 382; Ref. 41, p. 3
			Antimony	14.6 mg/kg	7.07 mg/kg	
			Arsenic	112 mg/kg	1.18 mg/kg	
			Chromium	1410 JH mg/kg (AC = 1093 mg/kg)	1.18 mg/kg	
			Copper	5390 mg/kg	2.94 mg/kg	
			Nickel	688 JH mg/kg (AC = 510 mg/kg)	4.71 mg/kg	
			Zinc	2670 JL mg/kg	7.07 mg/kg	
BA02SS (MJ8GM7) (08184101)	Soil	5/1/2008	Butyltin Trichloride	530 ug/kg	5 ug/kg	Ref. 4, pp. 32, 194, 197, 328, and 383; Ref. 41, pp. 3 and 4
			Tributyltin Chloride	630 ug/kg	5 ug/kg	
			Antimony	40.2 mg/kg	8.47 mg/kg	
			Arsenic	412 mg/kg	1.41 mg/kg	
			Cadmium	6.6 mg/kg	0.71 mg/kg	
			Chromium	596 JH mg/kg (AC = 462 mg/kg)	1.41 mg/kg	
			Copper	60500 mg/kg	3.53 mg/kg	
			Lead	2170 JL mg/kg	1.41 mg/kg	
			Nickel	1570 JH mg/kg (AC = 1163 mg/kg)	0.71 mg/kg	
			Silver	3.7 mg/kg	1.41 mg/kg	
			Zinc	11000 JL mg/kg	8.47 mg/kg	
			Ethylbenzene	1200 ug/kg	69 ug/kg	
			m,p-Xylenes	43000 ug/kg	69 ug/kg	
			Methylcyclohexane	7100 ug/kg	69 ug/kg	
			o-Xylene	23000 ug/kg	69 ug/kg	
BA03SS (MJ8GR0) (08184134)	Soil	5/1/2008	Antimony	23.5 mg/kg	7.36 mg/kg	Ref. 4, pp. 32 and 345; Ref. 41, p. 4
			Arsenic	1450 mg/kg	1.23 mg/kg	
			Cadmium	18.4 mg/kg	0.61 mg/kg	
			Copper	118000 mg/kg	3.07 mg/kg	
			Lead	10100 JL mg/kg	1.23 mg/kg	
			Silver	8.7 mg/kg	1.23 mg/kg	

Table 3 EPA 2008 Phase I SI						
Sample ID	**Sample Type**	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Quantitation Limit[a]**	**Reference**
			Zinc	17000 JL mg/kg	7.36 mg/kg	
BA04SS (MJ8GR1) (08184135)	Soil	5/1/2008	Arsenic	420 mg/kg	2.04 mg/kg	Ref. 4, pp. 32 and 346; Ref. 41, p. 4
			Cadmium	7.7 mg/kg	1.02 mg/kg	
			Cobalt	61.9 mg/kg	10.18 mg/kg	
			Copper	9430 mg/kg	5.09 mg/kg	
			Lead	545 JL mg/kg	2.04 mg/kg	
			Manganese	3350 mg/kg	3.05 mg/kg	
			Nickel	560 JH mg/kg (AC = 415 mg/kg)	8.15 mg/kg	
			Zinc	9660 JL mg/kg	12.22 mg/kg	
Notes: a – The sample quantitation limit used meets the definition provided in Ref. 1, p. 51586 (Ref. 41, p. 1).						
Key: AC = Adjusted concentration as per Ref. 12, pp. 8 and 18. H = High bias (Ref. 4, p. 326). J = The associated value is an estimated quantity (Ref. 4, p. 326). L = Low bias (Ref. 4. p. 326). mg/kg = Milligrams per kilogram. ug/kg = Micrograms per kilogram.						

EPA SI (Ref. 4):

- Background Concentrations: For illustration purposes, "native" soil samples are presented to demonstrate that the levels of naturally occurring metals in the burn area soil samples are higher than they are in the surrounding surface soils. One background soil sample was collected during the EPA 2008 Phase I SI as presented in Table 4 below:

Table 4 EPA 2008 Phase I SI Background Sample						
Sample ID	**Sample Type**	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Quantitation Limit[a]**	**Reference**
BK01SS (MJ8GN0) (08184104)	Native Soil	5/1/2008	Butyltin Trichloride	91 ug/kg	5 ug/kg	Ref. 4, pp. 32, 202, 330, and 385; Ref. 10, Logbook 1, p. 4; Ref. 41, pp. 4 and 5
			Dibutyltin Dichloride	65 JL ug/kg (AC = 650 ug/kg)	5 ug/kg	
			Tributyltin Chloride	38 ug/kg	5 ug/kg	
			Antimony	4.5 U mg/kg	4.5 mg/kg	
			Arsenic	2.2 mg/kg	1.09 mg/kg	
			Cadmium	0.49 JQ mg/kg	0.55 mg/kg	
			Chromium	144 JH mg/kg	1.09 mg/kg	
			Cobalt	16.9 mg/kg	5.46 mg/kg	
			Copper	95.3 mg/kg	2.73 mg/kg	

Table 4
EPA 2008 Phase I SI
Background Sample

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Quantitation Limit[a]	Reference
			Lead	116 JL mg/kg (AC = 167 mg/kg)	1.09 mg/kg	
			Manganese	411 mg/kg	2.73 mg/kg	
			Nickel	71.2 JH mg/kg	4.37 mg/kg	
			Silver	1.1 U mg/kg	1.1 mg/kg	
			Zinc	423 JL mg/kg (AC = 635 mg/kg)	6.55 mg/kg	
			Ethylbenzene	3.7 U ug/kg	3.7 ug/kg	
			m,p-Xylenes	3.7 U ug/kg	3.7 ug/kg	
			Methylcyclohexane	3.7 U ug/kg	3.7 ug/kg	
			o-Xylene	3.7 U ug/kg	3.7 ug/kg	

Notes:
a – The sample quantitation limit used meets the definition provided in Ref. 1, p. 51586 (Ref 41, p. 1).

Key:

AC = Adjusted concentration as per Ref. 12, pp. 7, 8, and 18.
H = High bias (Ref. 4, p. 326).
J = The associated value is an estimated quantity (Ref. 4, p. 326).
K = Unknown bias (Ref. 4, p. 326).
L = Low bias (Ref. 4. p. 326).
mg/kg = Milligrams per kilogram.
Q = Detected concentration is below the method reporting limit/Contract Required Quantitation Limit, but is above the method detection limit (Ref. 4, p. 326).
U = The material was analyzed for, but was not detected above the level of the associated value (Ref. 4, p. 326).
ug/kg = Micrograms per kilogram.

List of Hazardous Substances Associated with Source

Butyltin trichloride, dibutyltin dichloride, tributyltin chloride, antimony, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, nickel, silver, zinc, ethylbenzene, m,p-xylenes, methylcyclohexane, and o-xylene.

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

Available data are insufficient to document a hazardous constituent quantity (Ref. 1, p. 51590, Section 2.4.2.1.1).

Hazardous Constituent Quantity (S): NS

2.4.2.1.2 Hazardous Wastestream Quantity

Available data are insufficient to document a hazardous wastestream quantity (Ref. 1, p. 51591, Section 2.4.2.1.2).

Hazardous Wastestream Quantity (W): NS

2.4.2.1.3 Volume

Available data are insufficient to document a volume measure (Ref. 1, p. 51591, Section 2.4.2.1.3).

Volume Assigned Value (V): 0

2.4.2.1.4 Area

The area described by contaminated soil points BA01SS through BA04SS is approximately 240 square feet (Ref. 13).

The value assigned to the area measure is calculated as follows:

240 square feet / 34,000 = 0.007

Area Assigned Value (A): 0.007

Source Hazardous Waste Quantity Value (Ref. 1, p. 51591): 0.007

Table 5 Summary of Source Descriptions			
Source Number	**Source Hazardous Waste Quantity Value [a]**	**Source Hazardous Constituent Quantity Complete? (Y/N)**	**Containment Value for Surface Water [b]**
1. Former Grit Storage Area	0.016	N	10
2. Burn Area	0.007	N	10
[a] - See Section 2.2 of this document. [b] - Ref. 1, pp. 51609, 51610, and Table 4-2.			

2.12 Other Possible Sources

In June 1997, Oregon Department of Environmental Quality (ODEQ) conducted a site visit of the AMCCO facility (Ref. 18, p. 1). By this time, the two waste sandblast grit piles had been removed (Ref. 18, p. 1). However, sandblast grit was noted to still be present in several areas in the middle of the property at locations outside of the former waste grit storage area (i.e., Source 1) (Ref. 18, p. 1). In 1999, EPA contractors conducting a site visit of AMCCO as a part of a preliminary assessment (PA) also noted some residual grit in non-paved areas south of the main building (Ref. 7, p. 12). These additional areas outside of Source 1 have not been sampled, but likely are additional sources of contaminated soil. As demonstrated in Section 2.2.2, waste sandblast grit contains hazardous substances including butyltin trichloride, dibutyltin dichloride, tributyltin chloride, chromium, copper, and nickel.

During the PA, four aboveground oil tanks were staged near the center of the facility; one tank had a 3,000-gallon capacity; one had a 1,500-gallon capacity; and the remaining two tanks each had a 500-gallon capacity (Ref. 7, p. 12). The tanks rested directly on the ground and had no containment features (Ref. 7, p. 12). During the PA site visit, the property owner reported that the tanks are used to store waste oil and bilge waste, and were often used by boat owners without supervision; therefore, some spillage had occurred (Ref. 7, pp. 12 and 13). Oily, stained soil was observed underneath the tanks at this location (Ref. 7, p. 13). The property owner reported that, under the advice of an ODEQ representative, he removed some of the stained soil and burned it in a pit at the northwest corner of the property (Ref. 7, p. 13). The two larger tanks were reported to be empty or to hold some residual product (Ref. 7, p. 13). It appeared that the two 500-gallon tanks were used to store waste oil and bilge waste (Ref. 7, p. 13). It was reported by the property owner that the waste oil was hauled off by a used oil recycler (Ref. 7, p. 13). A 500-gallon aboveground gasoline storage tank and pump were also observed during the PA site visit at a separate location east of the "new" grit pile (Ref. 7, p. 13). One of the four tanks mentioned above appeared to have leaked. Since soil samples were not collected at the time of the PA, and since the other tanks appeared to either be empty and/or did not have visual signs of leaking, these possible sources were not included in this HRS documentation record.

During the PA, a shed was observed on the north side of the property where approximately 25 drums are stored on a dirt floor (Ref. 7, p. 13). The drums appeared to have military markings, which were not legible (Ref. 7, p. 13). The facility owner identified them as empty Cosmolene (petroleum jelly) drums, a rust-preventive, from the time of the U.S. Navy contract in the early 1960s (Ref. 7, p. 13). Other possibly hazardous materials observed during the PA site visit consisted of approximately 250 gallons of solvents including lacquer thinner, naphtha, and petroleum distillates; two 55-gallon drums of Protopet lubricant

(petroleum jelly-type product); and two 55-gallon drums of lube oil stored in the pipe shop (Ref. 7, p. 13). These containers were present at AMCCO, but are not known to have released hazardous substances. For this reason, these containers have not been included as sources in this HRS documentation record.

Several areas of oil staining were observed around the AMCCO property during the SI site visit (Ref. 4, p. 20). These areas often coincided with locations previously or currently used to store boat engines (Ref. 4, p. 20). Four surface soil samples (OS01SS through OS04SS) were collected during the EPA 2008 Phase I SI from areas with oil staining (Ref. 4, p. 54). Sample OS01SS was collected from below the valve to an aboveground storage tank where oil stains were present; petroleum-related odors were noted at this location (Ref. 4, p. 54). Sample OS02SS was collected from the soil at the edge of a puddle that had an oily sheen on it; no odor was noted at this location (Ref. 4, p. 54). Sample OS03SS was collected from an area that was covered in what may be waste oil; a strong fuel odor was noted in this area (Ref. 4, p. 54). Sample OS04SS was collected from soil that looked like it was covered in heavy oil or grease; no odor was noted at this location (Ref. 4, p. 54). Samples were collected between 0 and 6 inches bgs and analyzed for total petroleum hydrocarbons as diesel (TPH-D), SVOCs, and TAL metals (Ref. 4, p. 54). Sample results indicated the presence of two TPH-Ds (diesel and motor oil range), 11 SVOCs [acetophenone, n-nitrosodiphenylamine, phenanthrene, fluoranthene, pyrene, pentachlorophenol, butylbenzylphthalate, benzo(a)anthracene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, and benzo(k)fluoranthene], and six TAL metals (antimony, arsenic, chromium, copper, lead, and nickel) at significant concentrations with respect to background concentrations (Ref. 4, p. 54). Since the area of contaminated soil at each of the four sample points is not well-defined and since the overland route from these locations to surface water also is not well-defined, these sources of contamination were not included in this HRS documentation record.

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1 GENERAL CONSIDERATIONS

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

The land surface at AMCCO is generally flat (Ref. 4, p. 61). AMCCO is located on tidal flats adjacent to the Lewis and Clark River (Ref. 4, p. 61). A dirt berm has been built up on portions of the western shore of the property along the river (Ref. 4, p. 61). At the burn area source (Source 2) land is mounded and merges with the dike about 10 feet from the Lewis and Clark River (Ref. 7, p. 13). The water level of the Lewis and Clark River often rises, flooding some portions of the property (Ref. 4, p. 61). The property drains into either Jeffers Slough bordering the south side of the property or to the Lewis and Clark River on the western side (Ref. 4, p. 61).

Four marine ways (Marine Ways 1 through 4) extend from the west side of the property into the Lewis and Clark River (Ref. 4, p. 15). Marine Ways 3 and 4 are covered (Ref. 4, p. 15). During annual flood events, the water level of the Lewis and Clark River extends to covered portions of Marine Ways 3 and 4 (Ref. 4, p. 20). The southern side of the AMCCO property, adjacent to Jeffers Slough, has been configured as a dock along the entire south-side frontage (Ref. 4, p. 16). The flow of Jeffers Slough into the Lewis and Clark River is controlled through a tide box that closes at high tide and allows the slough to flow one way into the river (Ref. 4, pp. 16 and 26). This tide box is located near the southeast portion of the property (Ref. 4, p. 26).

No drinking water intakes within the TDL are known (Ref. 4, p. 62). The Columbia River and Youngs Bay is used for fishing within the TDL (Ref. 4, p. 62). Additionally, habitat for several Federal-listed threatened salmon species occurs within the zone of actual contamination present in the Lewis and Clark River immediately offshore of the AMCCO facility (see Section 4.1.4.3.1.2).

4.1.1.2 Target Distance Limit

Surface water runoff from the AMCCO property drains to the shorelines of the Lewis and Clark River and Jeffers Slough (Ref. 4, p. 61). Since the property floods regularly, the entire shoreline along the Lewis and Clark River and Jeffers Slough is considered to be two long linear PPEs. From the PPEs, the surface water migration pathway 15-mile TDL continues approximately 1.25 miles downstream in the Lewis and Clark River to its confluence with Youngs Bay, continues in Youngs Bay approximately 1.75 miles to the Columbia River, then extends approximately 7.2 miles downstream to the Pacific Ocean (Ref. 4, p. 61). The 15-mile TDL concludes as a 4.8-mile radial arc in the Pacific Ocean (Ref. 4, p. 61; Ref. 8). Additionally, the 15-mile TDL extends up the Lewis and Clark River to River Mile 6 due to flow reversal (Ref. 8). Salinity levels in Youngs Bay, the lower Lewis and Clark River, and in Jeffers Slough exhibit diurnal (tidal) and seasonal fluctuations, with salinity levels generally highest at the end of the dry season (late summer/early autumn) (Ref. 43, p. 3).

4.1.2.1 LIKELIHOOD OF RELEASE

4.1.2.1.1 Observed Release

Direct Observation

Basis for Direct Observation:

Not scored.

Chemical Analysis

The EPA SI was conducted in two phases (Ref. 4, p. 12). The Phase I SI field sampling event was conducted from April 30 through May 2, 2008 (Ref. 4, p. 28). The Phase II SI field sampling event was conducted from November 9 through 14, 2009 (Ref. 4, p. 28).

During the EPA 2008 Phase I SI, two sediment samples were collected from Jeffers Slough (JS01SD and JS02SD) and five sediment samples were collected from the Lewis and Clark River (LC01SD through LC04SD and BK01SD) (Ref. 4, pp. 36, 64, and 65). Sample JS01SD was collected from Jeffers Slough at 0 to 4 inches near the tide box at the southern end of the AMCCO property (Ref. 4, p. 64; Ref. 10, Logbook 2, p. 4). Sample JS02SD was collected from Jeffers Slough at 0 to 3 inches at the southern end of the AMCCO property near the dock (Ref. 4, p. 64; Ref. 10, Logbook 2, p. 4). Sample LC01SD was collected from the Lewis and Clark River at 0 to 4 inches near the burn area (Ref. 4, p. 64; Ref. 10, Logbook 2, p. 3). Sample LC02SD was collected from the Lewis and Clark River at 0 to 3 inches near Marine Way 4 (Ref. 4, p. 64; Ref, 10, Logbook 2, p. 3). Sample LC03SD was collected from the Lewis and Clark River at 0 to 3 inches near Marine Way 3 (Ref. 4, p. 64; Ref, 10, Logbook 2, p. 3). Sample LC04SD was collected from the Lewis and Clark River at 0 to 3 inches in the area between Marine Ways 1 and 2 (Ref. 4, pp. 64 and 65; Ref, 10, Logbook 2, p. 4). Sample BK01SD was collected on the Lewis and Clark River at 0 to 6 inches from a location approximately 150 feet north of the burn area (Ref. 4, pp. 29, 36, 64, and 65) for use as a background sample. However, a new background sample (also designated BK01SD) was collected during EPA 2009 Phase II SI from a more appropriate location at approximately River Mile 6.5 of the Lewis and Clark River (Ref. 4, pp. 40 and 64). Because of the new background sample collected during EPA 2009 Phase II SI, the original background sample collected during EPA 2008 Phase I SI is considered a release sample (Ref. 4, p. 64). The EPA 2009 Phase II SI background sediment sample was collected from 0 to 6 inches (Ref. 11, p. 42).

Also, during the EPA 2009 Phase II SI, fifteen sediment samples (AM01SD through AM15SD) were collected from the Lewis and Clark River in front (and west) of the AMCCO facility (Ref. 4, pp. 38 and 65). Samples were collected from five transects (Ref. 4, p. 65). Each transect ran perpendicular to the Lewis and Clark River (Ref. 4. p. 65). The transects were spaced approximately 200 feet apart (Ref. 4, p. 65). Along each transect, three samples were collected from locations spaced approximately 100 feet apart extending from the shoreline into the center of the river (Ref. 4, p. 65). All fifteen sediment samples were collected from 0 to 6 inches (Ref. 11, p. 42).

Sampling for both phases of the SI was conducted in accordance with EPA-approved Sampling and Quality Assurance Plans (SQAPs) (Ref. 4, p. 28; Ref. 5; Ref. 6). EPA 2008 Phase I SI sediment samples were collected from known areas of sediment deposition using dedicated stainless steel spoons (Ref. 4, p. 29). Collected material was homogenized thoroughly in dedicated stainless steel bowls and placed into pre-labeled containers (Ref. 4, p. 29). EPA 2009 Phase II SI sediment samples were collected using a

stainless steel Van Veen ® dredge deployed from an EPA operated boat (Ref. 4, p. 30). The Van Veen® dredge sampler was dropped multiple times at each sample location in order to retrieve sufficient sample volume for the planned analytical suite (Ref. 4, p. 30). Sample material was removed from the center portion of the Van Veen® dredge sampler using dedicated stainless steel spoons, taking care not to collect sediments that were in contact with the walls of the sampler (Ref. 4, p. 30). Collected material was then homogenized thoroughly in a dedicated stainless steel bowl and placed into prelabeled containers (Ref. 4, p. 30).

Phase I and II SI sediment samples indicate the presence of elevated concentrations of several organotins and several metals (Ref. 4, pp. 73 through 77). These samples were analyzed for TAL metals analysis using EPA CLP SOW ILM05.4) and organotins by Krone Method (Ref. 4, pp. 32 through 35, 323, 365, 376, 499, 500, 501; Ref. 45). Additionally, EPA 2009 Phase II SI sediment samples were analyzed for grain size using ASTM Method D-422 (Ref. 4, pp. 33 through 35, 1067, 1083, and 1090). All samples were stored on ice in coolers continuously maintained under custody of the sample team (Ref. 4, pp. 29, 1144, 1158, 1173, 1175, 1179, and 1180: Ref. 46, pp, 4, 5, 15, 16, and 17). All data underwent data validation. Analytical results were validated by EPA chemists and in most cases were reviewed by an E & E chemist (Ref. 4, pp. 32 through 35, 323 through 326, 365 through 368, and 376 through 381, 419, 499 through 505, 519 through 522, 547 through 550, 1067, 1083, and 1090).

Table 6 below provides information about background sediment sample concentrations and hazardous substances present in the Lewis and Clark River and Jeffers Slough sediment samples. The background EPA 2009 Phase II SI sediment sample (BK01SD) grain size analysis results had 69.3% of the sample material passing through the 75 micron sieve (Ref. 4, p. 1084). EPA 2009 Phase II SI sediment samples used in Table 6 had the following percentages of material passing through the 75 micron sieve: AM05SD with 79.6%, AM06SD with 67.6%, and AM08SD with 60.1% (Ref. 4, p. 1091). Since these percentages are within +/- 15% of the background sample, they are considered to be comparable to the background sample. Grain size analysis was not conducted on EPA 2008 Phase I SI sediment samples.

The EPA 2009 Phase II SI background sediment sample (BK01SD) was described as consisting of brown with reddish mottling, silty, sandy clay (Ref. 4, p. 33). The EPA 2008 Phase I SI sediment samples (i.e., LC01SD through LC04SD; and BK01SD, JS01SD and JS02SD) were described as consisting of light brown or moist gray sediment; while the EPA 2009 Phase II SI sediment samples (i.e., AM05SD, AM06SD, and AM08SD) were described as consisting of brown or black sandy silt (Ref. 4, pp. 32 and 33). Based on these descriptions it appears the EPA 2009 Phase II SI background sediment sample (BK01SD) may have been more fine grained than the release EPA 2009 Phase II SI sediment samples; however the grain size analysis indicates the samples were similar. EPA 2008 Phase I SI sediment sample descriptions do not address grain size.

Table 6
EPA 2008 Phase I and 2009 Phase II SI
Sediment Samples

Sample ID	Sample Medium	Sample Location	Distance from PPE	Date	References	Hazardous Substance	Concentration (units)	Sample Quantitation Limit[a] (units)	References
BK01SD – Phase II (Background Sample) (MJC1Q7) (09454115)	Sediment	Lewis and Clark River	6 miles	11/11/2009	Ref. 4, pp. 33 and 40; Ref. 9	Butyltin Trichloride	6.0 U ug/kg	6.0 ug/kg	Ref. 4, p. 33, 469, and 526; Ref. 41, p. 5
						Dibutyltin Dichloride	6.9 U ug/kg	6.9 ug/kg	
						Tributyltin Chloride	4.0 U ug/kg	4.0 ug/kg	
						Antimony	10.5 U mg/kg	10.5 mg/kg	
						Arsenic	6.6 mg/kg	1.75 mg/kg	
						Cadmium	0.46 JQ mg/kg	0.87 mg/kg	
						Chromium	12.9 mg/kg	1.75 mg/kg	
						Copper	21.2 mg/kg	4.37 mg/kg	
						Lead	8.3 mg/kg	1.75 mg/kg	
						Manganese	339 mg/kg	6.56 mg/kg	
						Nickel	17.9 mg/kg	17.49 mg/kg	
						Silver	1.7 U mg/kg	1.7 mg/kg	
						Zinc	85 mg/kg	10.50 mg/kg	
LC01SD (MJ8GP0) (08184114)	Sediment	Lewis and Clark River	0 Feet	5/1/2008	Ref. 4, p. 32; Ref. 9	Butyltin Trichloride	140 ug/kg	5 ug/kg	Ref. 4, pp. 32, 339, and 396; Ref. 41, p. 5
						Dibutyltin Dichloride	320 JL ug/kg	5 ug/kg	
						Tributyltin Chloride	93 ug/kg	5 ug/kg	
						Antimony	300 mg/kg	15.04 mg/kg	
						Arsenic	42.8 mg/kg	2.51 mg/kg	
						Cadmium	2.6 mg/kg	1.25 mg/kg	
						Chromium	284 JH mg/kg (AC = 220 mg/kg)	2.51 mg/kg	
						Copper	10300 mg/kg	3.13 mg/kg	
						Lead	1080 JL mg/kg	2.51 mg/kg	
						Nickel	215 JH mg/kg	10.03 mg/kg	

Table 6 EPA 2008 Phase I and 2009 Phase II SI Sediment Samples									
Sample ID	**Sample Medium**	**Sample Location**	**Distance from PPE**	**Date**	**References**	**Hazardous Substance**	**Concentration (units)**	**Sample Quantitation Limit[a] (units)**	**References**
							(AC = 159 mg/kg)		
						Silver	7.1 mg/kg	2.51 mg/kg	
						Zinc	1650 JL mg/kg	15.04 mg/kg	
LC02SD (MJ8GP1) (08184115)	Sediment	Lewis and Clark River	0 Feet	5/1/2008	Ref. 4, p. 32; Ref. 9	Butyltin Trichloride	370 ug/kg	5 ug/kg	Ref. 4, pp. 32, 340, and 397; Ref. 41, p. 5
						Dibutyltin Dichloride	740 JL ug/kg	5 ug/kg	
						Tributyltin Chloride	520 ug/kg	5 ug/kg	
						Copper	273 mg/kg	7.32 mg/kg	
						Lead	78.8 JL mg/kg	2.93 mg/kg	
						Zinc	313 JL mg/kg	17.56 mg/kg	
LC03SD (MJ8GP2) (08184116)	Sediment	Lewis and Clark River	120 Feet	5/1/2008	Ref. 4, p. 32; Ref. 9	Butyltin Trichloride	210 ug/kg	5 ug/kg	Ref. 4, pp. 32, 341, and 398; Ref. 41, p. 5
						Dibutyltin Dichloride	830 ug/kg	5 ug/kg	
						Tributyltin Chloride	220 ug/kg	5 ug/kg	
						Copper	558 mg/kg	5.98 mg/kg	
						Lead	46.9 JL mg/kg	2.39 mg/kg	
LC04SD (MJ8GP3) (08184117)	Sediment	Lewis and Clark River	0 Feet	5/1/2008	Ref. 4, p. 32; Ref. 9	Butyltin Trichloride	560 ug/kg	5 ug/kg	Ref. 4, pp. 32, 369, and 399; Ref. 41, p. 5
						Dibutyltin Dichloride	3100 JL ug/kg	5 ug/kg	
						Tributyltin Chloride	700 ug/kg	5 ug/kg	
						Copper	5670 mg/kg	6.81 mg/kg	
						Lead	47.6 mg/kg	2.72 mg/kg	
						Manganese	1850 JK mg/kg (AC = 1492 mg/kg)	4.09 mg/kg	

Table 6
EPA 2008 Phase I and 2009 Phase II SI
Sediment Samples

Sample ID	Sample Medium	Sample Location	Distance from PPE	Date	References	Hazardous Substance	Concentration (units)	Sample Quantitation Limit[a] (units)	References
						Zinc	1610 mg/kg	16.35 mg/kg	
BK01SD – Phase I (MJ8GM9) (08184103)	Sediment	Lewis and Clark River	0 Feet	5/1/2008	Ref. 4, p. 32; Ref. 9	Butyltin Trichloride Dibutyltin Dichloride Tributyltin Chloride Copper Lead	44 ug/kg 81 JL ug/kg 32 ug/kg 174 mg/kg 61 JL mg/kg	5 ug/kg 5 ug/kg 5 ug/kg 7.13 mg/kg 2.85 mg/kg	Ref. 4, pp. 32, 329, and 384; Ref. 41, p. 5
AM05SD (MJC1P6) (09454104)	Sediment	Lewis and Clark River	131 Feet	11/13/2009	Ref. 4, p. 33; Ref. 9	Dibutyltin Dichloride Tributyltin Chloride	41 ug/kg 12 ug/kg	6.8 ug/kg 3.9 ug/kg	Ref. 4, pp. 33 and 444; Ref. 41, p. 6
AM06SD (MJC1P7) (09454105)	Sediment	Lewis and Clark River	206 Feet	11/13/2009	Ref. 4, p. 33; Ref. 9	Dibutyltin Dichloride	9 ug/kg	7.0 ug/kg	Ref. 4, pp. 33 and 445; Ref. 41, p. 6
AM08SD (MJC1P9) (09454107)	Sediment	Lewis and Clark River	194 Feet	11/13/2009	Ref. 4, p. 33; Ref. 9	Butyltin Trichloride Dibutyltin Dichloride Tributyltin Chloride	26 ug/kg 40 ug/kg 72 ug/kg	6.1 ug/kg 7.0 ug/kg 4.0 ug/kg	Ref. 4, pp 33 and 447; Ref. 41, p. 6
JS01SD (MJ8GN8) (08184112)	Sediment	Jeffers Slough	0 Feet	5/1/2008	Ref. 4, p. 32; Ref. 9	Butyltin Trichloride Dibutyltin Dichloride Tributyltin Chloride Copper Lead	12 ug/kg 15 JL ug/kg 6 ug/kg 67.1 mg/kg 70.6 JL mg/kg	5 ug/kg 5 ug/kg 5 ug/kg 16.49 mg/kg 6.60 mg/kg	Ref. 4, pp. 32, 337, 394; Ref. 41, p. 6
JS02SD (MJ8GN9)	Sediment	Jeffers Slough	0 Feet	5/1/2008	Ref. 4, p. 32; Ref. 9	Butyltin Trichloride	17 ug/kg	5 ug/kg	Ref. 4, pp. 32 and 395; Ref.

Table 6
EPA 2008 Phase I and 2009 Phase II SI
Sediment Samples

Sample ID	Sample Medium	Sample Location	Distance from PPE	Date	References	Hazardous Substance	Concentration (units)	Sample Quantitation Limit[a] (units)	References
(08184113)						Dibutyltin Dichloride	34 JL ug/kg	5 ug/kg	41, p. 6
						Tributyltin Chloride	43 ug/kg	5 ug/kg	

Notes:
a – The sample quantitation limit used meets the definition provided in Ref. 1, p. 51586 (Ref. 41, p. 1).

Key:

AC = Adjusted concentration as per Ref. 12, pp. 8 and 18.
H = High bias (Ref. 4, p. 326).
J = The associated value is an estimated quantity (Ref. 4, p. 326).
K = Unknown bias (Ref. 4, p. 326).
L = Low bias (Ref. 4. p. 326).
mg/kg = Milligrams per kilogram.
Q = Detected concentration is below the method reporting limit/Contract Required Quantitation Limit, but is above the method detection limit (Ref. 4, p. 326).
U = The material was analyzed for, but was not detected above the level of the associated value (Ref. 4, p. 326).
ug/kg = Micrograms per kilogram.

Additional Supporting Data

Although not used to document an observed release to the surface water migration pathway for this documentation record, it is possible that former paint removal activities and contaminated ground water at AMCCO is impacting the adjacent water bodies.

Paint removal from boats over Jeffers Slough has been performed at AMCCO by various methods, including grinding overwater (Ref. 15, p. 2; Ref. 22, p. 1). Specific information about the paints removed and their constituents has not been documented; however, it is likely that these paints would have contained organotins and metals including copper-based paints containing tributyltin and paints containing cupric oxide and lead (Ref. 7, p. 10; Ref. 14, p. 1).

In June 1996, Oregon Department of Environmental Quality conducted an inspection of the AMCCO facility which included a site visit (Ref. 14, p. 1). During the site visit, the facility's owner was reported to have stated that during the 1950s AMCCO sandblasted over the water (Ref. 14, p. 2; Ref. 43, p. 1). The property owner stated that despite AMCCO's attempts to sandblast smaller ships' hulls indoors, many of the ships, especially back in the days of peak maritime commerce in the area, would not fit within the building (Ref. 43, p. 1). He indicated that AMCCO discontinued that practice in the 1950s and sandblasted in the buildings located on the property (Ref. 14, p. 2). In a letter drafted in June 1997, the property owner indicated that the earlier statement that AMCCO disposed of grit into Jeffers Slough and the Lewis and Clark River was false (Ref. 21, p. 1).

Attribution:

The land surface at AMCCO is generally flat (Ref. 4, p. 61). AMCCO is located on tidal flats adjacent to the Lewis and Clark River (Ref. 4, p. 61). A dirt berm has been built up on portions of the western shore of the property along the river (Ref. 4, p. 61). The water level of the Lewis and Clark River often rises, flooding some portions of the property (Ref. 4, p. 61). The property drains into either Jeffers Slough bordering the south side of the property or to the Lewis and Clark River on the western side (Ref. 4, p. 61).

Organotins and metals have been detected in the Lewis and Clark River and Jeffers Slough sediments at observed release concentrations from the PPEs to up to 206 feet into the Lewis and Clark River (see Section 4.1.2.1.1 and Ref. 9). The hazardous substances detected at observed release concentrations in sediment samples are likewise present in sources at AMCCO which are not fully contained and are available to migrate to the surface water migration pathway (see Sections 2.2.2 for Sources 1 and 2, and Section 4.1.2.1.1 for hazardous substances present at observed release concentrations in sediment samples).

Paint removal from boats over Jeffers Slough has been performed at AMCCO by various methods, including grinding overwater (Ref. 15, p. 2; Ref. 22, p. 1). Specific information about the paints removed and their constituents has not been documented; however, it is likely that these paints would have contained organotins and metals including copper-based paints containing tributyltin and paints containing cupric oxide and lead (Ref. 7, p. 10; Ref. 14, p. 1).

In June 1996, Oregon Department of Environmental Quality conducted an inspection of the AMCCO facility which included a site visit (Ref. 14, p. 1). During the site visit, the facility's owner was reported to have stated that during the 1950s AMCCO sandblasted over the water (Ref. 14, p. 2; Ref. 43, p. 1). The property owner stated that despite AMCCO's attempts to sandblast smaller ships' hulls indoors, many of the ships, especially back in the days of peak maritime commerce in the area, would not fit within the building (Ref. 43, p. 1). He indicated that AMCCO discontinued that practice in the 1950s and sandblasted in the buildings located on the property (Ref. 14, p. 2). In a letter drafted in June 1997, the property owner indicated that the earlier statement that AMCCO disposed of grit into Jeffers Slough and the Lewis and Clark River was false (Ref. 21, p. 1).

Other Possible Non-Site-Related Sources

In June 2009, a search was conducted on behalf of the EPA for additional potential sources of contamination to Youngs Bay from companies that were involved in maritime-related activities that could potentially be linked to similar marine contaminants as those found at the Astoria Marine Construction Company site (Ref. 51, p. 1). These companies were located adjacent to a body of water that could be contributing contamination to Youngs Bay (Ref. 51, p. 1). Seven such companies were identified (Ref. 51, p. 2). None of the companies were on the Lewis and Clark River (Ref. 51, pp. 2 and 5).

During the EPA 2009 Phase II SI, fifteen sediment samples (AM01SD through AM15SD) were collected from the Lewis and Clark River in front (and west) of the AMCCO facility (Ref. 4, pp. 38 and 65). Samples were collected from five transects (Ref. 4, pp. 38 and 65). Each transect ran perpendicular to the Lewis and Clark River (Ref. 4. pp. 38 and 65). The transects were spaced approximately 200 feet apart (Ref. 4, pp. 38 and 65). Along each transect, three samples were collected from locations spaced approximately 100 feet apart extending from the shoreline into the center of the river (Ref. 4, pp. 38 and 65). Analytical results for samples collected at locations upstream and downstream of the contaminated sample points documenting the zone of actual contamination did not likewise have contaminants present at observed release concentrations (Ref. 4, pp. 36, 38, and 75). The lack of contamination at these points

indicates that the contamination is not migrating from possible upstream sources and that contamination is not migrating during tidal reversals from sources that are usually downstream or on Youngs Bay.

Hazardous Substances Released

The hazardous substances found in observed releases to surface water bodies within the TDL are butyltin trichloride, dibutyltin dichloride, tributyltin chloride, antimony, arsenic, cadmium, chromium, copper, lead, manganese, nickel, silver, and zinc.

4.1.3.2 WASTE CHARACTERISTICS

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

Table 7 below provides Human Food Chain Threat Waste Characteristics Factor Values for those hazardous substances present in sources at the AMCCO facility (see Section 2.2).

Table 7 Human Food Chain Threat Waste Characteristics Factor Values

Hazardous Substance	Source	Toxicity Factor Value	Persistence Factor Value[a]	Bioaccumulation Factor Value[b]	Toxicity/Persistence/Bioaccumulation Value (Ref. 1, p. 51619 Table 4-16)	Reference
Butyltin Trichloride[c]	1, 2	--	--	--	--	--
Dibutyltin Dichloride	1, 2	10,000	1	50	5×10^5	Ref. 52
Tributyltin Chloride	1, 2	10,000	1	50,000	5×10^8	Ref. 25
Antimony	2	10,000	1	5	5×10^4	Ref. 2, p. BI-1
Arsenic	2	10,000	1	500	5×10^6	Ref. 2, p. BI-1
Cadmium	2	10,000	1	50,000	5×10^8	Ref. 2, p. BI-2
Chromium	1, 2	10,000	1	500	5×10^6	Ref. 2, p. BI-3
Cobalt	2	10	1	5,000	5×10^4	Ref. 2, p. BI-3
Copper	1, 2	0	1	50,000	0	Ref. 2, p. BI-3
Lead	2	10,000	1	5,000	5×10^7	Ref. 2, p. BI-8
Manganese	2	10,000	1	50,000	5×10^8	Ref. 2, p. BI-8
Nickel	1, 2	10,000	1	500	5×10^6	Ref. 2, p. BI-9
Silver	2	100	1	50,000	5×10^6	Ref. 2, p. BI-10
Zinc	2	10	1	50,000	5×10^5	Ref. 2, p. BI-12
Ethylbenzene	2	10	0.0007	50	0.35	Ref. 2, p. BI-6
m,p-Xylenes	2	100	0.4	50	2,000	Ref. 2, p. BI-12
Methylcyclohexane[c]	2	--	--	--	--	--
o-Xylene	2	1	0.4	50	20	Ref. 2, p. BI-12

a. River persistence value (Ref. 2; Ref. 25; Ref 52).
b. The higher food chain bioaccumulation value of fresh or salt water (Ref. 1, p. 51617; Ref. 2; Ref. 25; Ref. 52).
c. Superfund Chemical Data Matrix values are not available for the analyte.

The hazardous substances having the highest Toxicity/Persistence/Bioaccumulation Value of 5×10^8 are tributytin chloride, cadmium, and manganese.

4.1.3.2.2 Hazardous Waste Quantity

Table 8 Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1. Former Grit Storage Area	Contaminated Soil	0.016
2. Burn Area	Contaminated Soil	0.007
Sum of Values		**0.023 → 1[a]**
a. Ref. 1, p. 51591.		

Targets within the surface water migration pathway are subject to Level II concentrations, and hazardous constituent quantity has not been adequately determined (see Section 4.1.4.3.1.2 below). A Hazardous Waste Quantity Factor Value of 100 is assigned (Ref. 1, pp. 51591 and 51592).

Hazardous Waste Quantity Factor Value (Ref. 1, p. 51591, Table 2-6): 100

4.1.3.2.3 Waste Characteristics Factor Category Value

Toxicity/Persistence Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100

Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value: 1×10^6

(Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value) x
Bioaccumulation Factor Value: 5×10^{10} subject to a maximum value of 1×10^{12} (Ref. 1, p. 51620)

Waste Characteristics Factor Category Value (Ref. 1, p. 51592, Table 2-7): 320

4.1.3.3 HUMAN FOOD CHAIN TARGETS

4.1.3.3.1 Food Chain Individual

The food chain individual factor is assigned a value of 45 based on the presence of Level II targets (see below) (Ref. 1, p. 51620).

Level I Concentrations
Level I concentrations for the Human Food Chain Threat is not being scored.

Level II Concentrations –
The Zone of Actual Contamination is within the vicinity of Young's Bay Select Area commercial gillnet fishery for coho and Chinook salmon (spring/summer races) (see Section 4.1.2.1.1 [Chemical Analysis] and Ref. 50). It also encompasses an area utilized by recreational anglers for fisheries including coho, Chinook, and white sturgeon (Ref. 50, p. 2). These commercial and recreational fisheries are explicitly intended to harvest fish for human consumption (Ref. 50, p. 3).

Food Chain Individual Factor Value: 45
Ref. 1, p. 51620

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

Not scored.

Level I Concentrations Factor Value: 0

4.1.3.3.2.2 Level II Concentrations

The Level II Zone of Actual Contamination is delineated by the following samples: LC01SD - LC04SD, BK01SD, JS01SD, JS02SD, AM05SD, AM06SD, and AM08SD (see Table 6, Section 4.1.2.1.1 of this HRS documentation record and Ref. 9). The Zone of Actual Contamination is within the vicinity of Young's Bay Select Area commercial gillnet fishery for coho and Chinook salmon (spring/summer races) (Ref. 50). It also encompasses an area utilized by recreational anglers for fisheries including coho, Chinook, and white sturgeon (Ref. 50, p. 2). These commercial and recreational fisheries are explicitly intended to harvest fish for human consumption (Ref. 50, p. 3). Fish catch figures for these fisheries are not maintained. For scoring purposes, it is assumed that greater than 1 pound of fish per year is harvested for human consumption from the Zone of Actual Contamination by commercial fishers and by recreational fishers. This fishery is subject to actual contamination (see Section 4.1.2.1.1; Ref. 9). Table 9 below provides the calculation of the Level II Concentrations Human Food Chain Population Value.

Table 9
Human Food Chain Population Values

Identity of Fishery	Annual Production (pounds)	References	Human Food Chain Population Value (Ref. 1, Table 4-18)
Lewis and Clark River	>1	Ref. 9; Ref. 50	0.03
Sum of Level II Human Food Chain Population Values:			**0.03**

Level II Concentrations Factor Value: 0.03

4.1.3.3.2.3 Potential Human Food Chain Contamination

Commercial Chinook salmon and sturgeon catch data is available for Youngs Bay for the year 2010 (Ref. 38). The entirety of Youngs Bay is within the surface water migration pathway TDL (Ref. 8). Commercial catch data is reported by season (Ref. 38). Table 10 below provides commercial landings data for Chinook salmon and sturgeon harvested from Youngs Bay.

.

Table 10
Youngs Bay Commercial Chinook and Sturgeon Harvest 2010
(Ref. 38)

Season and Week	Chinook			Sturgeon			Totals
	Number of Fish (A)	Average Weight in Pounds (B)	Total Weight of Fish (A x B = C; rounded to the nearest integer)	Number of Fish (D)	Average Weight in Pounds (E)	Total Weight of Fish (D x E = F; rounded to the nearest integer)	Pounds of Chinook and Sturgeon (C + F)
Winter (Ref. 38, p. 8)							
Week 9	47	13.9	653	16	31.9	510	1,163
Week 10	146	15.3	2,234	11	31.9	351	2,585
Week 11	43	15.0	645	1	27.8	28	673
Week 12	120	12.5	1,500	0		0	1,500
Week 13	410	12.7	5,207	0		0	5,207
Week 14	268	13.1	3,511	0		0	3,511
Spring (Ref. 38, p. 4)							
Week 16	3,943	11.6	45,739	5	33.8	169	45,908
Week 17	2,100	10.9	22,890	4	23.5	94	22,984
Week 18	0		0	0		0	0
Week 19	5,177	11.2	57,982	22	29.5	649	58,631
Week 20	4,268	11.6	49,509	15	34.7	521	50,030
Week 21	1,558	11.4	17,761	10	30.6	306	18,067
Week 22	927	12.1	11,217	0		0	11,217
Week 23	606	12.1	7,333	0		0	7,333
Week 24	151	12.2	1,842	0		0	1,842
Summer (Ref. 38, p. 5)							
Week 25	215	12.0	2,580	0		0	2,580
Week 26	205	11.4	2,337	0		0	2,337
Week 27	122	13.7	1,671	0		0	1,671
Week 28	62	14.8	918	0		0	918
Week 29	134	15.9	2,131	0		0	2,131
Week 30	87	15.2	1,322	0		0	1,322
Week 31	115	15.0	1,725	0		0	1,725
Fall (Ref. 38, pp. 6 and 7)							
Week 32	301	16.7	5,027	9	36.9	332	5,359
Week 33	1,168	16.9	19,739	31	32.1	995	20,734
Week 34	185	14.0	2,590	0		0	2,590
Week 35	1,158	12.6	14,591	0		0	14,591
Week 36	2,100	12.5	26,250	1	55.0	55	26,305

Table 10 Youngs Bay Commercial Chinook and Sturgeon Harvest 2010 (Ref. 38)							
Season and Week	**Chinook**			**Sturgeon**			**Totals**
	Number of Fish (A)	**Average Weight in Pounds (B)**	**Total Weight of Fish (A x B = C; rounded to the nearest integer)**	**Number of Fish (D)**	**Average Weight in Pounds (E)**	**Total Weight of Fish (D x E = F; rounded to the nearest integer)**	**Pounds of Chinook and Sturgeon (C + F)**
Week 37	2,505	12.2	30,561	3	34.4	103	30,664
Week 38	405	10.6	4,293	0		0	4,293
Total Youngs Bay Commercial Chinook and Sturgeon Harvest in Pounds						**347,871**	

Commercial Coho salmon catch data is available for Youngs Bay for the Fall 2010 (Ref. 38). As previously indicated, the entirety of Youngs Bay is within the surface water migration pathway TDL (Ref. 8). Table 11 below provides commercial landings data for Coho salmon harvested from Youngs Bay.

Table 11 Youngs Bay Commercial Coho Harvest Fall 2010 (Ref. 38, pp. 6 and 7)			
Week	**Coho**		
	Number of Fish (A)	**Average Weight in Pounds (B)**	**Total Weight of Fish (A x B = C; rounded to the nearest integer)**
Week 32	2	8.6	17
Week 33	42	11.2	470
Week 34	4	11.1	44
Week 35	640	10.1	6,464
Week 36	8,697	10.1	87,840
Week 37	11,815	10.5	124,058
Week 38	2,569	10.2	26,204
Total Youngs Bay Commercial Coho Harvest in Pounds			**245,097**

Sport fishing occurs within the surface water migration pathway TDL. The most recent steelhead sport catch data is from 2001 to 2002, which is presented by zone. The fishing zone within the TDL for Steelhead trout is from Buoy 10 located at the mouth of the Columbia River upstream to the Megler-Astoria Bridge (i.e., US Highway 101) (Ref. 8; Ref. 26, p. 27). This zone is completely within the 15-mile TDL (Ref. 8; Ref. 26, p. 27). It was reported that 264 Steelhead were caught from this zone in 2001 to 2002 (Ref. 26, p. 27). The average weight of Steelhead is between 5 and 10 pounds (Ref. 40, p. 75). The total Steelhead sport catch harvest for 2001 to 2002 from the Columbia River is calculated to be 1,980 pounds using the median weight of 7.5 pounds for estimating purposes (i.e., 264 steelhead x 7.5 pounds).

The nearest United States Geological Survey water gauging station on the Columbia River is at Quincy, Oregon at River Mile 53.8 (Ref. 27; 28; Ref. 29). The flow rate of the Columbia River at this location was approximately 211,600 cubic feet per second (cfs) for Water Year 2009, the most recent year on

record (Ref. 27). The flow rate of Youngs Bay is not maintained by the United States Geological Survey nor is the flow rate of its tributaries (Ref. 27; Ref. 29). Historic stream flow data for Youngs River, a tributary to Youngs Bay, is available for 1958 (Ref. 39). The average annual stream flow for the Youngs River at that time was 185.8 cfs (Ref. 39). It can be assumed that the average annual flow rate of Youngs Bay is greater than the flow rate of its tributary the Youngs River of 185.8 cfs, but less than the flow rate of the Columbia River of 211,600 cfs into which Youngs Bay discharges. Given this information, it is estimated that the average annual flow rate of Youngs Bay is greater than 1,000 cfs to 10,000 cfs.

The dilution weight for the Columbia River (a very large river) is 0.00001 [Ref. 1, p. 51613 (Table 4-13)]. The dilution weight for Youngs Bay (large stream to river) is 0.001 [Ref. 1, p. 51613 (Table 4-13)]. The potential human food chain target value is calculated in Table 12 below.

Table 12
Potential Human Food Chain Target Value

Surface Water Body	**Type of Fish**	**Pounds of Fish[a]**	**Human Food Chain Value[b]**	**Dilution Weight[c]**	**Dilution Weighted Value**
Youngs Bay	Chinook and Sturgeon	347,871	310	0.001	0.31
	Coho	245,097			
	Total Catch for Youngs Bay	**592,967**			
Columbia River	Steelhead	1,980	3	0.00001	0.00003
Total TDL dilution weighted human food chain target value					**0.31003 / 10 = 0.031003**

References
[a] - See Tables 10 and 11.
[b] - Ref. 1, p. 51621, Table 4-18
[c] - Ref. 27; Ref. 28; Ref. 29; Ref. 1, p. 51613, Table 4-13.

Potential Human Food Chain Contamination Factor Value: 0.031003

4.1.4.2 WASTE CHARACTERISTICS

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

Table 13 below provides Environmental Threat Waste Characteristics Factor Values for those hazardous substances present in sources at the AMCCO facility (see Section 2.2).

Table 13 Environmental Threat Waste Characteristics Factor Values

Hazardous Substance	Source	Ecosystem Toxicity Factor Value [a]	Persistence Factor Value [b]	Environmental Bioaccumulation Factor Value [c]	Ecosystem Toxicity/Persistence/Environmental Bioaccumulation Value (Ref. 1, p. 51619, Table 4-16)	Reference
Butyltin Trichloride[d]	1, 2	--	--	--	--	--
Dibutyltin Dichloride	1, 2	1,000	1	50	50,000	Ref. 52
Tributyltin Chloride	1, 2	10,000	1	50,000	5×10^8	Ref. 25
Antimony	2	100	1	50	5,000	Ref. 2, p. BI-1
Arsenic	2	100	1	5,000	5×10^5	Ref. 2, p. BI-1
Cadmium	2	10,000	1	50,000	5×10^8	Ref. 2, p. BI-2
Chromium	1, 2	10,000	1	500	5×10^6	Ref. 2, p. BI-3
Cobalt	2	0	1	5,000	0	Ref. 2, p. BI-3
Copper	1, 2	1,000	1	50,000	5×10^7	Ref. 2, p. BI-3
Lead	2	1,000	1	50,000	5×10^7	Ref. 2, p. BI-8
Manganese	2	0	1	50,000	0	Ref. 2, p. BI-8
Nickel	1, 2	1,000	1	500	5×10^5	Ref. 2, p. BI-9
Silver	2	10,000	1	50,000	5×10^8	Ref. 2, p. BI-10
Zinc	2	100	1	50,000	5×10^6	Ref. 2, p. BI-12
Ethylbenzene	2	1,000	0.0007	50	35	Ref. 2, p. BI-6
m,p-Xylenes	2	100	0.4	50	3.5	Ref. 2, p. BI-12
Methylcyclohexane[d]	2	--	--	--	--	--
o-Xylene	2	100	0.4	50	2,000	Ref. 2, p. BI-12

a. The higher of fresh and salt water values (Ref. 1, p. 51621; Ref. 2; Ref. 25; Ref. 52).
b. River persistence values (Ref. 2; Ref. 25; Ref. 52).
c. The higher of fresh and salt water values (Ref. 1, p. 51622; Ref. 2; Ref. 25; Ref. 52).
d. Superfund Chemical Data Matrix values are not available for the analyte.

The hazardous substances having the highest Ecosystem Toxicity/Persistence/Environmental Bioaccumulation Factor value of 5×10^8 are tributyltin chloride, cadmium, and silver.

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^8

4.1.3.2.2 Hazardous Waste Quantity

Table 14 Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1. Former Grit Storage Area	Contaminated Soil	0.016
2. Burn Area	Contaminated Soil	0.007
Sum of Values		**0.023 → 1[a]**
a. Ref. 1, p. 51591.		

Targets within the surface water migration pathway are subject to Level II concentrations, and hazardous constituent quantity has not been adequately determined (see Section 4.1.4.3.1.2 below). A Hazardous Waste Quantity Factor Value of 100 is assigned (Ref. 1, pp. 51591 and 51592).

Hazardous Waste Quantity Factor Value (Ref. 1, p. 51591, Table 2-6): 100

4.1.3.2.3 Waste Characteristics Factor Category Value

Ecosystem Toxicity/Persistence Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100

Ecosystem Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value: 1×10^6

(Ecosystem Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value) x Environmental Bioaccumulation Factor Value: 5×10^{10} subject to a maximum value of 1×10^{12}

Waste Characteristics Factor Category Value (Ref. 1, p. 51592, Table 2-7): 320

4.1.4.3 ENVIRONMENTAL THREAT – TARGETS

Level I concentrations for the Environmental Threat is not being scored.

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

Sensitive Environments

Not scored.

Wetlands

Not scored.

Level I Concentrations Factor Value: 0

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

A zone of actual contamination subject to Level II concentrations is present in Jeffers Slough and the Lewis and Clark River as described by contaminated sample points LC01SD through LC04SD, JS01SD, JS02SD, BK01SD (EPA 2008 Phase I SI), AM05SD, AM06SD, and AM08SD (see Section 4.1.2.1.1 and Ref. 9). This zone of actual contamination provides habitat for several Evolutionarily Significant Units (ESUs) of Federal-listed threatened salmon species as demonstrated in Table 15 below. These species are subject to Level II concentrations of hazardous substances (see Section 4.1.2.1.1).

Table 15
Species Subject to Level II Concentrations

Sensitive Environment	Distance from PPE to Nearest Sensitive Environment	Sensitive Environment Value (Ref. 1, p. 51624, Table 4-23)	References
Lower Columbia River and its tributaries Coho ESU – Threatened *(oncorhynchus kisutch)*	0 feet	75	Ref. 9; Ref. 30; Ref. 31; Ref. 47, pp. 1 and 2; Ref. 50
Columbia River Chum ESU – Threatened *(oncorhynchus keta)*	0 feet	75	Ref. 9; Ref. 32, Ref. 33, Ref. 34; Ref. 48, pp. 1 and 2; Ref. 50
Lower Columbia River Chinook Salmon ESU – Threatened *(oncorhynchus tshawytscha)*	0 feet	75	Ref. 9; Ref. 35; Ref. 36; Ref. 37; Ref. 49, pp. 1 and 3; Ref. 50
Sum of Values			**225**

Wetlands

Not scored.

Sum of Level II Sensitive Environments Value + Wetlands Value: 225 + 0 (not scored) = 225

Level II Concentrations Factor Value: 225

4.1.4.3.1.3 Potential Contamination

Potential Sensitive Environment Targets

Not Scored.

Potential Wetland Frontages –

Not Scored. Although potential contamination to wetlands is not included in this documentation record, it should be noted that many miles of wetland frontage exist within the TDL (Ref. 8; Ref. 42).

Potential Contamination Factor Value: 0