

AMCCO REMEDIAL ACTION CONSTRUCTION COMPLETION REPORT

ASTORIA MARINE CONSTRUCTION COMPANY
ECSI NO. 1898



Prepared for
ASTORIA MARINE CONSTRUCTION COMPANY

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AMCCO REMEDIAL ACTION CONSTRUCTION CERTIFICATION REPORT

ASTORIA MARINE CONSTRUCTION COMPANY

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

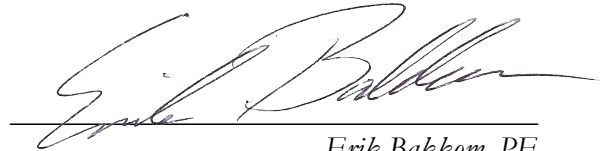
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ACRONYMS AND ABBREVIATIONS

ACOE	U.S. Army Corps of Engineers
AMCCO	Astoria Marine Construction Company
BMP	Best Management Practices
County	Clatsop County Public Works Department
CQA	Construction Quality Assurance
cy	cubic yards
DEQ	Oregon Department of Environmental Quality
DSL	Oregon Department of State Lands
DSL	Oregon Department of State Lands
ECSI	Environmental Cleanup Site Information
EMNR	Enhanced Monitored Natural Recovery
EPA	U.S. Environmental Protection Agency
final design report	Final Remedial Design Report, Astoria Marine Construction Company, ECSI No. 1898, Astoria, Oregon
geotechnical engineer	NV5, Inc. formerly known as GeoDesign Inc,
GPS	global positioning system
Hillsboro Landfill	Waste Management - Hillsboro Subtitle D Landfill in Hillsboro, Oregon
In-Water Contractor	J.E McAmis
ISM	incremental sampling methodology
MFA	Maul Foster & Alongi, Inc.
mg/kg	milligram per kilogram
NAVD 88	North American Vertical Datum 1988
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRG	preliminary remediation goals
RBC	risk-based concentration
remedial investigation report	Remedial Investigation Report, Astoria Marine Construction Company Facility, ECSI No. 1898, Astoria, Oregon
ROD	Record of Decision
SAP	sampling and analysis plan
sf	square feet
Site	Astoria Marine Construction Company site
ug/kg	microgram per kilogram
Upland Contractor	Custom Excavating
WM	Waste Management Northwest

1 INTRODUCTION

Maul Foster & Alongi, Inc. (MFA), has prepared this report summarizing the completed remedial action at the Astoria Marine Construction Company (AMCCO) site (the Site) on behalf of AMCCO. The owner of the Site will also be referred to as AMCCO in this report.

The AMCCO remediation construction was completed in accordance with the *Final Remedial Design Report, Astoria Marine Construction Company, ECSI No. 1898, Astoria, Oregon* (hereafter referred to as the final design report) (MFA 2020b). The final design report describes the specifications of the remedial design for construction of the selected remedial action documented in the Oregon Department of Environmental Quality's record of decision (ROD) (DEQ 2017) and to satisfy the requirements of the consent judgment for AMCCO (Case No. 19CV13270, effective March 25, 2019). The Site is identified in the DEQ's Environmental Cleanup Site Information (ECSI) system as No. 1898.

The selected remedial action addresses the presence of metals, petroleum hydrocarbons, dioxins, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) in contaminated soil; and metals, tributyltin, dioxins, and PCBs in contaminated sediment at the Site. The selected remedial action consists of the following elements:

- Excavation and off-site removal and disposal of contaminated soil (e.g., hot spots)
- Capping of the on-site soils that show contaminants at lower concentrations
- Modification of the upland stormwater system to reduce migration of residually contaminated soil
- Excavation and off-site removal and disposal of contaminated sediment
- Placement of a sand layer above residual sediment contamination and enhanced monitored natural recovery (EMNR)
- Institutional controls to maintain the upland soil cap and manage the sediment remedy
- Long-term monitoring and maintenance for sediment recovery

The consent judgment directs AMCCO to implement the remedial action identified in the ROD. The judgment also specifies that the DEQ will perform long-term maintenance and monitoring of the in-water area after the cleanup remedy is implemented. This arrangement was agreed upon during settlement proceedings. Correspondingly, this report does not cover work that will be performed by the DEQ. AMCCO will remain responsible for upland cap inspections and maintenance, as needed. An upland inspection and maintenance plan has been submitted under separate correspondence.

In 2011, the U.S. Environmental Protection Agency (EPA) initiated efforts to place the AMCCO facility on the National Priorities List, otherwise known as Superfund. In 2012, an agreement deferred the site listing, and EPA transferred site management to the DEQ. The consent judgment also includes

a Natural Resource Damages Assessment and restoration plan agreed upon by project trustees, including tribal governments and natural resource agencies.

This report describes the units of work that were completed from 2020 to 2022, summarizes the construction quality assurance (CQA) program implemented to ensure that the completed components of the project were constructed in compliance with the approved design, and describes issues that resulted in changes to the design.

1.1 Site Location and Setting

The physical address of the Site is the 92134 Front Road, Astoria, Oregon. The Site is located on seven acres just outside the eastern boundary of Warrenton and three miles southwest of Astoria, Oregon, at township 8 north, range 10 west, southeast quarter of section 25, Clatsop County (Figure 1-1). The Site's latitude is 46° 08' 41.67" N and longitude is 123° 51' 45.06" W. The Site is zoned Marine Industrial and is a former shipyard. The area immediately to the north and east are zoned Rural Community Residential.

The upland portion of the Site is generally flat, with elevations ranging from 5 feet to 13 feet North American Vertical Datum (NAVD 88). The 100-year floodplain elevation is approximately 12 feet NAVD 88 along this reach of the Lewis and Clark River. The elevation of the ordinary high water line is 8 feet NAVD 88.

1.2 Permits, Review, and Substantive Requirements for Upland and In-Water Remedial Action

The following permits, certifications, approvals, and notifications were obtained before the start of construction:

- Joint U.S. Army Corps of Engineers (USACE) and Oregon Department of State Lands (DSL) Removal-Fill Permit.
- USACE Section 408 Permit to conduct work on the dike routed through the property adjacent to the Lewis Clark and River. The ROD specifies removal of contamination attributed to the former Burn Pit area located on and within the dike. Dike restoration also included removal of a flood wall to be replaced with approved dike material. The USACE authorization also entails additional requirements outside the scope of the cleanup, such as extending the dike elevation by 2.2 feet to satisfy flood protection standards.
- Oregon Department of Fish and Wildlife in-water work window variance for the period between July 1 and October 15, approved via email (ODFW 2020) for the 2020 construction window. The regular authorized in-water work period along this portion of the Lewis and Clark River occurs from November 1st through February 28th.
- DSL Division 145 Access Agreement addresses access to state-owned submerged land subject to remediation and habitat restoration activities.

- DEQ 1200C National Pollutant Discharge Elimination System Permit addresses stormwater discharges during construction.
- Clatsop County approvals or permits, as required, for the following:
 - Demolition
 - Conditional use review for proposed active restoration (dredging, enhanced monitored natural recovery sand placement, dike restoration)
 - Floodplain development review

1.3 Site Work Summary

The final design report (MFA 2020b), approved by the DEQ in June 2020, presents the basis of the design for the upland and in-water remediation project. The primary basis of the design is to implement hot spot excavations and capping to the limits summarized in the ROD (DEQ 2017), and based on the remedial investigation and modified or further delineated by the supplemental investigations conducted by MFA and GSI Water Solutions, Inc. (GSI 2016). Figure 1-2 shows the main Site features, which are referenced throughout this report. The remediation project includes the following general components: demolition, in-water works (including water quality controls), upland remediation work, and dike restoration and extension. Remedial action implementation is described in greater detail in Sections 2 and 3.

The upland and in-water remediation components of the project were awarded to two separate contractors. Custom Excavating (the Upland Contractor) was contracted to complete upland remediation and nearshore sediment excavation and backfill work, while J.E. McAmis (the In-Water Contractor) was contracted for in-water remediation work, including piling and in-water structure removal, sand transport, and EMNR sand placement. This report documents that remedial units of work completed by AMCCO and its contractors are consistent with the final design report, plans, and specifications, as well as consistent with MFA's direction as lead project engineer for the project. MFA was supported by geotechnical engineers from NV5, Inc. (NV5), for verification of the dike restoration construction. MFA specifically conducted and provided oversight for the activities described below. Descriptions of deviations from the final design report are described in Section 3 and are generally based on field observations and approved by the DEQ.

Project permits were obtained prior to construction, with the extensive USACE Section 408 Permit authorization granted in December 2019. In consultation with and approval by the DEQ, AMCCO performed a focused removal of the debris piles early in 2020 as a conservative measure to minimize potential erosion of contaminated solids that would have resulted from the removal of overwater structures that were protecting the debris piles. The proposed debris pile removal is documented in the technical memorandum, *AMCCO Demolition Update and Debris Pile Removal Request* (MFA 2020a). Prior to removal activities, the Upland Contractor installed upland and water quality best management practices (BMPs) in related areas. The implemented in-water BMPs included silt curtains and debris booms; upland BMPs included a rock construction entrance and a lined soil and sediment storage cell constructed of concrete blocks. Overwater building structure demolition work took place between February 1 and February 28, 2020, during the normally approved in-water work window. Following

demolition of the pipe shop and partial demolition of the coffee shop, the debris piles were removed and staged in an upland area that was located directly over Hot Spot #8 (See Figure 1-3 for locations of sediment and upland soil hot spot excavation areas).

The debris pile material was later removed from the Site and disposed with other excavated hot spot materials. The rest of the upland structures were demolished between February and June 2020. In-water structures, dock floats and associated piles, cradle system rails at Marine Ways #1, #2, and #3, and portions of wooden bents supporting the rails were removed from the Site by the In-Water Contractor in early July 2020. All wood and metal debris were transported to the Upland Contractor's recycling facility (Trails End Recovery) for recycling.

Construction of the primary in-water and upland remediation work commenced in July 2020. The Upland Contractor performed upland Site preparation and nearshore dredging. The In-Water Contractor installed the EMNR sand layer. All in-water work was finalized by September 2020. Upland hot spot excavation and removal work was completed between August and October 2020.

Upland hot spot excavations were excavated and backfilled in general conformance with the design drawings. In the former Burn Pit area, removal volumes were increased from the planned 1,400 cy to 1,600 cy based on subsurface conditions discovered in the field. Subgrade grading for the north and south yards was completed to smooth out the uneven surfaces and to direct runoff towards the stormwater pond, which provided a small amount of detention and sedimentation prior to discharge. During grading operations and prior to the placement of the final cap, straw was placed over the disturbed surfaces as a temporary erosion control measure. A small portion of southeast quadrant was capped with a minimum of 12 inches of gravel cap to accommodate construction of a concrete block perimeter fence. A ten-foot-wide stretch abutting the north property line was capped with 24 inches of topsoil, underlain by orange mesh plastic fencing (demarcation layer), and planted with shrubs.

Dike restoration work commenced in September of 2020 and was halted in October of 2020 due to wet weather, a shortage of suitable dike construction material, and regional forest fires that produced hazardous air conditions. The delays in fall 2020 paused dike construction and winterization measures were implemented throughout the Site by mid-October, prior to reaching final design elevations. Dike construction resumed and was completed in September 2021. For detailed information on dike restoration work, see Section 2.7 of this report.

The construction of Site stormwater improvements was started in the 2021 construction season and completed in the 2022 construction season. A total of two stormwater ditches were excavated; one ditch to convey stormwater from the southwestern portion of the Site and the other to convey stormwater from the southeastern edge of the Site. For more information on the construction of the stormwater facilities, see Section 2.9 of this report. North yard gravel capping was completed in 2021; south yard subgrade grading and gravel capping were completed in 2022. For detailed information on the gravel cap placement, see Section 2.8 of this report.

1.4 Construction Quality Assurance

Construction quality assurance for environmental work was performed by MFA as necessary to verify and document satisfactory construction of remedial design elements presented in the final design

report. AMCCO provided overall construction management of the contractors and coordinated site inspection requests with MFA. NV5 provided geotechnical oversight and inspection during the dike restoration activity.

During February 2020, the MFA CQA officer was on site on the day of the removal of the debris piles to document the work. Additionally, AMCCO provided oversight during building demolition (upland and overwater), which occurred between February and June 2020.

The removal of contaminated soil and sediment, and the initial construction of the dike occurred between July and October 2020. AMCCO directed construction activities on a day-to-day basis. The MFA CQA officer was on site to document the removal and management of contaminated soil and sediment. The geotechnical subconsultant provided oversight during dike restoration work in September 2020.

Between July and September 2021, a gravel cap was placed over the north yard, the dike was restored to the full elevation required by USACE, and the stormwater ditch construction began. AMCCO directed construction activities, the MFA CQA officer performed periodic inspections to monitor and verify the progress of work, and NV5 provided dike inspection services.

Due to the limited amount of work to be completed in 2022, MFA coordinated closely with AMCCO for work progress updates through field photos and routine communication, supplemented with several site inspections. The CQA officer reported observations, issues, and recommendations to the lead project engineer for communication to AMCCO and the contractor(s) when required (see construction daily reports in Appendix A).

1.4.1 Upland

MFA provided upland remediation oversight which consisted of verifying perimeter controls, monitoring excavations, material loading, site grading, dike restoration work, and site restoration activities. This also included verification of erosion control BMPs. Observations of remedial activities are presented in Sections 2 and 3 and supporting documentation is provided in Appendix A.

Geotechnical engineer NV5 was subcontracted for construction inspection of the dike restoration in accordance with USACE Section 408 Permit requirements. Section 2.7 summarizes dike restoration activities completed in two construction seasons (2020 and 2021). Appendix B is the memo for *AMCCO Dike Restoration Progress, End of 2020 Season Update. A Final Summary Report for Geotechnical Construction Observation Services* was issued by NV5 and included in this report as Appendix C.

1.4.2 In-Water Work

MFA provided oversight of in-water remediation work, which consisted of verification of in-water BMPs, observation of hot spot dredging operations, and placement of EMNR sand placement. Remedial activity observations are presented Sections 2 and 3 and supporting documentation provided in *CQA Daily Reports* (Appendix A), and *EMNR Core Sampling Observations* (Appendix D).

Additionally, in-water construction addressed National Resource Damage Assessment (NRDA) obligations, which included removal of floating docks and associated piles. MFA coordinated with the Construction Team on documentation of the completed NRDA work.

1.5 Construction Meetings

Construction coordination meetings were held virtually via Microsoft Teams and included the DEQ (Erin McDonnell, and Kevin Parrett), the lead project engineer, and AMCCO. The meetings were held to provide weekly work progress updates and to discuss schedule, outstanding issues, health and safety, and other topics as designated by the party recipients. The DEQ was consulted weekly and more frequently as needed.

1.6 Construction Daily Reports

While on site documenting removal of contaminated soil and sediment, MFA generated a daily report of construction activities. Reports recorded observations regarding site conditions, contractor activities, construction issues, and construction progress. Daily reports typically included photos of the day's construction activities along with appropriate figures. The construction daily reports are provided in Appendix A.

An email summary of construction progress was sent to the DEQ on a weekly basis (with the daily reports attached) during 2020 and 2021 construction seasons, and bi-weekly during 2022 construction season. These progress updates summarized upland and in-water construction activities, communications, and planned construction activities for the following week. For the 2020 construction season reporting, a figure, along with site photos, was included with each progress update to identify the extent of work completed.

1.7 Photographic Documentation

Photographs were taken daily by the construction oversight team (MFA and AMCCO) to record units of work and site conditions. Photographs were logged and stored by the engineer, and selected photos were attached to each of the daily reports that are in Appendix A. MFA maintains a full inventory of digital construction photographs. A photo log illustrating the completed remediation components is attached as Appendix E.

1.8 Water Quality Monitoring

Water quality in the Lewis and Clark River was monitored for the duration of in-water construction, consistent with the approved Clean Water Act Section 401 Water Quality Certification (see the daily reports in Appendix A). Turbidity measurements at the background and compliance monitoring points showed no significant water quality impacts during construction. No visible plumes were observed associated with in-water demolition work. Additional water quality monitoring activities are documented in Section 2.3.6.

1.9 Health and Safety

During site activities, MFA personnel strictly adhered to the project health and safety plan provided in the final design report (MFA 2020b).

2 REMEDIAL ACTION OBSERVATIONS

2.1 Site Setup, BMP Installation, and Equipment Mobilization

Prior to the start of remedial construction, the owner coordinated site preparation, including perimeter erosion control BMPs, utility locates, minor clearing and grubbing, relocation of power service to the facility, and structure demolition.

Erosion and sediment controls and other construction site BMPs were installed prior to the start of work or during the construction process. MFA's CQA officer verified the installation of the following BMPs:

- Perimeter stormwater runoff control berm
- Construction entrance
- Establishment of sediment dewatering cells
- Silt fence
- Debris booms
- Turbidity curtain

A variety of upland equipment was delivered to the Site during the course of the 2020 construction season, including, but not limited to, excavators (standard and long reach), front loader, drum roller, backhoe with attachments (i.e., a pin wheel for compaction), a small bulldozer, and dump trucks. In-water equipment included a crane derrick, materials barges, a tugboat, and a skiff.

2.2 Import Material Analysis

All import material, including sand, dike construction clay, crushed rock, and topsoil, were analyzed in accordance with the sampling and analysis plan (SAP) provided in the final design report (MFA 2020b). Table 2-1 summarizes the analytical results for in-water materials and Table 2-2 summarizes the analytical results for upland and dike materials. Screening analysis confirmed that selected material sources were suitable for the intended use.

Clean sand was imported to the Site from a local sand source (Grampson Property in Warrenton) by the Upland and In-Water Contractors for placement as backfill and as enhanced natural recovery cover material to be placed in aquatic areas.

A five-point composite sample was collected from the sand source prior to transporting sand material to the Site. Once the sand source was approved, one sample for every 1,000 cy of imported sand was collected to document placed sediment quality. A 30-point composite sample was collected at the source location.

The composite sediment samples were submitted to Apex for the following analyses:

- Organotins by Organotins SIM
- TPHs by NWTPH-Dx
- Total Metals by USEPA Method 6020A
- Pesticides by USEPA Method 8081A
- Total PCBs as Aroclors by USEPA Method 8082A
- Semivolatile organic compounds by USEPA Method 8270D
- Dioxins by USEPA Method 1613B

All import materials placed in water met the sediment fill criteria, which were based on both the sediment toxicity criteria and the sediment background values that had been presented in the *Screening Level Human Health and Ecological Risk Assessment* (MFA 2015), as identified in the final design report.

For dike construction soils, clayey soil was sourced from Upland Contractor's commercial landscaping supply facility (Trails End Recovery located at 2060 SE Airport Ln, Warrenton, OR 97146). Incremental sampling methodology (ISM) samples were collected from Trails End Recovery, where the soils were stored as a single soil stockpile. A 30-point composite sample were collected from the soil embankment. A composite sample was obtained for every 2,500 cy of import soil. Approximately 5,950 cy of dike soil was imported to the Site.

Due to the known history (a former vacant site that was recently developed to become the Warrenton Walmart site; based on a review of the aerial photography, this site had not been previously developed) of the dike material (clayey soil), the composite soil samples were submitted to Apex for analysis of:

- RCRA 8 metals by USEPA Method 6020A
- TPHs by NWTPH-Dx
- PAHs by USEPA Method 8270D

The landscape buffer from the north property line received a minimum of 12-inch soil layer with an import of approximately 400 cy of soil. For vegetated buffer import soils, a five-point composite sample were collected from Trails End Recovery, where it was stored as a stockpile. The five-point composite sample was collected from the stockpile. A composite sample was obtained for every 500 cy of import soil for the vegetated buffer. Due to the various and unknown sources of this material, the composite soil samples were submitted to Apex for analysis of:

- RCRA 8 metals by USEPA Method 6020A
- TPHs by NWTPH-Dx

- Pesticides by USEPA Method 8081B
- Herbicides by USEPA Method 8151
- PAHs by USEPA Method 8270D

Import materials for the upland and dike meet the clean fill criteria, with the exception of three sample results for topsoil that was placed on a small area (a 10-foot-wide swath) along the north property line to support a vegetative buffer (the area is noted as Upland Soil Cap on Sheet C5.2 Upland Capping Plan of the as-built drawings in the Drawings section that follows this report). The topsoil is not expected to result in any unacceptable risk to human health or ecological receptors for the following reasons:

- Cadmium marginally exceeds the clean fill natural background-based criterion of 0.54 milligram per kilogram (mg/kg). The detection of 0.765 mg/kg is consistent with the maximum detected background concentration of 0.701 mg/kg that was used to develop the criterion (DEQ, 2013) relevant to the Site (Coast Range) and is still representative of background cadmium concentrations. The detection is also two orders of magnitude below the lowest DEQ human health risk-based concentration (RBC) for soil of 78 mg/kg and the lowest DEQ 2020 ecological RBC of 23 mg/kg.
- Dibenzofuran exceeds the clean fill criterion of 2 microgram per kilogram (ug/kg). The criterion is based on an outdated ecological RBC. The detection of 56.1 ug/kg is two orders of magnitude below the lowest and current DEQ 2020 ecological RBC of 6,100 ug/kg.
- Naphthalene exceeds the clean fill criterion of 77 ug/kg. The clean fill criterion is based on a soil-leaching-to-groundwater RBC for residential properties. The Site is nonresidential and the detected value of 219 ug/kg is well below the soil-leaching-to-groundwater RBC for an occupational scenario (340 ug/kg). The detection is also well below the lowest DEQ human health RBC for direct soil contact (5,300 ug/kg) and the lowest DEQ 2020 ecological RBC of 1,000 ug/kg.

2.3 In-Water Work

The in-water work addressed the ROD requirements to remove and dispose of highly contaminated sediment and to place a sand layer above sediment with low-level contamination for the enhancement of monitored natural recovery processes. The in-water construction approach employed engineering and operational controls to prevent the release of sediment with contaminant concentrations exceeding the DEQ's acceptable risk levels.

The hot spot sediment was dredged and backfilled with clean sand "in the dry," at low tide. The area of sediment with low-level contamination was covered by the slow placement of clean sand from a crane derrick with GPS tracking equipment to ensure accuracy.

2.3.1 Structure Removal

In accordance with the Natural Resource Damage Injury Evaluation and Restoration Plan, which was an attachment to the CJ , dock floats and pilings that were shown in Drawing C2.4, along with the pilings needed to be removed for barge access were removed by J.E. McAmis prior to start of dredge and sand placement. A total of 81 pilings were removed. Removed wood was recycled at Trails End Recovery facility in Warrenton, Oregon.

2.3.2 Tidal Schedule

The in-water work schedule was closely coordinated with the daily tide cycles. Nearshore dredging required all work (including sediment exaction, sampling, and backfill) to occur during the low tide cycle. EMNR sand placement work generally required high tide conditions to avoid having the barge run aground.

2.3.3 Nearshore Sediment Excavation

Dredge boundaries (i.e., corners) for sediment hot spot areas were marked by the surveyor and marked with white PVC pipe driven into the sediment as posts. In-water structures, such as rails and wooden support structures within dredge boundaries, were removed to facilitate sediment excavation. After determining that the removed wooden components had not been treated through visual observation of field-cut samples (see Daily Report 07.30.2020 in Appendix A), debris was recycled at the Trails End Recovery facility. The quantity of removed in-water structures had not been accounted for in the design sediment removal volumes.

All sediment dredging work was performed by the Upland Contractor with a long reach excavator during low tide conditions. The Upland Contractor dredged to the extents shown on the engineering plans for the North Dredge area, and Marine Ways #1, #2, and #3 in the dry during low tide cycles from late July through August (see Sheet C4.0 of the as-built drawings). Each dredge area was completed in multiple daily dredge units. A daily unit would be dredged to the target depth (3 to 4 feet below existing grade), photographed, and sampled (if a sample aliquot was designated within the daily unit), and then backfilled ahead of the returning tide. Daily dredge units were joined by exposing the backfill sand of the preceding daily dredge unit. Sample aliquots were stored on ice for field compositing prior to shipment to the laboratory.

The excavator bucket was cleaned prior to handling clean backfill sand by physically removing (shaking and brooming) excess sediment over the dredge area, minimizing the opportunity for cross-contamination of clean sand. The clean sand backfill depth was approximately equivalent to the dredge depth in all locations, which resulted in depths ranging from 3.5 to 4.5 feet.

Excavated sediments were stockpiled in the closest of three on-site containment or dewatering cells (see Sheet C2.1 of the as-built drawings). The containment cells were lined with a filter fabric and contained by concrete Ultrablock walls. Most of the dewatering occurred through evaporation. In accordance with the final design report (MFA 2020b), oyster shells were brought on site to be deployed immediately downstream of the containment cells, for treatment in case surface runoff of the

dewatering water were to occur. However, no overland flow of the dewatering water was observed at any of the containment cells. Waste characterization samples were obtained from excavated sediment and submitted to Waste Management Northwest prior to disposal at the Hillsboro Subtitle D Landfill in Hillsboro, Oregon (Hillsboro Landfill).

Based on the field analysis, the excavated sediment at Marine Ways #1, #2, and #3 were categorized as fine sand with silt, with a high water content and a high amount of organic matter.

2.3.3.1 CQA

MFA's CQA officer provided full time engineering oversight to verify and document that the horizontal limits of excavation matched the permit. The aerial extent of removal (or take) was not exceeded. The CQA officer also used sidewall measurements to verify that dredge depth targets were achieved. Photo documentation of each excavation is provided in the daily reports (see Appendix A).

2.3.3.2 North Dredge Area

Excavation depth reached to 40 inches from existing grade, resulting in a total of 400 cubic yards (cy) of sediment removal from North Dredge area (see Daily Report 07.22.2020). In the North Dredge area, the excavated sediment was classified as predominantly silt with high levels of organics and high water content. Stockpiled sediments from the North Dredge area were blended with Enviroblend CS lead stabilizing agent (2.5 to 3 percent by weight) prior to waste sampling. Due to the high silt and organics content, dewatering of sediment from the North Dredge area required additional durations of up to three weeks.

2.3.3.3 Marine Way #1

Support pilings under the rails and bents could not be removed. After receiving approval from the DEQ, the Upland Contractor was instructed to excavate around the pilings, relying on manual labor and shovels to remove any residuals around the pilings before backfilling occurred. The excavation bottom ranged between 4 and 5 feet below existing grade (see Daily Report 08.31.2020). Pilings left in place were covered with approximately 12 inches of clean sand. The pilings on the north side of the dredge area that were supporting the dock between Marine Ways #1 and #2 were taller and could not be trimmed before the incoming tide. After MFA determined that the piles were untreated wood, the DEQ approved leaving the taller piles (at approximately 12 inches above finished grade). Where the target depth of excavation could not be achieved in one low tide cycle, the active excavation surface was covered with a minimum of 4 to 6 inches of sacrificial interim clean sand cover layer, before the tide returned in the work area. The following day, the sacrificial layer was excavated until the target depth was advanced and the sacrificial layer was discarded along with the rest of the excavated sediment from the work area. Marine Way #1 was dredged after placement of EMNR sand adjacent to the dredge area. The extents of the clean backfill projected 2 feet out of the dredge boundary, overlapping recently placed EMNR sand. A total of 200 cy of sediment was excavated and disposed at Waste Management Northwest's Hillsboro Landfill. Table 2-3 tabulates total project disposal quantities under three different waste profiles at the Hillsboro Landfill.

2.3.3.4 Marine Way #2

Similar to the pilings associated with Marine Way #1, wooden piling supports for Marine Way #2 could not be removed within the dredge prism. After excavating hot spot sediment as described in Section 2.3.3.3, pilings were left in place and buried with approximately 12 inches of clean sand backfill. The average excavation depth for Marine Way #2 was 3.5 feet (42 inches) (see Daily Report 07.28.2020). A total of 200 cy of sediment was removed and disposed at the Hillsboro Landfill.

2.3.3.5 Marine Way #3

Similar to the pilings associated with Marine Ways #1 and #2, support pilings for Marine Way #3 were present and could not be removed; so the Upland Contractor excavated around the pilings and used manual labor and shovels to remove any residuals around the pilings before backfilling occurred.

The excavation boundary for Marine Way #3 was inadvertently set such that it encroached in the area of the dock structure that was to remain. The Upland Contractor was instructed to excavate as close as possible to the north edge of the dock, without compromising the support structure.

The average excavation depth was 4 feet (48 inches), which also corresponds to the thickness of clean backfill sand. All of the pilings were covered with between 1.5 feet and 2 feet of clean sand after backfill (see Daily Report 08.21.2020). Excavated Marine Way #3 material was blended with a lead stabilizing agent (Enviroblend CS), due to high concentrations of lead. A total of 390 cy of hot spot sediment was removed and disposed at the Hillsboro Landfill (see Daily Reports 08.21.2020 through 08.24.2020).

2.3.4 Sediment Excavation Leave Surface Analysis

The sediment excavations achieved the goal of significantly reducing contaminant mass at all locations. Documentation samples were collected in accordance with the SAP because the excavation was completed sequentially and then immediately backfilled while the work area was dry (i.e. the tide was out). The sequencing of the excavation was required as a turbidity management and residuals control approach. Sediment leave surface results are tabulated in Table 2-4.

A combined composite sample was collected for the leave surfaces at Marine Ways # 1 and #2, and individual composite samples were collected for the leave surface at Marine Way #3 and the North Dredge area. For each sample, five aliquots were collected from a predetermined location, stored on ice, and then composited on site prior to sending to the laboratory for analysis.

The leave surface documentation sample of the North Dredge area, below the former Burn Pit area, shows that the lead concentration exceeded the sediment preliminary remediation goal (PRG), and that total PCBs exceeded the ecological hot spot value. The combined leave surface sample for Marine Ways #1 and #2 was below sediment PRGs. The Marine Way #3 leave surface documentation sample shows that the copper concentration exceeded sediment PRGs, and that lead and total PCBs exceeded the ecological hot spot value. At the North Dredge area and Marine Way #3, the sediment contamination that remains has been covered by more than 3.5 feet of clean sand cover. The residual

contaminant concentrations at the leave surface/backfill interface are not expected to result in unacceptable risk to human health or ecological receptors for the following reasons:

- At least 3.5-feet of backfill sand has been placed over each sediment excavation, physically isolating residual concentrations.
- The North Dredge area and Marine Way #3 area are depositional. The placed materials are not expected to erode and it is anticipated that clean sediments will deposit in the area, further burying remaining contamination.
- Bioturbation is typically limited to the top 4 inches in sediment. The placed material exceeds 36 inches and therefore mixing of, and contact with, the leave surface by receptors is not expected.
- There is little to no contaminant flux that is expected to occur toward surface water as a result of the preference for risk-drivers (PCBs, dioxins) to sorb to sediment and due to limited groundwater discharge to the Lewis & Clark River (as summarized in the ROD).
- The limited groundwater flux potential coupled with the very thick layer of backfill sand and the expectation for no expected contact as a result of benthic activity, the potential for long-term transport of contaminants through the clean backfill layer is extremely low.

MFA issued a memorandum to the DEQ on July 30, 2021 (Appendix F), that (1) discussed remediation work completed at Marine Way #3, (2) provided a summary of the construction quality assurance protocols conducted by MFA, and (3) outlined future use in response to the elevated concentrations of PCBs.

2.3.5 EMNR Sand Layer Placement

J.E. McAmis and Custom Excavating transported clean sand via barge from the sand source site in Warrenton, Oregon. J.E. McAmis placed clean sand from a crane derrick equipped with an 8-cy-capacity clamshell bucket and real-time GPS tracking technology. EMNR sand placement was placed by the Upland Contractor for a portion of the project between Marine Way #4 and the former Burn Pit area, where the barge could not reach. The Upland Contractor overlapped the clean sand placed by barge by a minimum of 2 feet along the transition area. As required in the project specifications, EMNR sand was placed in 6- to 12-inch sand lifts within the designated areas shown on the plans.

The work was performed during high tide conditions.

A total of 2,100 cy of imported clean sand was placed over an area that was 65,700¹ square feet (sf) in size, corresponding to an average EMNR thickness of 10.4 inches, satisfying the design specification. The approximate footprints of individual in-water remediation areas are listed below:

- North dredge area: 2,630 sf

¹ The EMNR Sand Area listed in the final design documents was 72,100 sf and inadvertently included the wood deck between Marine Way #2 and Marine Way#3. The corrected EMNR sand placement area is 65,700 sf.

- Marine Ways #1 and #2 dredge area: 4,850 sf
- Marine Way #3 dredge area: 2,475 sf
- EMNR sand area outside the dredge areas: 55,745 sf

To verify the EMNR sand placement and near-term stability, three separate core sampling events were performed following remedy construction at one year intervals (2020, 2021, and 2022) a year apart, documenting the thickness of the clean sand layer and the presence of a clear and abrupt transition to the native sediment. A Russian peat borer sampling device was used for all sampling events at depths of up to 2 feet to inspect the EMNR sand and sediment interface. The first core sampling event occurred in September of 2020 and consisted of collecting data at 11 points within the nearshore sand placement area (see Appendix D for *EMNR Core Sampling Report*). The sand placement depth over the sampling points resulted in an average sand layer thickness of approximately 12.5 inches, with the minimum collected sand thickness at 10 inches and the maximum collected sand thickness at 15 inches. The second core sampling event occurred in August 2021 and consisted of collecting data at the same 11 sampling points as for the first core sampling event, as well as at a 12th sampling point. The third core sampling event took place in August 2022 and included data collection from five of the previously sampled locations. The objective of the subsequent core sampling events was to verify stability of the EMNR sand layer, and to evaluate potential changes in layer thickness after two years of tidal exchange and wave action on the Lewis and Clark River. The analysis also evaluated whether there has been any discernable mixing at the EMNR sand and sediment interface. A handheld GPS unit and GIS mapping were used to locate the previously identified sample locations (see Appendix D for *EMNR Core Sampling Report*). All EMNR core sampling work was conducted in the dry during low tide conditions.

All of the coring locations show that the design goal of delivering a minimum of 6 inches has been achieved. While the EMNR is not required to maintain a specific thickness long-term since mixing and erosion/bed exchange is expected, it is noted that the minimum sand depth continued to exceed 6-inches in 2022.

At the DEQ's request, core samples of the dredged and backfilled areas were attempted after EMNR sand placement within the excavation areas to verify the backfill sand and native sediment interface. Both the CQA officer and AMCCO attempted to collect deeper samples, but the recently installed clean sand layer was too thick for the sampling instruments available on site.

2.3.6 Water Quality Monitoring

Water quality was monitored for the duration of in-water construction, consistent with the approved Clean Water Act Section 401 Water Quality Certification. Turbidity measurements were taken at the compliance and background monitoring points during active in-water construction from July 5 through September 10, 2020. The background turbidity location was set approximately 100 feet upstream of the work area, and the compliance point was set 100 feet downstream of the work area. A water quality meter, the Aqua TROLL 600 Multiparameter Sonde, was used from a boat to collect measurements every two hours during active in-water work periods. Measurements at the background and compliance monitoring points were highly correlated, showing no significant water quality impacts

during construction. No visible plumes were observed associated with in-water demolition work. Daily water quality measurements were recorded in the daily construction reports (Appendix A).

MFA contacted² Jeff Britain of the DEQ on September 10, 2020, to discuss (1) the water quality monitoring requirements with consideration of the fact that sediment excavation in the marine ways had been completed, (2) the proven performance of the deployed turbidity curtains (based on the water quality monitoring data with no exceedances for turbidity), and (3) remaining work planned for the face of the dike was to be conducted in the dry. It was agreed that the project would continue to comply with the Clean Water Act Section 401 Water Quality Certification and would not need to monitor turbidity with water quality monitoring equipment for any remaining work below high tide line, as long as the work occurred in the dry and the turbidity curtains were maintained. Visual turbidity inspections continued, with no visual indication of turbidity, until all shoreline work was completed. In-water work construction was completed, meeting the requirements of the Clean Water Act Section 401 Water Quality Certification.

2.4 Upland Remediation

The upland remedial design addressed the ROD requirements to remove and dispose of more highly contaminated “hot spot” soil, to construct a cap over soil with low-level contamination within the Site extents, and to remove contaminated sediment from stormwater ditches surrounding the Site. The ROD identified three hot spot areas, two smaller ones on the southern portion of the property and the former Burn Pit area on the northern portion of the property.

In 2020, units of work completed include site preparation, impacted soil excavation, backfill, site regrading, and perimeter control fence construction. Hot spot soil was removed by excavator and disposed at the Hillsboro Landfill. The 2020 work addressed a majority of the on-site and off-site ditches that were required to be cleaned out and excavated, with wastes disposed at the Hillsboro Landfill.

In 2021, units of work included the completion of the stormwater basin construction, partial completion of the on-site stormwater ditches, and completion of the northern upland gravel cap.

In 2022, upland remediation units of work included the excavation and rock lining of the on-site stormwater ditches, completion of the rest of the upland gravel cap (south yard capping), and the remaining grit excavation around the existing structures, substantially completing all required activities.

2.4.1 Upland Structure Removal

Several upland structures were demolished or partially demolished by the Upland Contractor to facilitate remediation, though demolition was not a required part of the remediation. Overwater structures, including the pipe shop and coffee shop, were demolished during the February 2020 in-water work window. Upland structures were demolished between March and July, which included a portion of the ship building and three other support structures. All upland structure demolition debris

² Britain, Jeff. 2020. Telephone communication (re: exemption from water quality monitoring for remaining work below high tide line) with Cem Gokcora, Maul Foster & Alongi, Inc.: Portland, OR. September 10.

was managed by AMCCO and the Upland Contractor, and was recycled at the Trails End Recovery facility in Warrenton, Oregon.

2.4.2 Upland Excavation and Handling, Transport, and Disposal

Upland contaminated soil was excavated between July and October 2020. All contaminated soil excavated from the Site during remediation was disposed of at the Hillsboro Landfill. The total amount of soil hauled from the Site and disposed of was approximately 2,860 tons, as identified in Table 2-3.

2.4.2.1 Upland Hot Spot Excavation

The two designated hot spots in the upland facility area, designated Hot Spot Excavation Areas 7 and 8, were excavated to a depth of 30 inches and to the extents shown on the plans. Approximately 150 cy of contaminated material was excavated from Excavation Area 7, and 25 cy of material was excavated from Excavation Area 8.

Leave surface samples were obtained from each of the excavation areas. A five-point composite sample was collected from each excavation area and field composited prior to shipping to the laboratory for analysis. The composite sample aliquots were collected in accordance with the SAP. The hot spot excavations were backfilled with clean imported fill upon completion of excavation. Excavated hot spot soils were stockpiled in containment cells for disposal characterization.

2.4.2.2 Former Burn Pit Area Excavation

AMCCO surveyed the excavation boundary of Upland Hot Spot Excavation Area 6 (Former Burn Pit Area Excavation) based on the final design report. During this survey, the northern boundary was potholed for further refinement. Due to the findings from this initial potholing, the excavation boundary was adjusted to include the hot spot material that projected further north than the original boundary. The southern hot spot boundary was also reevaluated, which resulted in excluding the non-hot spot areas. An analysis describing the environmental benefit of removing hot spot materials versus source control exceedances was submitted to DEQ on August 28, 2020 (Appendix G). In it, MFA recommended prioritizing hot spot removal in a smaller footprint, provided that the area of source control exceedances was managed under an erosion control (dense grass cover). DEQ expressed their preference for the excavation to proceed as planned.

The Upland Contractor started the excavation at the northwest quadrant of the Former Burn Pit Area Excavation, along the riverward face of the overbuilt dike section. As agreed to with the DEQ during a phone conversation³ on September 25, 2020, the operator followed visual markers (burnt debris, change in granularity, and color) to determine the excavation extents. As a result of following visual markers, the Former Burn Pit Area Excavation grew in overall size on the landward side, and in depth. The landward side was modified due to the potential for interfering with the existing dike prism (see Sheet C3.0 of the as-built drawings). The material that was exposed was generally burnt debris (i.e.,

³ McDonnell, Erin 2020. Telephone communication (re: former Burn Pit area excavation limits based on results of initial potholing) with Cem Gokcora, Maul Foster & Alongi, Inc.. Portland, OR, September 25.

cables, metals, coarse grit). The operator excavated debris until firmer and finer subgrade soil, generally free of debris and grit, was encountered.

During initial excavation, it was discovered the burnt debris extended past the originally anticipated 3-foot depth, to more than 6 feet below the preconstruction grade. All excavated material was transported and placed in the north sediment containment area via a front-end loader that was loaded by the excavator. The excavated bottom was dark brown to gray color with no significant odor. The subgrade soils were generally consistent with the material that had been observed at the bottom of the sediment excavation at the toe of the dike.

The Former Burn Pit Area Excavation bottom was approximately 36 inches below grade and tied into the sediment hot spot excavation bottom at the toe of the dike. The resulting excavation removed over 10 feet of material from the dike surface. Excess soil and debris were physically removed from the excavator bucket over the excavation, before beginning backfill operations. The excavation subgrade (i.e., newly exposed dike) was stair-stepped in accordance with dike restoration plans and backfilled with clean clay, as shown in Figure 2-1.

During the progress of excavation within the burn pit area, when it became apparent that the hot spot volume would exceed the quantity listed in the ROD and design plans, DEQ agreed to focus on removing the hot spot material only. While the source control areas were moderately above the PRGs established by the DEQ to be protective of erosion to surface water, the parties agreed that the vegetation present on the dike face was sufficient to manage the risk of erosion and potential release to the river. Upon completion of the burn pit excavation, all areas of burned material and the mapped hot spot concentrations were removed (including the entire 4- and 7-foot-deep excavation areas). A portion of the 2-foot-deep excavation area, generally north and west of the former Burn Pit hot spot, was removed to the extents shown in Figure 2-1. Approximately 1,600 cy of hot spot material was removed from the Former Burn Pit Area Excavation. This volume exceeds the 1,400 cy of source control and hot spot soil that was planned to be removed in the design.

All work was completed in the dry, and no visible turbidity was observed when the high tide covered the lower areas of the clean sand backfilled hot spot excavation areas.

2.4.2.3 Burn Pit CQA Sampling

As a result of the reduction in the excavation footprint of the former Burn Pit soil to focus on greater amounts of potential hot spot contamination than originally estimated per coordination with DEQ, the incremental sampling methodology (ISM) leave surface sample approach (as described in the SAP) required modification to reduce the increments down to 20 (from 30). Though the footprint was reduced from the original plan, the volume of removed contaminated material increased with the larger excavation depth than planned. The modified ISM sample is representative of leave surface concentrations. Modified ISM increments were located by GPS for accuracy. Triplicate samples were collected at each accessed sampling location. Duplicates and triplicates were collected within 5 feet of each sampling location.

A ten-point field composite waste characterization sample was collected from the stockpiled excavated soil and debris material within the north containment cell and was analyzed. Waste characterization results were shared with the Hillsboro Landfill prior to disposal.

Approximately 1,730 tons of excavated former Burn Pit material was hauled to the Hillsboro Landfill for disposal.

2.4.2.4 Grit Excavation and Backfill Around Existing Structures

The Upland Contractor began excavating grit from the perimeters of the building in 2021 as identified in the ROD. Work also addressed remaining backfill placement following the completion of the hot spot and former Burn Pit area excavation. Grit excavation for site buildings included 6-inch-deep excavation trenches with widths of approximately 3 feet around the main ship building, the machine shop, the welding shop, and the sand blast shop. Demarcation fabric was placed on the ditch subgrade before being covered with a 12-inch-thick gravel cap. The excavated material was hauled to and disposed of at the Hillsboro Landfill using the same waste profile that was generated for upland hot spot excavation material and burn pit material. All grit excavation and backfill activities were completed in mid-July 2022.

2.5 Leave Surface Analysis

Leave surface sampling at each hot spot excavation area were conducted per the SAP as part of final design report (MFA 2020b). Samples were stored in temperature-controlled coolers and transported to Apex Laboratories, LLC, which conducted all analytical lab testing for the remediation construction.

Upland Excavations

Analytical results for Excavation Areas 7 and 8 are tabulated in Table 2-5. The leave surface sampling documents concentrations are generally below soil PRGs. There is a minor total PCB exceedance of the soil PRG at Excavation Area #7.

The upland excavations achieved the goal of removing a significant volume of soil exceeding hot spot values. As described in the *Remedial Investigation Report, Astoria Marine Construction Company Facility, ECSI No. 1898, Astoria, Oregon* (remedial investigation report) (GSI and MFA 2015), soils at the Site generally have a very low permeability, and when combined with the very low solubility of PCBs in water, the risk associated with remaining concentrations of PCBs in soil will be fully managed by the soil cap.

The triplicate leave surface sample results for the former Burn Pit area (Excavation Area #6) are shown in Table 2-6. The results are screened against the soil PRGs, as the former burn pit is in the upland, however sediment PRGs are also shown on the table for reference because the former burn pit excavation is on the riverward face of the dike. The former Burn Pit leave surface analytical results exceed upland PRGs for arsenic and lead; and results exceed sediment PRGs for chromium, lead, and PCBs. However, the results do not exceed hot spot levels, confirming that the remedial action has achieved the goal of removing hot spot soils.

As discussed in Section 2.4.2, the former Burn Pit excavation used an approach of targeting visibly burnt debris and ash, while limiting impacts to the dike that protects Clatsop County Diking District No. 5 (the diking district), ultimately removing 1,600 cy of highly contaminated material, exceeding the 1,400 cy that was planned in the ROD. In accordance with the USACE dike restoration plan, the former Burn Pit excavation was required to be backfilled immediately to remain protective of dike function. The former Burn Pit leave surface was covered with a minimum of two feet of clayey soil and vegetated, which significantly limits the potential for exposure and/or erosion in the future.

2.6 Waste Disposal

Waste profiles were generated using historical sampling information from each excavation area combined with post-excavation waste characterization sample results. Excavated materials were sampled for Toxicity Characteristic Leaching Procedure metals analysis for waste profiling in accordance with the SAP and Waste Management Northwest's waste acceptance criteria. Soil and sediment for disposal did not exceed Toxicity Characteristic Leaching Procedure limits and therefore were not considered to be hazardous waste. Approximately 2,860 tons of excavated material was disposed at the Hillsboro Landfill (see Table 2-3).

Due to the lateness of the season and onset of rain, soil in the northern containment cell was found to be too wet and liquid was released from the excavated sediment due to vibration during transport, requiring stabilization prior to disposal at the Hillsboro Landfill. As a result, AMCCO halted transport of the remaining excavated material to avoid landfill stabilization costs. Approximately 350 tons of stockpiled excavated sediment were deemed too wet for transport and had to be stored on site in a containment cell until dewatering could occur through infiltration and evaporation the following spring. After additional drying, the remaining excavated materials were disposed of at the Hillsboro Landfill in 2021.

2.7 Dike Restoration

While outside the scope of the cleanup, as described in the design report, the flood wall within the former main ship building was at significant risk of failure and required replacement to be protective of the remedy and of the diking district.

2.7.1 Demolition and Subgrade Evaluation

On September 8, 2020, the construction team commenced dike restoration work by removing the flood wall within the former main ship building. The existing dike wall was demolished, the subgrade soil was scarified and evaluated. To the south of the ship building, the subgrade soil was prepared by removing asphalt, concrete, and vegetation. Granular material in the subgrade soil was mixed with dike fill at the direction of the geotechnical engineer.

Upon approval of the subgrade conditions by the geotechnical engineer, dike fill material meeting the project specifications was placed and then compacted in 8-inch lifts to the height and extents identified in the final design report following the specified three-to-one side slope requirement. The material was compacted in place using tracked equipment and a smooth drum roller and then verified for

density. The surface of each lift was scarified by the excavator tracks and bucket prior to installation of the subsequent lift.

Compaction density was verified by the geotechnical engineer using a Troxler 3430 nuclear density gauge. The density results were compared against the geotechnical engineer's laboratory-produced compaction curves to determine the relative percent of maximum compaction. A 3-foot-tall embankment had been constructed in the dry by the end of the day on September 10, 2020. The embankment satisfied USACE Section 408 authorization requirements to an elevation of +12 feet NAVD88.

The Upland Contractor notified MFA on September 10, 2020, that the original dike material pile would soon be consumed and proposed a secondary pile at its yard. Due to the lack of available dry fine-grained material at the Upland Contractor's material yard, the construction team stopped embankment work in the afternoon of September 11, 2020, in search of suitable drier local fine-grained material.

Two backup sources of dike material were located, but both were found to have excessively high moisture, requiring significant drying prior to use. Due to the very low sun intensity as a result of heavy wildfire smoke, ambient drying was determined to be not feasible.

After consulting with the diking district manager, AMCCO proceeded with placing several uncertified lifts to an elevation of +13.5 feet NAVD88, equal to the surrounding dike elevation and corresponding to the predicted 500-year flood elevation. The embankment was topped with 12 to 18 inches of crushed rock underlain by filter fabric to stabilize the dike for winterization.

On August 30, 2021, the construction team resumed dike restoration work by removing the uncertified lifts to prepare for the addition of new lifts. The backup source of dike material used for the new lifts consisted of clay material from the same source used for the fill placed the prior year (see Section 2.7.2). The density of the backup source material was verified using a Troxler 3430 nuclear density gauge; the water content was determined to be in the acceptable range. Dike restoration work was completed on September 2, 2021, with the new lifts compacted to project specifications, bringing the dike embankment to a final and certified elevation of 15.0 feet NAVD88. A predicted final settling elevation of 14.33 feet will leave the final dike elevation above the 500-year flood elevation. The dike embankment was topped with 6 to 8 inches of crushed rock for dike access road surfacing. USACE conducted a final dike inspection on September 23, 2021, and the representative expressed their satisfaction with the completed dike restoration. A final geotechnical summary report (Appendix C) was issued on October 6, 2021, to USACE documenting that completion of the dike restoration work is in general compliance with project specifications and the USACE Section 408 Authorization requirements.

2.7.2 Alternative Dike Material

MFA and the geotechnical engineer worked with AMCCO to identify alternative sources of dike clay material that would satisfy project specifications and meet import requirements. In addition to the Upland Contractor's proposed stockpile, a second alternate source of dike clay material was identified that had been excavated from a Seaside School District site, a previously undeveloped site. The

Construction Team obtained geotechnical and environmental samples of both alternative dike clay sources for both sources. Samples were evaluated for environmental quality (consistent with the SAP) and geotechnical properties (proctor curves and moisture content). Analytical results showing that both sources met the DEQ's criteria for clean fill are tabulated in Table 2-2. Geotechnical testing showed that both samples had over 40 percent moisture content and required drying during or prior to placement.

AMCCO selected Dike Crown Camp material and it was stockpiled at the Site for use in 2021. The imported dike material stockpile was covered with polyethylene plastic sheeting for weather protection.

A dike progress report was issued on October 23, 2020, for USACE's review, summarizing completed work, observed conditions with test results, and the winterization plan. USACE reviewed and approved the proposed winterization process. The dike restoration progress report is attached in Appendix B.

2.8 Site Grading and Cap

Site grading began in late August of 2020 upon completion of the in-water work. The Upland Contractor started with grading the southern portion of the Site (south yard) near the south containment cell and the southeast corner of the Site. Clean clay material was placed in several low spots. A thin layer of gravel was placed over the clean clay at the southeast corner of the Site along with Ultrablock concrete block walls for perimeter control.

Grading for the northern section of the Site (north yard) began in mid-October 2020 upon completion of the former Burn Pit excavation. Subgrade establishment included sloping from the northeast corner of the Site to the northwest corner of the Site for stormwater runoff. The north property line vegetated setback was cleared along with excavating the bottom of the north ditch. An 18-inch-thick, clean rock layer was placed over demarcation fabric to support the Ultrablock wall 10 feet from the property boundary. An approximately 24-inch-thick topsoil layer was placed over the demarcation fabric between the property line and the Ultrablock wall. This transition area was planted with a row of shrubs. South yard grading operations had to be halted at the onset of the wet weather; and the area was winterized with the placement of straw over the disturbed soils.

Site grading and capping activities resumed in September of 2021 with the installation of over 24 inches of topsoil along the newly constructed north Ultrablock wall and fence line. The 8-inch base layer of crushed rock was installed over the demarcation fabric for the north yard cap starting in early October 2021. New drainpipes were installed within the backfill rock around the main building perimeter due to potential ponding from site grading.

Prior to cap placement, the north yard was regraded to accommodate positive site drainage to the stormwater pond on the west and conveyance ditch on the east.

As the work season drew to a close in November of 2021, Upland Contractor was able to complete the installation of the north yard cap (to the design installed thickness of 12-inches) and remove most of the grit around the site buildings. Crushed rock was used as backfill where grit was removed.

The 2022 work season commenced in June, with grading and capping of the south yard. The south yard subgrade was graded for stormwater to sheet flow off the dike in a northeast direction toward the east stormwater conveyance ditch. Perforated piping was installed below the cap material to improve stormwater flow toward the east conveyance ditch. Upon completion of subgrade grading, demarcation fabric was installed on the east side of the dike prior to placement of the cap material. Cap material, consisting of three-quarter-inch to one-and-a-half-inch crushed rock, was placed in a single 12-inch lift over the entire south gravel cap, including the area between the dike and wooden docks to the west. All site grading and capping activities were completed in late August 2022.

During cap placement and compaction, AMCCO photo documented the installed cap thickness at various locations (see Photo Log). Upon completion of the capping, topographic survey data was collected by a licensed surveyor and an as-built capping plan was generated showing the final surface elevation of the capped areas. During the final site walk that was conducted on October 20, 2022, MFA verified that the limits of the gravel cap and soil cap (for landscape buffer) are established in compliance with the project plans. MFA was also able to verify that the soil cap installation was conducted in a manner that protects the existing vegetation.

In addition to the remediation scope work described above, new power pole and conduit installation work occurred on the southeast quadrant of the Site during the winter of 2022. As part of that work, a limited disturbed area received crushed rock backfill and surfacing with the same material used for upland capping.

2.9 Construction of Stormwater Facilities

Stormwater conveyance ditch and facility construction commenced in mid-September of 2021, beginning with the installation of two 18-inch culverts at the northern entrance and northeast building access crossings (see Sheet C5.1 of the as-built drawings). The off-site ditch outside the east property line was also excavated down to 12 inches from the existing ditch bottom. The stormwater pond, which is located in the northeast corner of the Site, was completed in October 2021. To facilitate north yard drainage, a total of seven stormwater trench drains that include four-inch perforated PVC piping wrapped in filter fabric running from the east part of the north yard to the storm pond were installed. All stormwater ditches were lined with crushed rock, per the project specifications.

3 ISSUES ENCOUNTERED AND RESOLUTIONS

3.1 Unanticipated Deep Pilings

During preparation for sediment dredging at Marine Ways #1 and #2, the Upland Contractor ran into unexpected deep pilings. Due to the location of the pilings, neither the In-Water nor the Upland Contractor was able to establish equipment to safely pull the pilings. Upon review with the DEQ during a weekly progress meeting on July 28, 2020, it was agreed that if the pilings were untreated, they could be left in place and covered with clean sand. Treated pilings would need to be cut at the

excavation subgrade. MFA provided the DEQ with photo documentation on August 4, 2020, of cut piling cross sections showing no evidence of chemical treatment. Consistent with the DEQ agreement, pilings were left in place and backfill was placed around them. The piling ends are covered by approximately 1.5 to 2 feet of sand cover.

3.2 Sediment Excavation Boundary Adjustment

Prior to the start of sediment dredging at Marine Way #3, it was determined that the southernmost portion of the dredge area overlapped with the dock structure to the south, which was to remain. Due to the angle of the equipment relative to the support piling, the sediment could not be reached without compromising the structural integrity of the dock's supporting structure. Per discussions with the DEQ during a weekly work progress meeting on August 19, 2020, it was decided that the dock should not be demolished because the area of restricted access represented less than five percent of the subject dredge area. Therefore, the excavation limits were slightly revised to avoid undermining the dock.

3.3 Former Burn Pit Hot Spot Excavation Modifications

Two project modifications occurred during the completion of work at the former Burn Pit area. First, the extent of the hot spot removal area was expanded significantly as initial potholing revealed that material was spread further north than originally expected. In order to pursue removing the significant extra volume of hot spot material, MFA and the DEQ agreed to reduce the extent of the non-hot spot excavation on the dike face in the area to the south of the burn pit. The net environmental benefit was significantly increased because it allowed AMCCO to remove and dispose of the more highly contaminated material.

3.3.1 Burn Pit Material Extent

Prior to the former Burn Pit area excavation, a test pit was excavated to establish the northern excavation limit prior to hot spot excavation. The test pit showed that there was a significant amount of burnt debris at the northern corner of the hot spot (extending outside the excavation boundary defined by the remedial investigation). The excavated area was backfilled with sand to allow time for review with the DEQ.

The DEQ and MFA reviewed the photos of the excavated material (approximately 5 cy of burnt debris had been removed and stockpiled at the north containment area). MFA and the DEQ agreed that the burnt debris buried under the Burn Pit was the most critical environmental concern on the Site and that the burnt debris material needed to be removed to the maximum extent practicable.

As described in Section 2.4.2.2, the burn pit excavation was guided by visual markers (burnt debris and changes in granularity and color) leading to a significant increase in the planned excavation volume. The volume of total hot spot excavated material was approximately 1,600 cy whereas the design removal volume had been listed as 1,400 cy.

Figure 2-1 shows the Burn Pit excavation reflecting the daily residual covers and the sand-to-dike material transition.

3.3.2 Source Control Area Excavation

In response to the issue of having excess material to be excavated from the Burn Pit hot spot, MFA presented the DEQ with a series of remedial investigation figures for the Burn Pit (Figures 4a through 10) from the *Technical Memorandum Supplemental Remedial Investigation Results for Astoria Marine Construction Company, Astoria, Oregon* (supplemental remedial investigation results) (GSI 2016). The figures depict the extent of hot spot and source control screening level exceedances for multiple contaminants and at multiple depths. Figure 3-1 in this report summarizes the overall extent of excavation based on a compilation of the remedial investigation figures, which were incorporated into the final ROD figures. MFA reexamined these figures and previous investigation data, and proposed focusing on the removal of the highly contaminated material (i.e., hot spots), rather than residual contamination above source screening values. This adjustment allowed AMCCO to optimize the remaining project funding to prioritize tasks that resulted in the highest environmental benefit. MFA provided the DEQ with the following analysis in an email dated August 28, 2020 (Appendix G):

The source control risk for copper was considered as the basis for design regarding the shallow (2-foot) excavation boundary, as shown by the yellow boundary in Figure 3-2. The red boundary identifies a much smaller area where arsenic exceeds source control or hot spot criteria (see Figure 3-3 for arsenic details in shallow soil). Remedial investigation sampling results for these upland samples were screened against the sediment cleanup levels. The pathway of concern is the erosion of soil directly to the Lewis and Clark River sediment.

An analysis of the physical erosion risk was not performed at the time of the supplemental investigation and excavation boundary exercise, so the basis for the source control excavation assumed that soil exceeding sediment cleanup levels on the levee face would erode en masse and be deposited directly in the sediment bed without dispersion or mixing, a highly unlikely situation. The physical erosion risk of all soil on the face of the existing dike is minimal due to the dense vegetative cover required by the USACE.

The dike's vegetative cover is maintained rigorously by the diking district as part of its maintenance responsibilities to the residents of the district and as mandated by its operational agreements with the USACE. The dike restoration design approved by the USACE provides 2 to 3 feet of additional fill to restore the originally authorized height covering a large portion of the south leg of shallow excavation area. The dike fill on the crest road provides an engineering control that caps any low-level soil contamination that remains in place.

The removal of surface soil from the dike and revegetation will result in a period of elevated risk to residents while the grass cover is reestablishing significant root structures. Limiting the disturbance of the protective dike vegetation systems reduces the short-term risk of dike failure.

The area that was proposed to be left in place was identified as a source control risk for copper only, no other contaminants are identified at levels of concern in the remedial investigation report supporting figures. The hot spot concentration that is established for copper is 120,000 mg/kg.

AMCCO proposed to leave in place the southern portion of the shallow excavation, where copper concentrations are below 1,000 mg/kg, which is more than two orders of magnitude lower than the upland hot spot concentration.

Soil in the area would remain in place, fully covered by an erosion control consisting of dense vegetative soil cover that physically limits erosion of surface soil. Dense vegetative soil cover is required to be maintained on the face of the dike while the diking district is inhabited, under an agreement between the diking district and USACE. If the unlikely erosion of levee surface soil to the waterway were to occur, the two foreseeable scenarios do not present unacceptable environmental risk of exposure:

- Erosion that could occur over a significant length of time within the grass-cover root mass where reduction in concentration would occur due to the dispersion of a limited soil mass on an annual basis.
- Erosion that could occur under extreme flow conditions on the Lewis and Clark River where significant reduction in concentration would immediately occur due to significant mixing and dispersion away from the Site during a flood condition. Dike vegetation standards are designed to withstand significant flood flows. Floods in this area are not high energy due to the backwater conditions at this convergence with the Columbia River Estuary.

An area of 5,400 square feet of copper-impacted soil was left in place, equating to a volume of 500 cy. After accounting for cover by the rock surfaced dike crest road, an area of approximately 3,000 square feet of copper-impacted soil were covered by an erosion control of dense vegetative ground cover.

This analysis was presented to the DEQ on a video call and also in an email dated August 28, 2020 (Appendix G), and discussed during a follow-up meeting on September 1, 2020. The DEQ agreed to prioritize the areas with the highest environmental benefit as discussed in the above referenced email (see Figure 3-4 for guiding figure for reevaluated excavation area).

3.4 Eastern Stormwater Ditch Bottom Removal Exclusion

An exception to the completion of removal of bottom sediment from all ditches identified for excavation in the ROD is a 150-linear-foot stretch that runs on the opposite side of the street from the AMCCO facility, referred to as the eastern stormwater ditch, or Tarabochia ditch. The sediment in this ditch requires significant effort to remove due to the presence of unstable side slopes and an existing property fence located within a few feet of the ditch sidewall that removal would need to be done with great care to reduce the risk of undermining the existing fence.

The remedial investigation report (GSI and MFA 2015) concludes that sediment in the eastern stormwater ditch is not expected to pose unacceptable ecological risks.

Clatsop County Public Works Department (County) has an ongoing public stormwater system maintenance and cleaning program, in which the County comes through the Jeffers Garden area on a yearly basis and removes accumulated debris and sediment from all of the stormwater ditches to maintain a hydraulically functioning drainage ditch system. As a result of this routine scraping of the

ditch sediment, it is unlikely that the sediment that was originally sampled during the remedial investigation is still present in the bottom of the eastern stormwater ditch. MFA contacted the County Public Works Department⁴ and discussed that ditch sediment is brought to a dewatering facility, mixed with other sediment during the drying process, and then reused as fill for road repairs around the region.

As further described in the DEQ-approved baseline risk assessment (MFA 2015b) for the Site, no human health or ecological chemicals of concern were identified for the eastern stormwater ditch. The ditch is small and of low-quality habitat with little or no vegetative cover, is frequently inundated, and is therefore unattractive to potential receptors. In addition, the County cleans the ditch of debris and sediment on a yearly basis to maintain a working drainage ditch. Based on the analysis presented in the risk assessment and the County's ongoing maintenance, unacceptable risk under current or reasonable future scenarios is not expected and cleanup in addition to the ongoing maintenance activities is not warranted.

4 DEQ COMMUNICATION AND FINAL INSPECTION

As discussed in Section 1.5, MFA routinely communicated about site conditions and observations with Erin McDonnell and Kevin Parrett of the DEQ. Weekly summary emails, periodic phone calls, and site inspections allowed the construction oversight team to communicate the progress of work and field changes as they occurred.

MFA continued to coordinate closely with the DEQ throughout the construction seasons in 2021 and 2022. Weekly summary emails, conference calls, and site inspections were arranged when work resumed after each wet weather season break.

A final site walk for the project was conducted on October 20, 2022, after completing all remaining remediation work with the exceptions noted in Section 3.3.3. MFA provided AMCCO with verbal notice of substantial completion at the conclusion of the final site inspection in coordination with the DEQ.

Based on the observations made during the final inspection, it is the opinion of the engineer that remedial construction work completed at Site for the AMCCO remedial action was performed in accordance with all approved plans, specifications, and related documents.

⁴ Clatsop County Public Works Director. Telephone communication (re: County's ditch maintenance program and Tarabochia ditch excavation) with Cem Gokcora, Maul Foster & Alongi, Inc.: Portland, OR. September 15

LIMITATIONS

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

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

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TABLES



Table 2-1
Analytical Results for Sand
AMCCO



Sample Name	Sediment Fill Criteria ⁽¹⁾	CLSAND-2002100-01--04	SAND 1	AMCCO ROCK CAP
Collection Date		2/10/2020	7/21/2020	10/1/2020
Organotins (ug/kg)				
Monobutyltin	540	1.5 U	1.7 U	--
Dibutyltin	910	0.77 U	0.89 U	--
Tri-n-butyltin	47	1.6 U	1.8 U	--
Tetrabutyltin	97	0.78 U	0.91 U	--
Total Petroleum Hydrocarbons (mg/kg)				
Diesel Range Organics	340	9.82 U	25 U	--
Residual Oil Range Organics	3,600	19.6 U	50 U	--
Metals (mg/kg)				
Arsenic	8.18	3.03	2.38	1.95
Barium	NV	--	--	35.4
Cadmium	0.658	0.113 U	0.221 U	1.08 U
Chromium	30	8.09	16	6.26
Copper	27.6	3.08	5.26	--
Lead	15.5	1.4	1.76	2.77
Mercury	0.2	0.0453 U	0.0884 U	0.086 U
Nickel	20	7.2	12.4	--
Selenium	0.4	0.566 U	1.1 U	1.08 U
Silver	0.4	0.113 U	0.221 U	1.08 U
Zinc	97.2	18.9	30.7	--
Pesticides (ug/kg)				
4,4'-DDD	4.88	0.985 U	1.02 U	--
4,4'-DDE	3.16	0.985 U	1.02 U	--
4,4'-DDT	4.16	0.985 U	1.02 U	--
Dieldrin	1.9	0.985 U	1.02 U	--
Endrin ketone	8.5	0.985 U	1.02 U	--
PCBs (ug/kg)				
Aroclor 1016	NV	2.07 U	4.05 U	--
Aroclor 1221	NV	2.07 U	4.05 U	--
Aroclor 1232	NV	2.07 U	4.05 U	--
Aroclor 1242	NV	2.07 U	4.05 U	--
Aroclor 1248	NV	2.07 U	4.05 U	--
Aroclor 1254	NV	2.07 U	4.05 U	--
Aroclor 1260	NV	2.07 U	4.05 U	--
Total PCBs ^(a)	5.31	2.07 U	4.05 U	--
SVOCs (ug/kg)				
1-Methylnaphthalene	NV	2.75 U	5.55 U	--
2-Methylnaphthalene	NV	2.75 U	5.55 U	--
3- & 4-Methylphenol (m,p-Cresol)	100	3.43 U	6.94 U	--
Acenaphthene	NV	1.37 U	2.78 U	--
Acenaphthylene	NV	1.37 U	2.78 U	--
Anthracene	NV	1.37 U	2.78 U	--
Benzo(a)anthracene	NV	1.37 U	2.78 U	--
Benzo(a)pyrene	NV	2.06 U	4.16 U	--
Benzo(b)fluoranthene	NV	2.06 U	4.16 U	--
Benzo(ghi)perylene	NV	1.37 U	2.78 U	--
Benzo(k)fluoranthene	NV	2.06 U	4.16 U	--
Benzoic acid	65	172 U	347 U	--
Bis(2-ethylhexyl)phthalate	500	20.6 U	41.6 U	--

Table 2-1
Analytical Results for Sand
AMCCO



Sample Name	Sediment Fill Criteria ⁽¹⁾	CLSAND-2002100- 01--04	SAND 1	AMCCO ROCK CAP
Collection Date		2/10/2020	7/21/2020	10/1/2020
Carbazole	140	2.06 U	4.16 U	--
Chrysene	NV	1.37 U	2.78 U	--
Dibenzo(a,h)anthracene	NV	1.37 U	2.78 U	--
Dibenzofuran	200	1.37 U	2.78 U	--
Di-n-butyl phthalate	110	13.7 U	27.8 U	--
Di-n-octyl phthalate	39	13.7 U	27.8 U	--
Fluoranthene	NV	1.37 U	2.78 U	--
Fluorene	NV	1.37 U	2.78 U	--
Indeno(1,2,3-cd)pyrene	NV	1.37 U	2.78 U	--
Naphthalene	NV	2.75 U	5.55 U	--
Pentachlorophenol	17	13.7 U	27.8 U	--
Phenanthrene	NV	1.37 U	2.78 U	--
Phenol	48	2.75 U	5.55 U	--
Pyrene	NV	1.37 U	2.78 U	--
Total PAH ^(b)	1,610	2.75 U	5.55 U	--
Dioxins (pg/g)				
1,2,3,4,6,7,8-HpCDD	NV	0.517 J	0.354 UJ	--
1,2,3,4,6,7,8-HpCDF	NV	0.388 UJK	0.9 UJ	--
1,2,3,4,7,8,9-HpCDF	NV	0.156 U	0.152 U	--
1,2,3,4,7,8-HxCDD	NV	0.16 U	0.117 U	--
1,2,3,4,7,8-HxCDF	NV	0.147 UJK	0.471 UJ	--
1,2,3,6,7,8-HxCDD	NV	0.15 U	0.116 U	--
1,2,3,6,7,8-HxCDF	NV	0.123 UJK	0.188 UJ	--
1,2,3,7,8,9-HxCDD	NV	0.157 U	0.139 UJK	--
1,2,3,7,8,9-HxCDF	NV	0.13 U	0.151 U	--
1,2,3,7,8-PeCDD	0.304	0.175 U	0.13 U	--
1,2,3,7,8-PeCDF	NV	0.151 U	0.214 UJ	--
2,3,4,6,7,8-HxCDF	NV	0.1 U	0.133 UJ	--
2,3,4,7,8-PeCDF	0.245	0.157 U	0.133 UJ	--
2,3,7,8-TCDD	0.295	0.266 U	0.116 U	--
2,3,7,8-TCDF	NV	0.197 U	0.263 UJ	--
OCDD	NV	4.22 J	1.06 UJ	--
OCDF	NV	0.363 J	0.255 UJ	--
Total HpCDDs	NV	1 J	0.623 UJ	--
Total HpCDFs	NV	0.388 UJK	0.9 UJ	--
Total HxCDDs	NV	0.245 J	0.675 UJ	--
Total HxCDFs	NV	0.519 UJK	1.32 UJ	--
Total PeCDDs	NV	0.463 J	0.166 UJK	--
Total PeCDFs	NV	1.02 UJK	1.24 UJ	--
Total TCDDs	NV	0.266 U	0.116 U	--
Total TCDFs	NV	0.197 U	1.25 UJ	--
Total Dioxin TEQ (ND=0.5)	1.47	0.314 J	ND	--

Table 2-1
Analytical Results for Sand
AMCCO



NOTES:

-- = not analyzed.

EMPC = estimated maximum potential concentration.

J = estimated value.

mg/kg = milligrams per kilogram.

ND = not detected.

NV = no value.

PAH = polyaromatic hydrocarbons.

PCB = polychlorinated biphenyls.

pg/g = picograms per gram.

SVOC = semivolatile organic compound.

TEQ = toxic equivalency.

U = Result is non-detect to method detection limit or reporting limit.

ug/kg = micrograms per kilogram.

UJ = result is non-detect and estimated.

UJK = Result is non-detect to estimated detection limit, is an EMPC, and is an estimated value.

^(a) Total PCB is the sum of Aroclors; if all analytes are non-detect, the highest method reporting limit

^(b) Total PAH is the sum of 2-methylnaphthalene, naphthalene, acenaphthene, acenaphthylene, anthracene, phenanthrene, fluorene, fluoranthene, pyrene, chrysene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(ghi)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene; if all analytes are non-detect, the highest method detection limit is reported.

REFERENCE:

⁽¹⁾ Appendix A and B Screening Level Human Health and Ecological Risk Assessment, Astoria Marine Construction Company Facility; Maul Foster Alongi (2015).

Table 2-2
Analytical Results for Upland and Dike Import Materials



Sample ID	DEQ Clean Fill ⁽¹⁾	DIKE PILE NE	DIKE PILE SW	CUSTOMS DIKE PILE	CROWN CAMP DIKE PILE	TOP SOIL	ROCK CAP	ALTERNATIVE ROCK CAP MATERIAL
Date Collection		7/29/2020	7/29/2020	9/16/2020	9/16/2020	7/29/2020	10/1/2020	9/13/2021
Sample Depth (ft bgs)		0-0.5	0-0.5	2-4	2-4	0-0.5	0-0.5	0-0.5
TPH (mg/kg)								
Diesel Range Organics	1,100	25 U	25 U	25 U	28 U	25 U	--	--
Oil Range Organics	1,100 ^(a)	50.5	78.6	76.9	56.1 U	461	--	--
Metals (mg/kg)								
Arsenic	12	8.53	9.89	5.75	8.91	5.39	1.95	1.76
Barium	840	65.9	80.2	78.6	88.1	250	35.4	41.3
Cadmium	0.54	0.227 U	0.229 U	0.276 U	0.31 U	0.765	1.08 U	0.200 U
Chromium	240	40	48.8	31.1	33.6	18.3	6.26	10.4
Lead	34	10.1	11.1	12	9.39	34	2.77	2.10
Mercury	0.11	0.0907 U	0.0916 U	0.11 U	0.12 U	0.101	0.086 U	0.0800 UJ
Selenium	1.5	1.13 U	1.14 U	1.38 U	1.53 U	1.17 U	1.08 U	1.00 U
Silver	0.41	0.227 U	0.229 U	0.276 U	0.31 U	0.235 U	1.08 U	0.200 U
Organochlorine Pesticides (ug/kg)								
4,4'-DDD	6.3	--	--	--	--	2.16 U	--	--
4,4'-DDE	10	--	--	--	--	7.22 U	--	--
4,4'-DDT	10	--	--	--	--	21 U	--	--
Dieldrin	4.5	--	--	--	--	2.8 U	--	--
Endrin ketone	NV	--	--	--	--	10.6 U	--	--
Herbicides (ug/kg)								
2,2-Dichloropropionic acid (Dalapon)	7,200	--	--	--	--	450 U	--	--
2,4,5-T	4,100	--	--	--	--	18 U	--	--
2,4-D	2,300	--	--	--	--	180 U	--	--
2,4-DB	25,000	--	--	--	--	180 U	--	--
Dicamba	9,000	--	--	--	--	18 U	--	--
Dichloroprop	NV	--	--	--	--	180 U	--	--
Dinoseb	7,800	--	--	--	--	180 U	--	--
MCPA	97	--	--	--	--	36,000 U	--	--
MCPD	280	--	--	--	--	18,000 U	--	--
Silvex	3,700	--	--	--	--	18 U	--	--

Table 2-2
Analytical Results for Upland and Dike Import Materials



Sample ID	DEQ Clean Fill ⁽¹⁾	DIKE PILE NE	DIKE PILE SW	CUSTOMS DIKE PILE	CROWN CAMP DIKE PILE	TOP SOIL	ROCK CAP	ALTERNATIVE ROCK CAP MATERIAL
		7/29/2020	7/29/2020	9/16/2020	9/16/2020	7/29/2020	10/1/2020	9/13/2021
		0-0.5	0-0.5	2-4	2-4	0-0.5	0-0.5	0-0.5
PAHs (ug/kg)								
1-Methylnaphthalene	360	10.7 U	10.3 U	12.9 U	14.1 U	59.5	--	--
2-Methylnaphthalene	11,000	10.7 U	10.3 U	12.9 U	14.1 U	95.3	--	--
Acenaphthene	250	10.7 U	10.3 U	12.9 U	14.1 U	104	--	--
Acenaphthylene	120,000	10.7 U	10.3 U	12.9 U	14.1 U	16.1	--	--
Anthracene	6,800	10.7 U	10.3 U	12.9 U	14.1 U	20.5	--	--
Benzo(a)anthracene	730	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Benzo(a)pyrene	110	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Benzo(b)fluoranthene	1,100	10.7 U	10.3 U	12.9 U	14.1 U	15.3	--	--
Benzo(ghi)perylene	25,000	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Benzo(k)fluoranthene	11,000	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Chrysene	3,100	10.7 U	10.3 U	12.9 U	14.1 U	19.8	--	--
Dibenzo(a,h)anthracene	110	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Dibenzofuran	2	10.7 U	10.3 U	12.9 U	14.1 U	56.1	--	--
Fluoranthene	10,000	10.7 U	10.3 U	12.9 U	14.1 U	79.6	--	--
Fluorene	3,700	10.7 U	10.3 U	12.9 U	14.1 U	68	--	--
Indeno(1,2,3-cd)pyrene	1,100	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Naphthalene	77	10.7 U	10.3 U	12.9 U	14.1 U	219	--	--
Phenanthrene	5,500	10.7 U	10.3 U	12.9 U	14.1 U	143	--	--
Pyrene	10,000	10.7 U	10.3 U	12.9 U	14.1 U	68.7	--	--
cPAH TEQ ⁽²⁾	110	ND	ND	ND	ND	13.4	--	--

Table 2-2
Analytical Results for Upland and Dike Import Materials



NOTES:

Data has not been validated.

Shading (color key below) indicates values that exceed screening criteria; non-detects ("U" or "UJ") were not compared with screening criteria.

Clean Fill Exceedance

-- = not analyzed.

cPAH TEQ = carcinogenic PAH toxic equivalent.

DEQ = Oregon Department of Environmental Quality.

EPA = U.S. Environmental Protection Agency.

ft bgs = feet below ground surface.

ID = identification.

mg/kg = milligrams per kilogram.

ND = not detected.

NV = no value.

PAH = polycyclic aromatic hydrocarbon.

TEQ = toxic equivalent.

TPH = total petroleum hydrocarbons.

U = Result is non-detect to method detection limit or reporting limit.

UJ = result is non-detect and estimated.

ug/kg = micrograms per kilogram.

^(a) Value is for heating oil, since generic residual-range hydrocarbon values are not available.

REFERENCES:

⁽¹⁾ DEQ Clean Fill Determinations. Table 1 (Metals from Coast Range) and Table 2. 2019.

⁽²⁾ cPAH TEQ values are based on toxic equivalence factors from EPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. 1993. (EPA/600/R-93/089).

Table 2-3
Hillsboro Landfill Waste Disposal Totals
AMCCO



WM Waste Profile	Waste Source	Accepted as	Disposal Timeline	Total Quantity (TON)
133315	North Dredge Area, MW#1-2, Coffee Shop Debris Pile	Alternate Daily Cover	8/19/2020-9/2/2020	657.62
133937	MW#3, HotSpot 7&8, Pipe Shop Debris Pile	Direct Landfill /Nonhazardous	9/15/2020-9/29/2020	686.57
134181	Burn Pit	Direct Landfill/Non-hazardous	11/4/2020-11/24/2020	1508.94
Total				2853.13

Table 2-4
Leave Surface Analytical Results for AMCCO Sediment Dredge Areas
AMCCO



Sample Name	Site Specific PRG	Ecological Sediment Hot Spot Level	DREDGE AREA NORTH	MARINE WAY 1/2	MARINE WAY 3
Collection Date			7/22/2020	8/31/2020	8/24/2020
Collection Depth (ft bgs)			0.16-0.33	0.16-0.33	0.16-0.33
TCLP Metals (mg/L)					
Chromium	NV	NV	--	0.1 U	--
Lead	NV	NV	--	0.05 U	--
Mercury	NV	NV	--	0.007 U	--
Metals (mg/kg)					
Antimony	64	640	1.82 U	--	1.5
Arsenic	33	330	13.1	8.87	6.98
Barium	NV	NV	--	76.6	--
Cadmium	4.98	49.8	1.15	0.387 U	0.649
Chromium	111	1,110	42.9 J	22.9	31.2
Copper	149	1,490	130		702 J
Lead	15.5	155	66.5	11.6	202
Mercury	NV	NV	--	0.155 U	--
Nickel	48.6	486	28.8	--	12.6
Selenium	NV	NV	--	1.93 U	--
Silver	5	50	0.364 U	0.387 U	0.204 U
Zinc	459	4,590	231	--	264 J
PCBs (ug/kg)					
Aroclor 1016	NV	NV	17.8 U	17.8 U	197 U
Aroclor 1221	NV	NV	17.8 U	28.4 U	197 U
Aroclor 1232	NV	NV	17.8 U	17.8 U	197 U
Aroclor 1242	NV	NV	43.2 J	17.8 U	197 U
Aroclor 1248	NV	NV	17.8 U	17.8 U	197 U
Aroclor 1254	NV	NV	165 J	17.8 U	4640 J
Aroclor 1260	NV	NV	23.6 J	17.8 U	764 J
Total PCBs ^(a)	5.31	53.1	231.8 J	ND	5,404 J

Table 2-4
Leave Surface Analytical Results for AMCCO Sediment Dredge Areas
AMCCO



NOTES:
Shading (color key below) indicates values that exceed screening criteria; non-detects ("U") were not compared with screening criteria.
PRG Level
Ecological Sediment Hot Spot Level
-- = not analyzed.
ft bgs = feet below ground surface.
J = estimated value.
mg/kg = milligrams per kilogram.
ND = non-detect.
NV = no value.
PCB = polychlorinated biphenyls.
PEC= probable effects concentration.
PH= Portland Harbor.
PRG= Preliminary Remediation Goal.
U = Result is non-detect.
ug/kg = micrograms per kilogram.
^(a) Total PCB is the sum of detected Aroclors.

Table 2-5
Leave Surface Analytical Results for Excavation Areas 7 and 8
AMCCO



Sample Name	Soil PRG	EXCAVATION AREA #7	EXCAVATION AREA #8
Collection Date		9/4/2020	9/4/2020
Collection Depth (ft bgs)		0.16-0.33	0.16-0.33
TPH (mg/kg)			
Diesel Range Organics	4,600	1,370	168
Oil Range Organics	4,600 ^(a)	2,600	734
Total Metals (mg/kg)			
Antimony	NV	18.6	5.19
Arsenic	12	20	9.21
Cadmium	NV	1.37	1.46
Chromium	NV	217	194
Copper	250	861	383
Lead	250	1,210	159
Nickel	160	71	25.5
Zinc	250	1,120	330
PCBs (ug/kg)			
Aroclor 1016	NV	19 U	16.5 U
Aroclor 1221	NV	19 U	16.5 U
Aroclor 1232	NV	19 U	16.5 U
Aroclor 1242	NV	101 J	16.5 U
Aroclor 1248	NV	19 U	16.5 U
Aroclor 1254	NV	872 J	16.5 U
Aroclor 1260	NV	197 J	16.5 U
Total PCBs ^(b)	560	1,170 J	16.5 U

Table 2-5
Leave Surface Analytical Results for Excavation Areas 7 and 8
AMCCO



Sample Name	Soil PRG	EXCAVATION AREA #7	EXCAVATION AREA #8
Collection Date		9/4/2020	9/4/2020
Collection Depth (ft bgs)		0.16-0.33	0.16-0.33
Dioxin Furans (pg/g)			
1,2,3,4,6,7,8-HpCDD	NV	2,450	341
1,2,3,4,6,7,8-HpCDF	NV	518	93.8
1,2,3,4,7,8,9-HpCDF	NV	27.8	4.69
1,2,3,4,7,8-HxCDD	NV	19.1 J	3.71 J
1,2,3,4,7,8-HxCDF	NV	26.2	5.62
1,2,3,6,7,8-HxCDD	NV	72.1	15.9
1,2,3,6,7,8-HxCDF	NV	21.1 J	8.6
1,2,3,7,8,9-HxCDD	NV	30.4	8.69
1,2,3,7,8,9-HxCDF	NV	5.11 J	2.14 J
1,2,3,7,8-PeCDD	NV	21 J	4.31 J
1,2,3,7,8-PeCDF	NV	23.1 J	2.88 J
2,3,4,6,7,8-HxCDF	NV	27.3	13
2,3,4,7,8-PeCDF	NV	37.3	23.2
2,3,7,8-TCDD	NV	6.8	4.18
2,3,7,8-TCDF	NV	48.3	3.25
OCDD	NV	27,000 J	3,290
OCDF	NV	2,810	313
Total HpCDDs	NV	4,160	697
Total HpCDFs	NV	2,200 J	304 J
Total HxCDDs	NV	501 J	144 J
Total HxCDFs	NV	551 UJK	204 UJK
Total PeCDDs	NV	384 UJK	53.5 J
Total PeCDFs	NV	422 J	404 J
Total TeCDFs	NV	1,010 UJK	219 UJK
Total TCDDs	NV	449	51.4 UJK
Dioxin/Furan TEQ ^{(c)(1)}	15	104 J	27.1 J

Table 2-5
Leave Surface Analytical Results for Excavation Areas 7 and 8
AMCCO



Notes

Shading (color key below) indicates values that exceed screening criteria.

Soil, PRG

-- = not analyzed.

EMPC = estimated maximum potential concentration.

ft bgs = feet below ground surface.

J = result is an estimated value.

mg/kg = milligrams per kilogram.

NV = no value.

PCB = polychlorinated biphenyls.

PRG = preliminary remediation goal.

pg/g = picogram per gram.

U = result is non-detect to reporting limit.

ug/kg = micrograms per kilogram.

UJK = analyte was not detected, the limit reported is estimated and is an EMPC.

^(a) Value is for generic diesel/heating oil, since generic residual-range hydrocarbon values are not available.

^(b) Total PCBs is the sum of PCB aroclors. Non-detect results are summed as zero. If all analytes are non-detect, the highest reporting limit is used.

^(c) Dioxin/furan TEQs calculated as the sum of each detected congener concentration multiplied by the corresponding TEF value. 2005 World Health Organization consensus TEF values for mammals are used (Van den Berg et al., 2006).

Reference

⁽¹⁾ Van den Berg, M. et al. 2006. The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds. Toxicological Sciences. 93 No. 2:223–241.

Table 2-6
Leave Surface Analytical Results for Burn Pit
AMCCO

Sample Name Collection Date Collection Depth (ft bgs)	Sediment PRGs	Basis	Soil PRGs	Basis	EXCAVATION AREA #6 LEAVE SURFACE 1	EXCAVATION AREA #6 LEAVE SURFACE 2	EXCAVATION AREA #6 LEAVE SURFACE 3
					10/8/2020	10/8/2020	10/8/2020
					2	2	2
TPH (mg/kg)							
Diesel Range Organics	NV	--	NV	--	51.6 U	52 U	51.6 U
Oil Range Organics	NV	--	NV	--	3,750	3,380	3,990
Diesel + Oil ^(a)	NV	--	46,000	Construction Soil RBC ⁽⁴⁾	3,776	3,406	4,016
Total Metals (mg/kg)							
Arsenic	33	Probable Effects Concentration ⁽¹⁾	12	Oregon Coast Background ⁽³⁾	32.3	32.6	31.3
Barium	NV	--	NV	--	263	263	240
Cadmium	4.98	Probable Effects Concentration ⁽¹⁾	NV	--	3.93	3.69	3.82
Chromium	111	Probable Effects Concentration ⁽¹⁾	NV	--	155	163	153
Lead	15.5	Probable Effects Concentration ⁽¹⁾	250	DEQ Soil Plant Screening Level (populations) ⁽⁵⁾	3,600	1,860	3,500
Mercury	NV	--	NV	--	0.697	0.713	0.666
Selenium	NV	--	NV	--	0.609 J	0.717 J	0.701 J
Silver	5	Portland Harbor Joint Source Control ⁽²⁾	NV	--	1.79	1.73	2.43
PCBs (ug/kg)							
Aroclor 1016	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1221	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1232	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1242	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1248	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1254	NV	--	NV	--	105 J	99.8 J	84.8 J
Aroclor 1260	NV	--	NV	--	144 J	121 J	110 J
Total PCBs ^(b)	5.31	Site-Specific Ecological Bioaccumulation Model ⁽¹⁾	560	Occupational Soil RBC (milk ingestion pathway) ⁽⁴⁾	249 J	220.8 J	194.8 J

Table 2-6
Leave Surface Analytical Results for Burn Pit
AMCCO

Notes

Shading (color key below) indicates values that exceed screening criteria.

Sediment PRGs

Soil PRGs

-- = not analyzed.

ft bgs = feet below ground surface.

J = estimated value.

mg/kg = milligrams per kilogram.

NV = no value.

PCB = polychlorinated biphenyls.

PRG = preliminary remediation goals.

U = result is non-detect to reporting limit.

ug/kg = micrograms per kilogram.

^(a) Diesel + Oil is the sum of diesel range organics and oil range organics. Non-detects are summed at one half the reporting limit.

^(b) Total PCBs is the sum of PCB aroclors. Non-detect results are summed as zero.

References

⁽¹⁾ Maul Foster & Alongi, Inc. Focused baseline human health and ecological risk assessment, Astoria Marine Construction Company facility, Astoria, Oregon. [facts of publication]. May 13, 2015.

⁽²⁾ NOAA. Buchman, M. F., 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 pages.

⁽³⁾ Development of Oregon Background Metals Concentrations in Soil, Technical Report, State of Oregon DEQ, March 2013.

⁽⁴⁾ Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites, Oregon Department of Environmental Quality, September 2003.

⁽⁵⁾ Guidance for Ecological Risk Assessment: Levels I, II, III, IV, Final, Oregon Department of Environmental Quality, March 2001.

FIGURES





LEGEND

- Site Location
- Cities
- Roads

MAP NOTES:

Date: March 26, 2015
Data Sources: OGIC, USGS, ESRI, Air photo from Microsoft 2010

FIGURE 1-1

Site Location Map

Astoria Marine Construction Company (AMCCO)
Remedial Investigation



0 0.25 0.5
Miles

**MAUL
FOSTER
ALONGI**

GSI
Water Solutions, Inc.



FIGURE 1-2

Site Overview

Astoria Marine Construction
Company (AMCCO)
Supplemental Remedial Investigation

LEGEND

- Building
- Misc Structure
- Dock
- Railway
- Historical Feature
- AMCCO Upland Boundary
- Tax Lot
- Cement Dike
- Levee

NOTES:

- The locations of all features shown are approximate.
- Historical site features were identified using the 'Plant Arrangement' engineering drawing from July 1948 and from an aerial photo taken the same year.
- Current site features were refined on the basis of recent aerial photographs and observations from site walks. 'High' and 'low' water levels were delineated by GSI based on recent aerial photographs taken during an approximate high and low tide, respectively.



MAP NOTES:

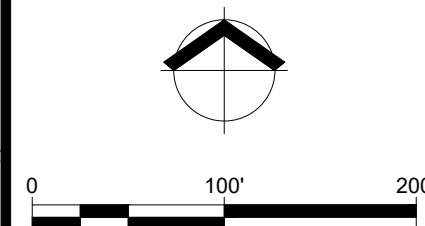
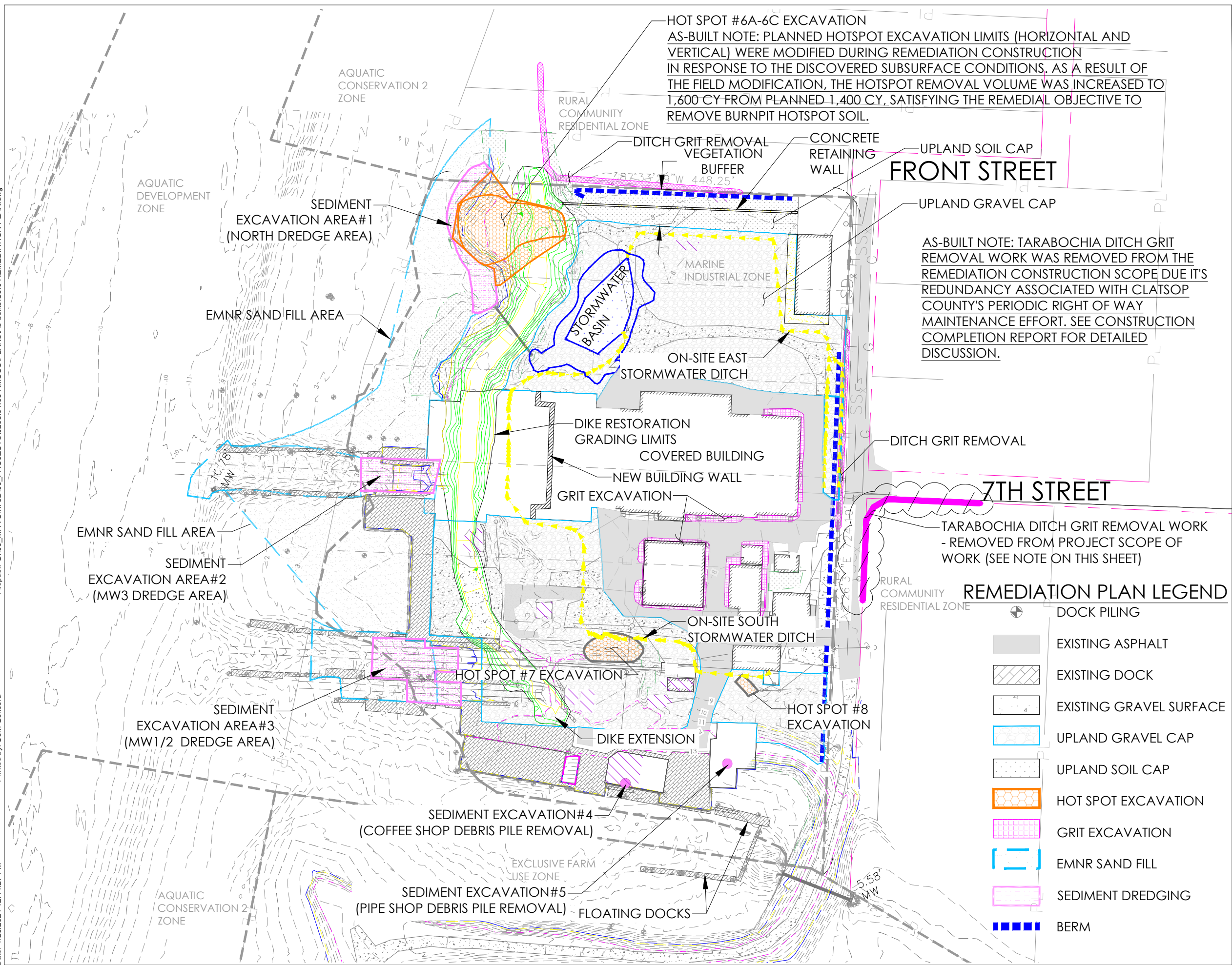
Date: April 14, 2016
Data Sources: OR DEQ, Clatsop
County, Air Photo by USDA 2014



Filepath: G:\100_MFA Civil 3D\100_PROJECTS\10298.04_03-AMCCO\PLANS\As-Built\3.0 REMEDIATION PLAN.dwg

Printed by: Cem Gokora

Date: 1/25/2024 12:44:27 PM



NOTE: BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALE ACCORDINGLY.

**Figure 1-3
Master
Remediation
Plan**

AMCCO Remediation
Astoria, OR

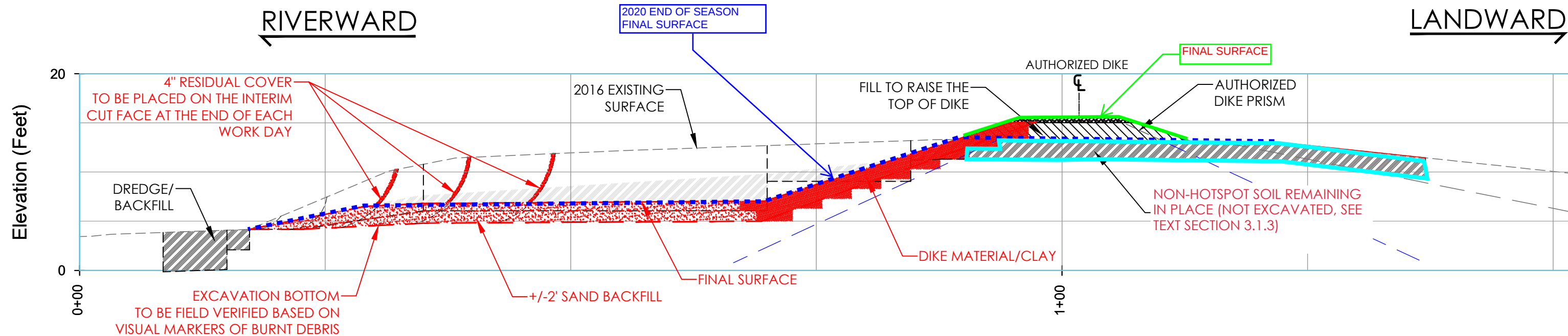


FIGURE 2-1 BURN PIT EXCAVATION DETAIL

H:1"=10', V:1"=10'



LEWIS AND CLARK RIVER

FIGURE 3-1

Burn Pit

Area to be Excavated

Astoria Marine
Construction Company
(AMCCO) Remedial
Design/Remedial Action
Work Plan

LEGEND

Planned Hot Spot/Source Control Excavation Area

-  0-2' bgs
-  0-4' bgs
-  0-7' bgs

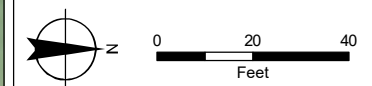
All Other Features

-  AMCCO Upland Boundary
-  Surface Drainage Ditch

-  Revised 0-2'
Excavation Extent
(Proposed)
-  0-4' Excavation also
required

NOTES:

- Excavation in this area is required due to the Arsenic hot spot.
- Excavation also addresses arsenic, copper and lead concentrations above site-specific source control concentrations.



MAP NOTES:

Date: May 31, 2016
Data Source: Aerial Photo from NAIP 2014





Astoria Marine Construction
Company (AMCCO)
Remedial Design/Remedial Action
Work Plan

LEGEND

Planned Excavation to Address

-  Arsenic Hot Spot/Source Control 0-2' bgs (See Figures 4a and 5a)
-  Copper Source Control 0-2' bgs

Soil Sample

-  Supplemental RI
 Phase 2 RI
 Phase 1 RI
 EPA

Copper Concentration (mg/kg)

-  0-149
 >149, Site Specific Source Control Concentration

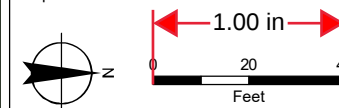
All Other Features

- AMCCO Upland Boundary
 Surface Drainage Ditch

Revised 0-2'
Excavation Extent
(Proposed)

NOTES:

- Excavation in this area is required due to the Arsenic hot spot/source control.
- Site specific source control concentrations are based on Preliminary Sediment Remediation Goals presented in DEQ's April 2016 Staff Report.
- Concentrations outside the excavation area represent residual soil concentrations.



MAP NOTES:

Date: June 1, 2016
Data Source: Aerial Phot from NAIP 2014





FIGURE 3-3

Burn Pit

Arsenic Source Control Screening Results in Surface Soil, 0-1' bgs

Astoria Marine Construction Company (AMCCO)
Remedial Design/Remedial Action Work Plan

LEGEND

Planned Excavation to Address

- Arsenic Hot Spot 0-2' bgs (See Figure 4a)
- Arsenic Source Control 0-2' bgs

Soil Sample

- Supplemental RI
- Phase 2 RI
- Phase 1 RI
- EPA

Arsenic Concentration (mg/kg)

- 0-33
- >33, Site Specific Source Control Concentration

All Other Features

- AMCCO Upland Boundary
- Surface Drainage Ditch

Revised 0-2' Excavation Extent (Proposed)

NOTES:

- Excavation in this area is required due to the Arsenic hot spot.
- Site specific source control concentrations are based on Preliminary Sediment Remediation Goals presented in DEQ's April 2016 Staff Report.
- Concentrations outside the excavation area represent residual soil concentrations.



MAP NOTES:

Date: June 1, 2016
Data Source: Aerial Photo from NAIP 2014



