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REPORT ON

CUSTOM PLYWOOD MILL SITE
PHASE III SUBTIDAL SEDIMENT CLEANUP
CONSTRUCTION COMPLETION REPORT
CLEANUP SITE IDENTIFICATION NO. 4533
FIDALGO BAY
ANACORTES, WASHINGTON

by
Haley & Aldrich, Inc.
Seattle, Washington

for
Washington State Department of Ecology
Olympia, Washington

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HALEY & ALDRICH, INC.
3131 ELLIOTT AVENUE
SUITE 600
SEATTLE, WA 98121
206.324.9530

SIGNATURE PAGE FOR

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PREPARED FOR

WASHINGTON STATE DEPARTMENT OF ECOLOGY
OLYMPIA, WASHINGTON

12 January 2024

PREPARED BY:

N. John Bingham
Program Manager - Engineer
Haley & Aldrich, Inc.

Jessica Blanchette
Sr. Technical Specialist - Marine Biologist
Haley & Aldrich, Inc.

REVIEWED AND APPROVED BY:

Mike Ehlebracht, L.H.G.
Principal Consultant
Haley & Aldrich, Inc.

Executive Summary

This Construction Completion Report (CCR) summarizes and documents the environmental construction activities completed as part of the final Phase III subtidal remedial action at the Custom Plywood Mill Site (Site) in Anacortes, Washington. The work was completed following the provisions of the Washington State Model Toxics Control Act (MTCA) and its implementing regulations (Chapter 173-340 Washington Administrative Code [WAC]), under the direction of the Washington State Department of Ecology (Ecology) Toxics Cleanup Program (TCP) and in accordance with an agreement with GBH Investments, LLC (GBH), for selected aquatic portions of the site. GBH is the current property owner and represents a potentially liable person per Chapter 173-340-200 WAC. Construction took place from July through October 2021 under the oversight of Hart Crowser, Inc. (now Haley & Aldrich, Inc.), as Ecology's representative.

The Custom Plywood Site, located in Anacortes, Washington, is one of several bay-wide priority sites for Fidalgo/Padilla Bays being addressed by the TCP under the Puget Sound Initiative (PSI). The site includes property owned by GBH covering approximately 6.6 acres of upland and 34 acres of intertidal and subtidal areas. The Custom Plywood Site operated as a lumber and planning mill beginning in about 1900 until it burned down sometime between 1925 and 1937. Through the years, the property changed hands several times and was rebuilt and expanded until Custom Plywood became the operating entity sometime before 1991. The facility was used as a sawmill and plywood manufacturing plant until most of the wooden structures in the main plant area were consumed in a fire on 28 November 1992. Milling activities produced wood waste and chemical contaminants that affected site soil, sediment, and groundwater. During milling operations, a large amount of wood waste was placed on upland and aquatic portions of the site over many years.

Past limited interim remedial actions were conducted under WAC 173-340-515 (Independent Remedial Actions) on the upland portion of the site beginning in 1998. The most recent upland cleanup action at the site was the Phase I interim remedial action completed in the summer of 2011. Before cleanup, the upland was characterized as heavily disturbed and contained abandoned foundations and structures, concrete and wood debris, native and non-native vegetation, and poorly functioning wetlands. The Phase I cleanup work involved demolishing remaining concrete structures in the uplands, removing wooden piling, excavating surface debris and contaminated soil and wood waste, backfilling with clean fill material, and constructing a wetland mitigation area with a vegetated buffer zone and a stormwater swale.

Sediment containing wood waste has been an ongoing source of contamination in the aquatic environment at the site. Wood waste accumulation in nearshore areas and near former overwater structures exceeded 6 feet in places. In sufficient quantities, wood waste can represent an environmental pollutant and deleterious substance per criteria in the Sediment Management Standards (SMS) (WAC 173-240-200(17) and WAC 173-204-562(4)). As part of the sediment profile, wood waste in the biologically active zone can adversely affect benthic habitat by potentially generating sulfide, ammonia, phenols, and related degradation products harmful to marine biota.

Dioxins/furans are the other notable contaminants in the aquatic environment. Near-surface sediment throughout the aquatic portion of the site contains dioxin/furan concentrations exceeding Fidalgo Bay background levels (SAIC, 2008) as well as natural background levels for Puget Sound sediments. Deeper portions of the sediment profile are also affected; elevated dioxin/furan concentrations have been encountered in deeper sediment associated with relatively thick nearshore accumulations of wood waste. Given their low aqueous solubility and tendency to adsorb onto organic carbon sources in sediment, dioxins/furans in site sediments are strongly associated with the presence of wood waste. As the thickness and general quantity of wood waste decreases seaward, dioxins/furans are more likely restricted to surface sediment due to secondary redistribution of nearshore wood waste (more buoyant than sand sediment) or erosion of nearshore wood waste deposits.

Phase II interim remedial action construction work was deemed substantially complete by 23 December 2013, by Ecology. Abandoned in-water concrete structures in the intertidal and subtidal areas were demolished, with some reused as fill in the upland part of the site. Near-surface debris generally consisting of concrete, brick, wood, and other materials was removed as part of the planned excavation and dredging work completed in the intertidal and subtidal areas. Wooden piling that remained in the intertidal and subtidal areas was removed. The piling along with other wood waste was disposed of off site at a permitted Subtitle D landfill facility (Republic Services Roosevelt Regional Landfill in Roosevelt, Washington). Nearshore subtidal areas containing wood waste and/or affected by dioxin/furan contamination were dredged to native material or the prescribed dredging depth. The extent of wood waste and historical dioxin/furan toxicity equivalence quotient (TEQs) measured in this area served as the basis for determining the design excavation and dredging depths.

During Phase II sediment dredged from the subtidal areas was loaded directly to barges and transported to the transloading facility operated by Lafarge North America in Seattle, Washington. From the transloading facility, the material was transported to the Roosevelt Regional Landfill by rail for off-site disposal. The excavated and dredged areas were backfilled with clean fill materials that are beneficial to aquatic habitat and provide a cap to isolate remaining impacted sediment from potential receptors. Shoreline protection features, including an extension of the jetty at the north end of the site and a protective spit at the wetland mitigation complex (constructed in Phase I), were constructed as part of Phase II. In addition, the cobble berm constructed in Phase I to protect the wetland area was partially breached to connect the wetland area to Fidalgo Bay. At the southern end of the site, shoreline armoring was constructed to provide protection against erosion. The interim remedial action provided shoreline enhancements intended to improve habitat for juvenile salmonids, forage fish spawning, shorebirds and waterfowl, and other aquatic species on and adjacent to the site. Dunegrass was planted along the property shoreline to provide erosion control and backshore habitat. Documentation sampling and analysis were conducted to characterize the concentration of dioxins/furans remaining in the sediment beneath the intertidal and subtidal sediment removal areas after dredging and excavation work was completed to inform Phase III marine cleanup work.

Necessary permits were obtained to facilitate the Phase III work which consisted of dredging and thin-layer capping of dioxin-impacted sediments located within subtidal areas. The U.S. Army Corps of Engineers (Corps) issues permits to authorize certain activities that require Department of the Army authorization under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899, which includes work in streams, wetlands, and other waters of the United States. The Corps authorized the Phase III work through Nationwide Permit 38 (NWP-38) (Reference NWS-2012-868) for cleanup of hazardous and toxic waste, as proposed through the Joint Aquatic Resources Permit Application (JARPA) submitted by Hart Crowser on behalf of Ecology.

Detailed plans and specifications were prepared to implement Phase III, and a bid package including the plans and specifications was prepared for selection of a contractor to complete the construction phase of the remedial action. The contract was awarded to the lowest responsive bidder, American Construction

Company (ACC). Hart Crowser served as Ecology's on-site representative to observe and document the Phase III remedial action.

The overall scope of work completed for the Phase III remedial action is summarized below. Ecology deemed the construction work substantially complete as of 2 November 2021.

Work was performed in the subtidal areas, which are defined as the areas located seaward of the intertidal area (the strip along the Site shoreline extending approximately 50 feet seaward of the ordinary high water [OHW] line). Dredging occurred where eelgrass is absent and where wood waste is greater than 1 foot thick or where the dioxin TEQ exceeds 25 parts per trillion (ppt, equivalent to picograms per gram [pg/g]). Nearshore subtidal areas containing wood waste and/or affected by dioxin/furan contamination were dredged to 2 feet below existing surface. A target volume of approximately 1,500 cubic yards (CY) of contaminated sediment (wet volume) was planned to be dredged (over a 0.37-acre footprint), loaded directly to barges for decanting/dewatering, and disposed of at an upland landfill facility. A total of 1,411 CY of sediment was dredged (Table 2). The extent of dredging is shown on Figure 4.

Sediment dredged from the subtidal areas was loaded directly to barges and transported to the transloading facility operated by Lafarge North America in Seattle, Washington. From the transloading facility, the material was transported to the Waste Management facility in Gilliam, Oregon, by rail for off-site disposal.

As the planned dredging was completed and progress surveys were approved, backfill material was placed in the subtidal sediment removal areas to place a minimum of 2 feet of sand material to attain approximate pre-construction grades (0.5-foot tolerance), which had been measured as part of the pre-construction survey completed before mobilization to the site. Final placement included a total of 1,653 CY of gravelly sand (Table 2).

Subtidal thin-layer capping consisted of two target areas containing 10 to 25 ppt dioxin TEQ (as shown on Figure 2):

- A 2-inch thin-layer cap (TLC) to cap impacted material within and adjacent to the existing eelgrass bed; and
- An 8-inch TLC to cap impacted material in the remaining project boundary outside of eelgrass.

Plans and specifications directed ACC to place 2 inches of material within designated areas (a subsection of the Phase III eelgrass remedial area) with a 1-inch tolerance to not smother/damage eelgrass. This TLC placement requires precise methods especially within and around the critical eelgrass bed, which required a novel TLC placement approach. ACC designed and constructed a crane-mounted "table" to control placement of material in 2-inch sheets across an 8-foot by 8.5-foot rectangle. The table was loaded with material by ACC laborers and then suspended over the placement area 1 to 3 feet above the water surface, held in place to stabilize the swinging motion, and then activated by a laborer from the derrick barge. A total of 424 CY of material was placed within the 2-inch TLC zone, covering about 1.7 acres (approximately 1.1 acre [ac]) outside eelgrass and approximately 0.6 ac over eelgrass) of the project site.

The 8-inch TLC zone was identified to address areas exceeding the 10 ppt TEQ dioxin action level and where eelgrass was not present. Sand was placed using a barge mounted crane equipped with a 4 CY clamshell. Plans and specifications required ACC to place 8 inches of TLC material with a tolerance of 2 inches. A total of 6,124 CY of material was placed over about 4.3 acres.

Following completion of the Phase III remedial action, a post-construction bathymetry survey and eelgrass monitoring have (Appendix J) and will continue to be conducted per the Thin-Layer Capping Eelgrass Monitoring and Adaptive Management Plan (Ecology, 2019b). A post-construction bathymetry survey along with the sediment chemistry was conducted in fall 2022 to document mudline bathymetry conditions during the time period after the construction survey was completed (Appendices K and L). The eelgrass monitoring effort will evaluate the health of the eelgrass within the 2-inch TLC test placement area. Prior to continued placement of 2-inch TLC in the remaining eelgrass bed, if needed biomass and density analysis will be conducted to inform the process. Assuming eelgrass biomass is retained following cap placement, as predicted by the TLC pilot study, the remainder of the eelgrass remediation area may be capped, if needed, during a future construction season. Sediment sampling to measure contaminant concentrations in much of the Phase III area was completed in the fall of 2022. Following collection of sediment, eelgrass, and bathymetric data, Ecology will determine if additional thin layer capping or other remedial actions should be performed.

Table of Contents

Page

Executive Summary i
List of Tables vii
List of Figures vii
List of Appendices viii
List of Abbreviations ix

1. Introduction 1

1.1 REPORT ORGANIZATION 2

2. Site Background 3

2.1 SITE LOCATION AND HISTORY 3
2.2 PREVIOUS CLEANUP ACTIONS 3
2.3 SITE ENVIRONMENTAL CONDITIONS 4
2.3.1 Contaminant Sources and Affected Media 4

3. Cleanup Requirements 6

3.1 REMEDIAL ACTION OBJECTIVES 6
3.2 CLEANUP STANDARDS 6
3.2.1 Sediment Cleanup Levels 7
3.2.2 Point of Compliance for Sediment 7
3.3 DEFINITION OF AQUATIC REMEDIATION AREAS 7
3.3.1 Marine Sediment Management Areas 7
3.4 APPLICABLE PERMITS AND REGULATORY REQUIREMENTS 8
3.5 EELGRASS TRANSPLANT AND PROTECTION 9

4. Overview of Phase III Remedial Action 10

4.1 PLANS, SPECIFICATIONS, AND CONTRACTOR SELECTION 10
4.2 SUMMARY OF THE COMPLETED SCOPE OF WORK 10
4.2.1 Subtidal Sediment Dredging and Disposal 10
4.2.2 8-Inch TLC Outside Eelgrass Area 11
4.2.3 2-Inch TLC in Transition Zone 11
4.2.4 2-Inch TLC within Eelgrass Area 11
4.3 CONSTRUCTION MANAGEMENT 11

5. Phase III Construction Details 13

5.1 MOBILIZATION, SITE PREPARATION, AND DEMOBILIZATION 13
5.1.1 Site Preparation Work 13
5.2 PRE-CONSTRUCTION EELGRASS TRANSPLANT AND SURVEY 14

Table of Contents

Page

5.2.1 Eelgrass Transplant 14
5.2.2 Eelgrass Survey 15
5.3 SUBTIDAL DREDGING 15
5.3.1 Dredging General Sequencing and Schedule 16
5.3.2 Sediment and Debris Management and Disposal 16
5.4 SUBTIDAL DREDGE AREA BACKFILLING 17
5.4.1 Backfill Material Descriptions 17
5.4.2 Backfilling Methods and Locations 17
5.4.3 Backfilling Challenges 18
5.5 SUBTIDAL THIN-LAYER CAPPING 18
5.5.1 2-Inch TLC 18
5.5.2 8-Inch TLC 20
5.6 SITE RESTORATION AND HABITAT IMPROVEMENTS 20
5.6.1 Dredging/Backfill and Thin-Layer Capping 20
5.6.2 Eelgrass Protection/Improvements 20
5.7 CLEANUP AND HABITAT OBSERVATIONS DURING CONSTRUCTION 20
5.7.1 Construction Progress Surveys 21
5.7.2 Water Quality Monitoring and Controls 21
5.7.3 Eelgrass Observations 23
5.8 DEVIATIONS FROM PLANS AND SPECIFICATIONS 24
5.8.1 TLC Area Adjustments 24
5.8.2 Spudding 24

6. Post-Dredge and TLC Sediment Documentation and Analysis 25

6.1 BASE OF DREDGE AREA SEDIMENT SAMPLING 25
6.2 TLC SURFACE SAMPLING 25

7. Post-Construction Activities 26

7.1 DIVER TLC AND EELGRASS OBSERVATIONS 26
7.1.1 Spudding Locations and TLC Placement 26
7.1.2 Eelgrass Observations 26
7.2 WINTER 2022-2023 BATHYMETRIC SURVEY 26
7.3 POST-CONSTRUCTION MONITORING 27
7.3.1 Eelgrass Monitoring 27
7.3.2 TLC Sediment Monitoring 27
7.4 CONCLUSIONS 28

8. Use of This Report 29

9. References 30

List of Tables

Table No.	Title
1	Construction Schedule Summary
2	Dredge and Thin-Layer Cap Material Quantities Summary
3	Dredge Excavation Bottom Documentation Sample Analytical Results
4	Thin-Layer Cap Thickness Measurements
5	Thin-Layer Cap Sediment Documentation Sample Analytical Results

List of Figures

Figure No.	Title
1	Vicinity Map
2	Pre-Construction Site Bathymetry and Work Areas
3	Pre-Construction Eelgrass Extent
4	Dredge Bottom Documentation Samples and TLC Thickness Check Points
5	Post-Construction Conditions - Bathymetry Contours
6	Post- Versus Pre-Construction Bathymetry Differences
7	Post-Construction Conditions - High Resolution Bathymetric Surface
8	Post-Construction Sediment Samples
9	Post-Construction Area-Weighted Average Dioxin Concentration (Remedial Action Area)
10	Post-Construction Area-Weighted Average Dioxin Concentration (South of Jetty)

List of Appendices

Appendix	Title
A	Survey and As-Built Drawings
B	Selected Site Photos
C	Pre-Construction Eelgrass Transplant Report
D	Pre-Construction Eelgrass Survey Report
E	Daily Field Reports
F	Off-Site Disposal and Import Scale Ticket Summary F01 - Dredged Material Disposal F02 - Import TLC, Backfill
G	G01 - Saylar Data Solutions G02 - Analytical Resources, Inc.
H	Contractor Water Quality Monitoring Reports American Construction Company
I	Post-Construction Diver Video Survey and Notes (Ecology 7/1/22 SharePoint Transmittal)
J	Post-Construction Eelgrass Survey Report
K	TLC Sediment Sample Chemical Data Quality Review and Laboratory Reports
L	Post-Construction and Monitoring Bathymetry and Comparison

List of Abbreviations

Abbreviation	Definition
ACC	American Construction Company
BMP	Best management practices
CAP	Cleanup Action Plan
CCR	Construction Completion Report
CDD	Chlorinated dibenzo-p-dioxin
CDF	Chlorinated dibenzofuran
CF	Cubic feet
COC	Constituent of concern
Corps	U.S. Army Corps of Engineers
CQA	Construction quality assurance
CSWGP	Construction Stormwater General Permit
CY	Cubic yards
DAHP	Washington State Department of Archaeology and Historic Preservation
DGPS	Differential global positioning system
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
FS	Feasibility Study
GBH	GBH Investments, LLC
HPA	Hydraulic Project Approval
IAWP	Interim Action Work Plan
JARPA	Joint Aquatic Resources Permit Application
MDNS	Mitigated Determination of Nonsignificance
MLLW	mean lower low water
MTCA	Model Toxics Control Act
NTU	Neophelometric Turbidity Unity
NWP-38	US Army Corps of Engineers Nationwide Permit 38 (Cleanup of Hazardous and Toxic Waste)
OHW	Ordinary high water
PLS	Professional Licensed Surveyor
POC	Point of compliance
ppt	Parts per trillion
PSE	Pacific Survey & Engineering Inc.
PSI	Puget Sound Initiative
QA	Quality assurance
QC	Quality control
RAO	Remedial Action Objectives
RCW	Revised Code of Washington
RFI	Requests for Information
RI	Remedial investigation

SEPA	State Environmental Policy Act
Site	Custom Plywood Site
SMA	Sediment management area
SMP	Shoreline Master Program
SMS	Sediment Management Standards
TCP	Toxics Cleanup Program, Washington State Department of Ecology
TLC	Thin-Layer Cap
TEQ	Toxicity Equivalence Quotient
USACE	United States Army Corps of Engineers
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WQMP	Water Quality Monitoring Plan

1. Introduction

This Construction Completion Report (CCR) summarizes and documents the environmental construction activities completed as part of the Phase III subtidal remedial action at the Custom Plywood Mill Site (site) in Anacortes, Washington (Figure 1). The work was completed following the provisions of the Washington State Model Toxics Control Act (MTCA) and its implementing regulations (Chapter 173-340 Washington Administrative Code [WAC]), under the direction of the Washington State Department of Ecology (Ecology) Toxics Cleanup Program (TCP) and in accordance with an agreement with GBH Investments, LLC (GBH), for selected aquatic portions of the site. GBH is the current property owner and represents a potentially liable person per Chapter 173-340-200 WAC. Construction took place from July through November 2021 under the oversight of Hart Crowser, Inc. (now Haley & Aldrich, Inc. [Haley & Aldrich]), as Ecology's representative.

Phase III construction described in this CCR involved:

- Dredging and off-site disposal of sediment affected by dioxin/furan contamination;
- Backfilling of the excavated and dredged areas with clean fill material that is beneficial to aquatic habitat;
- Placing an 8-inch thin-layer cap (TLC) across the project outside of eelgrass areas; and
- Placing a 2-inch TLC within about 0.6 acres of the eelgrass bed and about 1.1 acres adjacent to the eelgrass bed using sand that is beneficial to aquatic habitat.

The basis for the completed interim aquatic remedial actions is documented in the MTCA Interim Action Work Plan (IAWP) that was prepared for the site. The IAWP consists of the following documents:

- Remedial Investigation (RI) Report for the Interim Action Work Plan prepared by AMEC Geomatrix for GBH, September 2011 (AMEC, 2011);
- Feasibility Study (FS) Report for the Interim Action Work Plan prepared by Hart Crowser for Ecology, September 2011 (Hart Crowser, 2011a);
- Phase I Cleanup Action Plan (CAP) prepared by Hart Crowser for Ecology, September 2011 (Hart Crowser, 2011b);
- Phase I Engineering Design Report (EDR) prepared by Hart Crowser for Ecology, September 2011 (Hart Crowser, 2011c);
- Phase II CAP-EDR prepared by Hart Crowser for Ecology, February 2013 (Hart Crowser, 2013a); and
- Phase III CAP-EDR prepared by Hart Crowser for Ecology, April 2019 (Hart Crowser, 2019).

The overall cleanup actions at the site consist of both upland and in-water work. Three remedial actions were planned for the site, to be conducted in phases. Phase I consisted of the upland remediation that was completed in the summer of 2011 and described in the Phase I CCR (Hart Crowser, 2012b). The cleanup of in-water areas was completed in Phases II and III. Phase II consisted of intertidal and nearshore subtidal cleanup completed in 2013 and described in the Phase II CCR (Hart Crowser, 2014). Phase III, discussed herein, involved cleanup of subtidal areas not addressed in Phase II.

1.1 REPORT ORGANIZATION

This CCR text is organized as noted in the table of contents.

Tables and figures after the end of the CCR text support the discussion in the text. Table 1 summarizes the key construction schedule dates, Table 2 summarizes quantities of material imported to and exported from the site, and Table 3 presents the laboratory analytical results for the sediment documentation samples from the base of the dredge area. Table 4 includes the TLC thickness measurements. Table 5 includes TLC and dredge area sediment sample laboratory analytical results.

Figure 1 presents a vicinity map showing the location of the site and Figures 2 and 3 show pre-construction site features and conditions including work areas, bathymetry, and eelgrass extent. Figure 4 shows the dredge/backfill area and TLC thickness measurement points. Figures 5 through 7 show post-construction bathymetry contours, TLC thicknesses, and high-resolution bathymetry at the site. Figure 8 shows the 2022 post-construction sediment documentation samples within the current TLC and dredge construction work areas. Figures 9 and 10 show average dioxin concentrations for the Phase III area and the area north of the jetty, based on the available sediment sample results.

The appendices after the tables and figures provide additional information on the completed aquatic remedial work. Appendix A contains contractor-provided pre- and post-construction surveys and as-built drawings. Appendix B contains representative photographs of the cleanup work. Appendix C contains the eelgrass transplant report describing mitigation prior to dredging. Appendix D contains the pre-construction eelgrass survey report. Appendix E includes Hart Crowser daily field reports submitted as part of construction observation. Appendix F contains tables documenting material exported from the site for disposal and construction materials imported to the site. Dredge bottom laboratory reports and chemical data quality reviews are provided in Appendix G. Appendix H contains the contractor's water quality monitoring reports. The post-construction diver video survey and notes are included as Appendix I (video transmitted separately due to size). Appendix J is the 2022 post-construction eelgrass survey report. Appendix K is the TLC sediment sample laboratory results data completed in the fall of 2022. Appendix L is the post-construction versus monitoring bathymetry surveys and comparison.

2. Site Background

2.1 SITE LOCATION AND HISTORY

The Custom Plywood Site is one of several Anacortes-area bay-wide priority sites for Fidalgo/Padilla Bays being addressed by the TCP under the Puget Sound Initiative (PSI). The site includes property owned by GBH covering approximately 6.6 acres of upland and 34 acres of intertidal and subtidal areas.

The Custom Plywood Site operated as a lumber and planing mill, beginning in about 1900 until it burned down sometime between 1925 and 1937. Through the years, the property changed hands several times and was rebuilt and expanded until Custom Plywood became the operating entity sometime before 1991. The facility was used as a sawmill and plywood manufacturing plant until most of the wooden structures in the main plant area were consumed in a fire on 28 November 1992. Milling activities produced wood waste and chemical contaminants that affected site soil, sediment, and groundwater.

2.2 PREVIOUS CLEANUP ACTIONS

Past limited interim remedial actions were conducted under WAC 173-340-515 (Independent Remedial Actions) on the upland portion of the site beginning in 1998. These interim actions included removal of soil impacted by hydraulic lube oil within the City of Anacortes right-of-way located immediately northwest of the GBH property in 1998 and removal of impacted soil from four areas where petroleum hydrocarbons and other constituents exceeded MTCA Method A cleanup levels in 2007.

The Phase I interim remedial action was completed in the upland area of the site in the summer of 2011. Before cleanup, the upland was characterized as heavily disturbed and containing abandoned foundations and structures, concrete and wood debris, native and non-native vegetation, and wetlands. The Phase I cleanup work involved demolishing remaining concrete structures in the uplands, removing wooden piles, excavating surface debris and contaminated soil and wood waste, backfilling with clean fill material, and constructing a wetland mitigation area with a vegetated buffer zone and a stormwater swale. Approximately 25,000 cubic yards (CY) of contaminated material was excavated and disposed of off site. Additional information on previous site investigations and remedial actions is presented in the RI (AMEC 2011) and CAP-EDR (Hart Crowser, 2011b and 2011c). Details of the Phase I cleanup work are described in the Phase I CCR (Hart Crowser, 2012b).

Phase II interim remedial action construction work was deemed substantially complete by 23 December 2013, (Hart Crowser, 2013b and 2013d) by Ecology. Abandoned in-water concrete structures in the intertidal and subtidal areas were demolished, with some reused as fill in the upland part of the site. Near-surface debris generally consisting of concrete, brick, wood, and other materials was removed as part of the planned excavation and dredging work completed in the intertidal and subtidal areas. Wooden piling that remained in the intertidal and subtidal areas was removed. The piling along with other wood waste was disposed of off site at a permitted Subtitle D landfill facility (Republic Services Roosevelt Regional Landfill in Roosevelt, Washington). Nearshore subtidal areas containing wood waste and/or affected by dioxin/furan contamination were dredged to native material or the prescribed dredging depth. The extent of wood waste and historical dioxin/furan TEQs measured in this area served as the basis for determining the design excavation and dredging depths.

Sediment dredged from the subtidal areas was loaded directly to barges and transported to the transloading facility operated by Lafarge North America in Seattle, Washington. From the transloading facility, the material was transported to the Roosevelt Regional Landfill by rail for off-site disposal. The excavated and dredged areas were backfilled with clean fill materials that are beneficial to aquatic habitat and provide a cap to isolate remaining impacted sediment from potential receptors. Shoreline protection features, including an extension of the jetty at the north end of the site (Hart Crowser, 2013c) and a protective spit at the wetland mitigation complex (constructed in Phase I), were constructed as part of Phase II. In addition, the cobble berm constructed in Phase I to protect the wetland area was partially breached to connect the wetland area to Fidalgo Bay. At the southern end of the site, shoreline armoring was constructed to provide protection against erosion. The interim remedial action provided shoreline enhancements intended to improve habitat for juvenile salmonids, forage fish spawning, shorebirds and waterfowl, and other aquatic species on and adjacent to the site. Dunegrass was planted along the property shoreline to provide erosion control and backshore habitat. Documentation sampling and analysis were conducted to characterize the concentration of dioxins/furans remaining in the sediment beneath the intertidal and subtidal sediment removal areas after dredging and excavation work was completed to inform Phase III marine cleanup work.

2.3 SITE ENVIRONMENTAL CONDITIONS

Phase II remedial action addressed slowing active erosion of the shoreline by placing Ecology blocks, extending the existing jetty, building a protective spit, and adding dunegrass to targeted areas. Upon beginning Phase III, the beach appears to have retained the dunegrass and slowed the significant erosion of the upper beach.

Deeper in the subtidal zone, extensive eelgrass beds are documented on and adjacent to the Custom Plywood property. These beds are contiguous with the larger Fidalgo Bay eelgrass population. The eelgrass beds appeared in good condition where present but seemed limited in coverage due to previous site use in shallow subtidal areas. The shoreward extent of eelgrass coverage has been limited by the occurrence of wood waste, debris, and high-organic-content sediment within the project footprint.

Five wetland areas (Wetlands A through E) were historically located on the site. Wetlands A through D were removed during the Phase I remedial work and replaced with the wetland mitigation area in the southern portion of the site. Wetland E was removed during the Phase II work. The loss of Wetland E was accounted for in the design of the wetland mitigation area that was constructed during Phase I.

2.3.1 Contaminant Sources and Affected Media

Sediment containing wood waste has been an ongoing source of contamination in the aquatic environment at the site. Wood waste accumulation in nearshore areas and near former overwater structures exceeded 6 feet in places. In sufficient quantities, wood waste can represent an environmental pollutant and deleterious substance per criteria in the Sediment Management Standards (SMS) (WAC 173-240-200(17) and WAC 173-204-562(4)). As part of the sediment profile, wood waste in the biologically active zone can adversely affect benthic habitat by potentially generating sulfide, ammonia, phenols, and related degradation products harmful to marine biota. Prior to Phase II the seaward extent and magnitude of wood waste in quantities sufficient to promote adverse impacts was uncertain. This was further addressed in the May 2011 supplemental sediment field investigation report (see FS Section 2.4 and Feasibility Study Appendix E), and in an investigation conducted in January 2012 to fill additional data gaps in the aquatic area at the site (see Ph. II CAP-EDR Appendix E).

Dioxins/furans are the other notable contaminants in the aquatic environment. Near-surface sediment throughout the aquatic portion of the site has been impacted by dioxin/furan concentrations exceeding Fidalgo Bay and Puget Sound natural background levels. Deeper portions of the sediment profile are also affected as shown in the May 2011 and January 2012 supplemental field investigations. Elevated dioxin/furan concentrations have been encountered in deeper sediment associated with relatively thick nearshore accumulations of wood waste. As the thickness and general quantity of wood waste decreases seaward, dioxins/furans are more likely restricted to surface sediment due to secondary redistribution of nearshore wood waste (more buoyant than sand sediment) or erosion of nearshore wood waste deposits.

3. Cleanup Requirements

The Phase III remedial action is the final phase of cleanup of dioxin/furans and surficial wood waste at the site and was designed to meet the remedial action objectives (RAOs) and cleanup standards for the site, which were developed in the FS and CAP-EDR and are summarized below. The RAOs and cleanup standards were developed to address MTCA, SMS, and other applicable state and federal regulatory requirements for in-water cleanup efforts. These requirements address conditions relative to potential human and ecological receptor impacts. Requirements also consider related habitat, land use, and potential cultural resources issues.

Project RAOs and cleanup standards provided the framework for the selection of the preferred remedial alternative, which included eelgrass transplanting; dredging of contaminated sediments; thin-layer capping; and eelgrass monitoring.

3.1 REMEDIAL ACTION OBJECTIVES

The primary objective for the Phase III remedial action at the Site focused on substantially eliminating, reducing, and/or controlling unacceptable risks to the environment posed by constituents of concern (COCs) to the extent feasible and practicable. Applicable exposure pathways and receptors of interest for human health include current and future site users, including workers and visitors, shellfish consumers of marine biota and marine sediment/waters.

Applicable ecological exposure pathways and receptors include organisms in the biologically active zone exposed to sediment by direct contact and food chain uptake. Related ecologically focused cleanup objectives for bay-wide remediation also include:

- providing suitable substrate for promoting recovery/recruitment of aquatic organisms in remediated areas; and
- minimizing habitat (i.e., eelgrass) and water quality impacts during construction.

These RAOs were presented as target goals to be achieved to the extent feasible and practicable. A key additional objective was the preservation and protection of cultural resources, should such objects be encountered during the remedial action.

Protective in-water features to prevent further shoreline erosion and migration/dispersion of deleterious sawdust and residual contaminated sediment from the site's intertidal areas were addressed by the Phase II cleanup action.

3.2 CLEANUP STANDARDS

Under WAC 173-340-700, a cleanup level is the concentration of a hazardous substance in soil, water, air, or sediment that is determined to be protective of human health and the environmental under specified exposure conditions. Cleanup levels, in combination with points of compliance (POC), typically define the area or volume of soil, water, air, or sediment at a site that must be addressed by the cleanup action. For this Site, cleanup criteria established by MTCA, SMS, or other regulatory criteria would be achieved in a reasonable restoration timeframe by this Phase I, II, and III remedial action followed by natural recovery processes. The cleanup standards established for site sediment are summarized below.

3.2.1 Sediment Cleanup Levels

Cleanup actions for aquatic cleanup must comply with applicable MTCA, SMS, and other protective regulatory criteria for sediment and the aquatic environment. Per the SMS, the sediment cleanup level is the concentration or level of biological effects of a contaminant in sediment determined by Ecology to be protective of human health and the environment (WAC 173-204-560(2)). Cleanup levels for sediment are established through SMS criteria for protection of the benthic community, higher trophic level species, and human health. The SMS contains numeric standards for chemical constituents and bioassay testing for the benthic community, and processes for determining concentrations protective of higher trophic level species and humans.

Key indicator hazardous substances and COCs were identified, by medium, after a review of the RI. As noted in Section 7.0 of the RI, indicator hazardous substances were identified based on their frequency of occurrence, mobility and persistence in the environment, and/or their toxicological characteristics (WAC 173-340-703). The SMS requires that COCs be screened against criteria protective of human health and upper trophic level species health, in addition to criteria protective of the benthic community. In accordance with WAC 173-204-560 and applicable subsections, the most conservative concentration identified for protection of human, upper trophic level species, and benthic community health (i.e., risk-based criteria) was compared against natural background concentrations as well as the practical quantitation limit (PQL) for dioxins/furans. Per WAC 173-204-560(3), the PQL (i.e., 5.0 parts per trillion [ppt] TEQ) was selected as the initial cleanup level for dioxins/furans as it was greater than the Puget Sound Natural Background concentration of 4.0 ppt TEQ, as well as the risk-based criteria.

3.2.2 Point of Compliance for Sediment

The point of compliance (POC) was identified in accordance with the SMS for affected sediment. According to SMS requirements, the POC is represented by the “biologically active zone”, which is the sediment depth determined by Ecology where the species critical to the function, diversity and integrity of the benthic community are located. At this Site, the biologically active zone is the uppermost 10 centimeters below the mudline. This means to protect human and ecological health sediment cleanup levels must be met within the top 10 centimeters. After implementation of two interim remedial actions, the only remaining affected media were near surface (i.e., less than 10 centimeters) subtidal sediments (impacted with dioxins).

3.3 DEFINITION OF AQUATIC REMEDIATION AREAS

This section describes aquatic areas of concern at the Site where the concentration of COCs exceeded the identified cleanup levels. The areas of concern were identified based on the known or inferred extent of contaminated media following review of historical and analytical data presented in the RI and further summarized in the FS and Phase III CAP-EDR.

3.3.1 Marine Sediment Management Areas

Dioxin is the only remaining COC identified for defining sediment management areas (SMAs) for marine sediment cleanup at the Site. The overall extent of the aquatic remedial action area was defined by the 10- and 25-ppt dioxin/furan TEQ action thresholds described below.

- Aquatic sediment areas where dioxin concentrations exceed 25 ppt TEQ and/or greater than a foot of wood waste accumulation is present requires removal (dredging).

- Aquatic sediment areas where dioxin concentrations range between 25 and 10 ppt TEQ requires either thin-layer capping or removal.

Figure 2 presents the overall Phase III cleanup area that was identified/determined by comparing dioxin concentrations in surface sediment to the remedial action levels described above. The cleanup area includes 4.7 acres of eelgrass that has been identified for a 2-inch TLC. Of the 4.7 acres of eelgrass, 4.1 acres were not included in this current design and construction work but may be addressed later, pending eelgrass health after placement in a 0.6-acre test area. Additional rationale used to establish the aquatic SMAs based on dioxins/furans can be found in the FS and CAP-EDR. See Section 7.4.

3.4 APPLICABLE PERMITS AND REGULATORY REQUIREMENTS

MTCA and SMS regulatory provisions form the primary basis for evaluating and implementing aquatic cleanup alternatives for remediation at the Site. Given the project's status as an Ecology priority cleanup site under an Agreed Order, the project was exempt from procedural requirements of certain state and local government laws and related permitting requirements and approvals. This included the procedural requirements of the Shoreline Management Act (SMA) (Chapter 90.58 RCW) and the City of Anacortes Shoreline Master Program (SMP).

Although exempt from procedural requirements of certain state and local laws and related permitting requirements, pertinent substantive compliance requirements remained applicable. MTCA does not provide a procedural exemption from federal permitting. Necessary permits were obtained to facilitate the Phase III work. The United States Army Corps of Engineers (USACE) issues nationwide permits to authorize certain activities that require Department of the Army permits under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899, which includes work in streams, wetlands, and other waters of the United States. The Corps authorized the Phase III work through Nationwide Permit 38 (NWP-38) for cleanup of hazardous and toxic waste, as described in the letter dated 4 August 2020 (Reference NWS-20120868).

As a result of the State Environmental Policy Act (SEPA) review, Ecology issued a Mitigated Determination of Nonsignificance (MDNS, dated 7 March 2019). Ecology also obtained a Hydraulic Project Approval (HPA) from the Washington Department of Fish and Wildlife (WDFW) on 1 February 2019.

In addition, the Fidalgo Bay region is known to be archaeologically sensitive, and USACE involvement in Clean Water Act permitting triggered provisions of Section 106 of the National Historic Preservation Act of 1966, and the Archeological and Historic Preservation Act (16 U.S.C. 469). The Phase III project was coordinated with state and local agencies regarding substantive compliance issues, and USACE and other federal agencies for federal permitting issues. Additionally, the Samish Indian Nation, Swinomish Tribal Community, and other tribes with usual and accustomed treaty rights within Fidalgo and Padilla Bays, and the Washington State Department of Archaeology and Historic Preservation (DAHP) were consulted on cultural resource and archaeological matters. Revised Archaeological Monitoring Plan and Inadvertent Discovery prepared for Phase II in-water work was also used for Phase III dredging activities.

Ecology corresponded with the City of Anacortes (City) regarding the need for permits. Ecology understands that for the marine work the City only indicated their construction noise requirements, which were relayed to the Contractor. The Contractor corresponded with the City about noise variances that may be needed for work outside of normal working hours, to accommodate marine work restricted by tides.

3.5 EELGRASS TRANSPLANT AND PROTECTION

During the Phase II post-construction monitoring, the 2019 eelgrass survey revealed eelgrass occupying approximately half of the dredge area. There was significantly less eelgrass in the dredge area footprint in the pre-construction survey in 2021 (estimated 302 square feet) than during the 2019 survey (0.17 acres).

To prevent destruction of eelgrass from dredging within this area, eelgrass was transplanted from the dredge perimeter and from within a 10-foot buffer around the planned dredging boundary to the 2021 transplant area (Figure 3). Previous Phases identified a suitable mitigation area, resulting in proactive eelgrass transplant in 2014 to the north of the main bed and within the remedial action boundary (RAB). Subsequent monitoring of the 2014 transplant area found that the planted eelgrass persisted after planting, but has fluctuated and decreased in total area. In the time that the 2014 transplant area decreased, the northern boundary of the main bed extended towards the transplant area (Hart Crowser, 2020). As such, the mitigation area for Phase III was shifted to the southeast (Figure 3) to encourage new shoot recruitment between the northern main bed boundary and 2014 transplant area. Details regarding pre-construction transplanting can be found in Section 5.2.1 and Appendix C.

Protection of the eelgrass bed during TLC placement and general construction activities includes several techniques:

- Spudding was limited within the eelgrass bed by requiring the contractor submit a spudding plan before construction that minimized spudding to the extent practical.
- Spudding was not permitted within the 2014 and 2021 eelgrass transplant areas.
- Staging of overnight marine construction equipment was permitted in Fidalgo Bay only outside of areas with known or suspected eelgrass.
- The pre-construction eelgrass survey and known eelgrass beds along navigational paths were provided to the contractor in a digital format they added into their navigation software. The contractor was still required to prevent eelgrass damage.
- Placing 2-inches of sand TLC material (with a 1-inch tolerance) when in eelgrass, rather than the 8-inches of sand TLC placed elsewhere.
- Placing 2-inches of sand TLC material 20-feet outside of the border of eelgrass before the start of 8-inch TLC material. This transition zone was to limit sediment migrating from the 8-inch TLC area into the eelgrass to avoid smothering the eelgrass.

A pilot eelgrass TLC study (Hart Crowser, 2016a) determined the eelgrass in the project area could be carefully capped with up to 4-inches of sand. The first part of the Phase III construction included a test-placement of 2 inches of TLC using marine construction methods over an area of about 0.6 acres within the eelgrass bed. Future TLC placement within the eelgrass bed will be evaluated based on summer 2022 (Year 1) and 2023 (Year 2) monitoring.

4. Overview of Phase III Remedial Action

Final Phase III of the selected remedial alternative for the Site consists of remediating the final 10.5 acres of subtidal sediment not addressed during the previous interim actions. The Phase III cleanup action included the combination of (1) dredging surface sediments contaminated with dioxins/furans, (2) backfilling the dredge area, and (3) placing a TLC in eelgrass, in a transition zone adjacent to eelgrass, and outside eelgrass.

The aquatic remedial alternative was selected based on MTCA and SMS evaluation criteria and compared with other potential remedial alternatives, as detailed in the FS and CAP-EDR. This alternative not only addressed protection of the human health direct contact and ecological exposure pathways, but also removed impacted sediment as a secondary source of contamination via consumption of marine biota and marine waters.

Consistent with Chapter 70.105D RCW, as implemented by Chapter 173-340 WAC, Ecology determined that the selected aquatic remedial action should protect human health and the environment, should attain federal and state requirements that are applicable or relevant and appropriate, should comply with cleanup standards, and should provide for compliance monitoring.

A summary of the scope of work completed is provided below.

4.1 PLANS, SPECIFICATIONS, AND CONTRACTOR SELECTION

Detailed plans and specifications (Hart Crowser, 2021b and Anchor QEA, 2021) were prepared to implement Phase III based on the information provided in the Phase III CAP-EDR (Hart Crowser, 2019). A bid package including the plans and specifications was prepared for selection of a contractor to complete the construction phase of the remedial action. The contract was awarded to the lowest responsive bidder, American Construction Company (ACC).

4.2 SUMMARY OF THE COMPLETED SCOPE OF WORK

The overall scope of work completed for the Phase III remedial action is summarized below.

The work was performed in the subtidal areas, which are defined as the areas located seaward of the intertidal area (the strip along the Site shoreline extending approximately 50 feet seaward of the OHW line). Dredging occurred where wood waste was greater than 1 foot thick or where the dioxin TEQ exceeded 25 ppt (equivalent to picograms per gram [pg/g]). All eelgrass within the dredge prism was transplanted to a nearby mitigation area prior to dredging, and will be monitored for up to 10 years to evaluate transplant success. Thin-layer capping, either with 8-inches or 2-inches of sand material, was conducted in areas containing 10 to 25 ppt dioxin TEQ: 4.3 acres of 8-inch TLC, 1.15 acres of 2-inch TLC to transition into the eelgrass bed, and 0.6 acres of 2-inch TLC within the eelgrass bed.

4.2.1 Subtidal Sediment Dredging and Disposal

A target volume of approximately 1,500 CY of contaminated sediment (wet volume) was planned to be excavated or dredged (over a 0.37-acre footprint), loaded directly to barges for decanting/dewatering, and disposed of at an upland landfill facility. The final dredging volume of impacted material was approximately 1,411 CY (2,055 tons). Following removal, the dredged areas were backfilled with clean fill materials that are suitable for aquatic habitat and provide a cap to isolate any remaining impacted sediment from potential receptors. Approximately 1,653 CY of clean backfill materials (1-inch minus sandy gravel) were imported for placement in the excavated and dredged areas (Table 2).

Sediment dredged from the subtidal areas was loaded directly onto barges and transported to the transloading facility operated by Lafarge North America at 5400 West Marginal Way SW, Seattle, Washington. From the transloading facility, the material was transported to a landfill facility (Waste Management Disposal Services of Oregon, Gilliam, Oregon) by rail for off-site disposal.

4.2.2 8-Inch TLC Outside Eelgrass Area

Approximately 4.4 acres of subtidal sediment (located outside the eelgrass areas) was planned to be capped with 8 inches of clean sand. This included areas of sediment which exceed the 10 ppt TEQ dioxin action level. Based on changing conditions, the 8-inch capped area ended up covering roughly 4.3 acres (6,124 CY), as shown on Figure 5.

4.2.3 2-Inch TLC in Transition Zone

Approximately 1.1 acres of transition zone subtidal sediment (located adjacent to eelgrass beds) was to be placed to avoid the occurrence of slumping/redistribution of capping layers into the nearby eelgrass area. This transition zone was planned to be capped with 2 inches of clean sand. Based on changing conditions, the 2-inch capped area ended up covering roughly 1.7 acres (424 CY including transition and eelgrass areas), as shown on Figure 5.

4.2.4 2-Inch TLC within Eelgrass Area

In areas with eelgrass, capping may take place over two (or more) construction seasons. The first season was completed in 2021 to establish a proof of concept at full scale. Approximately 0.59 acres of eelgrass was capped with 2 inches of clean sand (424 CY including transition and eelgrass areas). After placement, the eelgrass cap will be closely monitored during Year 1 (summer 2022) following construction. Monitoring includes verification of cap thickness and documentation of above ground eelgrass biomass.

Assuming eelgrass biomass is retained following cap placement, as predicted by the TLC pilot study, the remainder of the eelgrass bed with sediment dioxin concentrations between 10 and 25 ppt TEQ may be capped during a subsequent construction season.

4.3 CONSTRUCTION MANAGEMENT

Ecology retained Hart Crowser to serve as their construction manager representative during implementation of Phase III to ensure execution of the project in accordance with the contract documents and to document the construction work. Construction management involved both on-site and off-site duties, consisting of daily construction observation and off-site engineering and managerial support. Specific construction management tasks included:

- Monitoring construction performance and documenting field observations, which included keeping a daily log of field activities, performing quality assurance (QA) of contractor water quality monitoring, taking photographs, and completing daily field reports. Selected representative photographs are shown in Appendix B, and Hart Crowser daily field reports are provided in Appendix E.

- Tracking import material quantities, tracking dredging and disposal quantities, reviewing contractor progress and payment requests, bathymetric surveys, and reviewing/cross checking contractor payment volume calculations.
- Tracking contractor construction quality assurance and quality control (CQA/QC) to ensure compliance with the plans and specifications.
- Collecting sediment documentation samples representative of the material left in-place, beneath the dredge prism.
- Communicating and coordinating with Ecology and the contractor, serving as Ecology's representative in the field, and coordinating weekly virtual construction meetings. This included communication of all deviations from the contract documents, change requests, field directives, and requests for information (RFIs) from the contractor to Ecology.
- Reviewing and providing recommendations to Ecology on contractor submittals, contractor pay applications, RFIs, and change requests.
- Reviewing contractor construction closeout documentation, end of construction site visit/meeting, and review/confirmation of substantial construction completion.

5. Phase III Construction Details

Specific details of the Phase III remedial action are described in this section. The work was completed by ACC. Hart Crowser was present on site as Ecology's representative during construction (see Section 4.3).

Contractor mobilization and setup at the site began in early July 2021. The in-water construction work was permitted to begin on 16 July 2021, in observance of the fish window requirement of the NWP-38 authorization for the project. Ecology deemed the construction work substantially complete as of 27 October 2021, per contract requirements. Table 1 includes a summary of key construction dates.

5.1 MOBILIZATION, SITE PREPARATION, AND DEMOBILIZATION

Contractor mobilization and site preparation activities included:

- Setting up a tide gauge on derelict piles in the area;
- Collecting the pre-construction bathymetry survey, subcontracted to and completed by Solmar Hydro on 6 July 2021 (Appendix A01);
- Mobilizing marine construction equipment to the site;
- Preparing the barges for material transport and for managing water drained from dredged sediment;
- Preparing the derrick/crane barge for dredging operations;
- Preparing the TLC table for TLC application; and
- Preparing water quality monitoring equipment and methods.

Contractor demobilization after construction consisted of removing all temporary equipment from the site and removing construction materials, debris, scrap, or waste.

5.1.1 Site Preparation Work

Work was conducted waterward of -1 feet mean low lower water (MLLW) to clean up subtidal areas remaining after the conclusion of Phase II. Preparation for dredging and TLC placement within the Phase III footprint (Figure 2) included:

- Preparation for water quality monitoring by discussing existing water quality monitoring plans and reviewing procedures with ACC. As ACC was the lead for conducting water quality monitoring, it was requested by Hart Crowser that they submit a water quality monitoring plan to adhere to.
- A turbidity curtain was initially planned, but site conditions, proposed ACC construction methods, and eelgrass protection were reviewed again while preparing for site work. The site is in shallow water that can have energetic storm events, is difficult to navigate barges in, and eelgrass throughout the site that cannot be avoided in the work zones. There was concern that the turbidity curtain anchors and lines could drag through the eelgrass bed and cause considerable damage. After discussion with Laura Inouye with Ecology Shorelands & Environmental Assistance (water quality reviewer), it was determined construction could

proceed without a turbidity curtain, provided water quality could meet the WQMP requirements.

- In consideration of the history of Fidalgo Bay and Native American resources, the Ecology Toxics Cleanup Program required cultural resources training for staff doing the dredging. Staff were trained to recognize and report potential middens and other items of cultural value (per the Inadvertent Discovery Plan, Ecology, 2020) while dredging.

5.2 PRE-CONSTRUCTION EELGRASS TRANSPLANT AND SURVEY

Phase III focuses on remediation of intermediate levels of dioxin contamination through the application of a thin-layer sand cap over roughly ten acres of subtidal habitat along with a minor dredging effort. These cleanup activities for the remainder of the site were planned to be completed over two in-water construction seasons with the first season including a TLC over approximately 4.4 acres (about 0.5 acres in eelgrass) and about 0.4 acres of dredging. The second season including placing a 2-inch TLC in the remaining approximate 4.1 acres of impacted sediment within eelgrass, pending results of post-construction eelgrass monitoring within the approximately 0.5-acre, 2-inch TLC test area, and sediment compliance sampling results.

A target volume of approximately 1,500 CY of contaminated sediment (wet volume) was planned to be dredged (over a 0.37-acre footprint). The dredge prism and associated construction buffer of 10 feet beyond the dredge boundary occupy approximately 0.46 acres of the total Phase III area. To mitigate impacts from dredging, eelgrass was removed by hand from the dredge prism and transplanted to the mitigation area outside of dredging (2021 eelgrass transplant area in Figure 3).

5.2.1 Eelgrass Transplant

Transplanting for Phase III construction in 2021 included planting 494 planting units (PU) with an average of four shoots per PU for a total of 2,025 shoots. Transplanted shoots cover approximately 50 m^2 (538 ft^2), planted at a density of 36 shoots/m^2 (~3 shoots/ft^2). Shoots were transplanted into the identified 2021 transplant area in the westernmost corner, bridging an area between new recruitment and the 2014 transplant area (Figure 3).

Visibility was challenging at the time of transplant; divers frequently had 0.5 to 2 feet of visibility while planting. As such, planting was opportunistic within circular plots and eelgrass was predominantly planted within plot numbers 11 and 12 (Appendix C, Figure 4).

The actual quantity of eelgrass shoots within the dredge prism proved to be significantly lower than planned for within the Custom Plywood Phase III Eelgrass Mitigation and Monitoring Plan (2019). As such, the goals outlined in the Mitigation and Monitoring Plan may require adjustment to more accurately reflect the actual impacts of Phase III construction. Monitoring of the transplant area is to be conducted during years 1, 3, 5 and 10. Year 1, 2022, is complete (Appendix J) and Year 3, 2024 is planned, but other years still need to be budgeted for monitoring.

Additional details regarding the transplant can be found in Appendix C: Pre-Construction Eelgrass Transplant Report.

5.2.2 Eelgrass Survey

The pre-construction eelgrass survey was intended to create an eelgrass map for construction and was done with a low tide walk in shallow water and by boat/divers in deeper water. The on-foot portion of the delineation was conducted 23 and 24 June 2021, and the vessel-based portion of the delineation was conducted 6 through 9 July 2021. The diver density surveys were conducted on 6 through 9 July from a 19-foot Almar aluminum boat. A representative from Ecology (Arianne Fernandez) was present during the field survey work on 8 July. Weather conditions were mostly to partly sunny with calm to breezy winds. The water column was moderately turbid for the majority of the survey with an average visibility of 3 to 6 feet. The delineation surveys covered approximately 44 acres to include the sediment cleanup area, transplant area, and areas of potential use by the contractor for access and staging (Figure 3).

Overall, the 2021 eelgrass delineation survey found that while eelgrass coverage increased on the site, eelgrass shoot density decreased. Expansion of the existing eelgrass bed occurred primarily in the offshore boundaries and to the south, while the eelgrass boundary retreated waterward in the location of the dredge prism.[1] As in 2019, eelgrass was absent to the north of the transplant area and south of the Fidalgo Marina jetty.

Additional details regarding the 2021 pre-construction eelgrass survey can be found in Appendix D: Pre-Construction Eelgrass Survey.

5.3 SUBTIDAL DREDGING

A target volume of approximately 1,500 CY of contaminated sediment (wet volume) was planned to be dredged (over a 0.37-acre footprint), loaded directly to barges for decanting/dewatering, and disposed of at an upland landfill facility. Dredging was performed to remove the upper 2 feet of sediment affected by wood waste and dioxins/furans in the 0.37-acre subtidal area on Figure 2. A total of 1,411 CY of sediment were dredged (Table 2). The extent of dredging is shown on Figure 4, and post-construction as-built drawings are provided in Appendices A02 to A05.

Dredging was performed using a derrick barge equipped with either a clamshell bucket (approximate capacity of 4 CY) or an enclosed environmental bucket (approximate capacity of 2 CY). Bucket selection depended on sediment and debris conditions in the dredging area. The environmental bucket was used for the first pass of dredging, but it was determined that the debris caused interference and the bite depth was limited which significantly hindered progress, thus, the 4-CY clamshell was used for the remaining dredging and placement with the exception of spot-cleaning the dredge prism at-depth. A separate material barge was used for receiving dredged sediment, draining and managing water from the sediment, and transporting sediment off site to the transloading facility for disposal. The material barge was equipped with a woven geotextile sediment tube outside the side walls that turbid water could be pumped into to filter before discharging clear water (Appendix B, Photo 16).

ACC's derrick barge was equipped with a differential global positioning system (dGPS) to position the vessel in the dredging area (Figure 4). Clam Vision software was used that allowed real-time tracking of

[1] The eelgrass delineation at the site (July 2021) was conducted after the completion of the eelgrass transplant from within the dredge prism (April 2021). Therefore, eelgrass was not expected to occur there. However, far less eelgrass was transplanted out of the dredge prism than was expected based on the 2019 delineation survey, indicating the eelgrass had retreated from the area of the dredge prism.

the horizontal position of the barge and dredging bucket. Background templates and overlays of the dredge area were uploaded to the software that allowed the dredge operator to see the position of the equipment relative to the planned dredging extent, shoreline, and proposed sediment sampling points. The software was also used to track dredging progress, designating areas that had been completed as the work progressed. During dredging, the depth of the cut relative to target depth was tracked by the dredge operator using a combination of bucket cable marks, a physical tide board, and an electronic tide gauge. The same systems were used to track the placement of backfill material (Section 5.4).

The quantity of dredged material was determined by a combination of techniques. Barge draft was measured and compared to an engineered displacement chart to estimate the tonnage of material dredged per barge load. A 1-cubic-foot (CF) standardized volume of dredged material was periodically collected and weighed for each barge load to determine the density of the material, which was used to convert tonnage to volume of material per barge load. Due to the deeper draft of the tug boat used for transporting the materials barge (the “Skagit”), overnight staging before transport took place outside of the work zone near the main navigation channel in deeper waters.

ACC also conducted hydrographic/bathymetry progress surveys in the completed dredged areas to verify whether target depths had been attained, which were submitted as progress surveys to Ecology for review and approval. Final bathymetry surveys were completed by a professional licensed surveyor (PLS) after ACC’s progress surveys indicated dredging was done. These PLS surveys were used for final acceptance and payment purposes. The final dredging elevations that were attained and documented in progress surveys are on Figure 4 and provided in Appendix A.

5.3.1 Dredging General Sequencing and Schedule

In the overall sequencing of the construction work, dredging and excavation commenced near the beginning of the scheduled work, after mobilization to the site was completed (Table 1). In accordance with the NWP-38, in-water work was permitted to begin on 16 July 2021. After preparing the barges, dredging work commenced on 28 July 2021. ACC began dredging operations generally at the south end of the planned footprint and progressed north.

ACC scheduled construction work based on a 5- to 6-day workweek, with daily work scheduled around favorable tides. Because of the overall shallow water depths at the site, observation of high tide schedules was critical to ensuring accessibility to in-water work areas and to accommodate the draft of the work vessels.

Some in-water work delays occurred due to potentially hazardous weather events (e.g., lightning or excessively high winds) and by the limited capacity of the transloading facility that was receiving the sediment from the Custom Plywood Site in addition to several other sources (see Section 5.3.2). During periods when the transloading facility was at maximum capacity, loaded barges were required to wait on standby until unloading capacity became available.

5.3.2 Sediment and Debris Management and Disposal

Dredging during Phase III removed approximately 1,411 CY of dioxin/furan-contaminated sediment and debris, which was disposed of off site at a landfill facility (Waste Management Disposal Services of Oregon, Gilliam, Oregon). Material transported by barge was received at Waste Management National Services’ transloading facility in Seattle (7400 8th Avenue South, Seattle, Washington), where it was transferred into gondola style (like a bathtub) railcar (lined if needed) containers and transport by rail to the CRLRC. The sediment is processed to remove excess water, if present, to meet rail transport requirements.

The sediment removed from the dredging areas contained little visible wood waste, predominately small woody debris particulates, and two partial timber piles.

Dredging activities were performed using marine equipment so dredge material was saturated when it was placed on the transport barge. Water was allowed to drain from the material on the barge back to the bay. The material barge was equipped with filtration systems (water pumped to woven geotextile tubes, or geotubes) to reduce the suspended solids content of the discharging water (Appendix B, Photo 16). Before leaving the site, the drain outlets on the barges were sealed to prevent any remaining water from discharging during travel from the site to the transloading facility.

Transportation and disposal quantities were based on the tonnage of material received at the transloading facility. Table 2 provides a summary of dredge material quantities and Appendix F01 includes transload facility barge displacement quantities and a final quantity certificate for the material that was transported off site.

5.4 SUBTIDAL DREDGE AREA BACKFILLING

As the planned dredging was completed and progress surveys were approved, backfill material was placed in the subtidal sediment removal areas to place a minimum 2-feet of sand material to attain approximate pre-construction grades (0.5-foot tolerance), which had been measured as part of the pre-construction survey completed before mobilization to the site. Final placement included a total of 1,653 CY of gravelly sand (Table 2 and Appendix F02).

5.4.1 Backfill Material Descriptions

Two types of import material were placed, a gravely sand for dredge area backfill and a sand for the 2-inch and 8-inch TLC. Both materials met the specified gradations (Appendix F02). The specified TLC sand allowed between 0 to 10 percent passing the No. 100 sieve with no requirement for the No. 200 sieve to provide suitable aquatic habitat and to promote eelgrass recolonization. The actual TLC material had about 3 percent passing the No. 100 sieve and about 1 percent passing the No. 200 sieve. The actual dredge backfill contained about 35 percent larger than the No. 4 sieve (i.e., gravelly sand) and about 1 percent passing the No. 200 sieve (i.e., fines).

During in-water placement of these materials, localized turbidity was generated, but water quality criteria were not exceeded at the point of compliance (POC). Due to aeration of the surface waters when backfill material was placed, brown bubbles would appear along the surface surrounding the work zone. Exploratory water quality testing demonstrated the bubbles were not indicative of a turbidity exceedance; see photos and descriptions in the Daily Field Reports (DFRs) in Appendix E for details.

5.4.2 Backfilling Methods and Locations

Backfill was only placed in the dredge prism. End of dredge bathymetry elevation contours and documentation samples are shown on Figure 4. Post-construction (post TLC) elevations of the backfilled dredge area is shown on Figure 5 and the as-built drawings provided in Appendix A. Backfill was placed using the barge-mounted crane and a 4-CY clamshell used during dredging by depositing material from less than one foot above the water while moving the bucket in a sweeping motion for better control of the placement depth. The extent of backfill placement was monitored to assure the backfill was within the dredged area and did not cover eelgrass. Placement of backfill material from the barge was tracked using the same positioning system and software as was used for dredging operations (see Section 5.3). The dredge and backfilled area was hydrographically surveyed by ACC (progress surveys) and Pacific Surveying & Engineering (acceptance surveys, Appendix A), the results of which were submitted to Ecology for review and approval.

5.4.3 Backfilling Challenges

The dredge area backfill progress survey showed that a small amount of backfill was placed slightly outside of the dredge area, just within the eelgrass bed. This backfill appeared to overlap eelgrass in a small approximately 3-foot by 16-foot area not planned for thin-layer capping. This area was re-surveyed with high resolution imaging and analyzed by cross section and inspected by divers to confirm that the material placed within the eelgrass bed was below the 4-inches of tolerance and to visually determine signs of smothering. Findings determined that the material did not reach actual eelgrass although it did cross the eelgrass boundary line determined by discrete GPS points.

5.5 SUBTIDAL THIN-LAYER CAPPING

Subtidal thin-layer capping consisted of two target areas:

- A 2-inch TLC to cap impacted material within and adjacent to the existing eelgrass bed; and
- An 8-inch TLC to cap impacted material in the remaining project boundary outside of eelgrass.

5.5.1 2-Inch TLC

Plans and specifications directed ACC to place 2-inches of material within designated areas with a 1-inch tolerance to not smother/damage eelgrass (as discussed in Section 3.5). This thin of TLC placement requires precise methods especially within and around the critical eelgrass bed, which required a novel TLC placement approach. ACC designed and constructed a crane-mounted “table” to control placement of material in 2-inch sheets across an 8 by 8.5-foot rectangle. The 2-inch TLC placement table consisted of two layers of slotted steel plates that slide across each other allowing sand to fall through the slots (Appendix B, Photos 11 to 13). Each slotted plate was pneumatically actuated by controlled levers and one cycle consisted of the top plate moving one direction and the bottom plate moving the other for top and bottom slots to align. The table had a hopper vibrator to help the sand fall through the slots, and a few plate cycles were often required. The table was loaded with material by ACC laborers using a combination of a skid steer and hand tools and smoothed until flat, loading the table to approximately 3 inches in depth (3-inch steel angles on the table provided a consistent “screeding” depth guide) to compensate for material that may remain on the table surface after placement. The table was then suspended over the placement area 1 to 3 feet above the water surface, held in place to stabilize the swinging motion, and then activated by a laborer from the derrick barge.

Due to the novel nature of the 2-inch TLC table fabricated for this project and the sensitive eelgrass beds, the specifications required dry (i.e., barge deck) and in-water demonstrations to show the 2-inch TLC table worked before routine production. To demonstrate the placed depth would meet thickness thresholds, multiple lines of evidence were used:

- Several “dry runs” of the table were conducted on the materials barge deck to determine how material spread, measure how thick it was placed, observe obvious gaps or mounds in material, detect mechanical malfunctions, determine the number of cycles to release adequate sand, and to practice the loading process.
- ACC placed a “rain bucket” (a 5-gallon bucket attached to a 2-foot-square aluminum plate and buoy, Appendix B, Photos 9 and 10) within the demonstration area to measure the thickness of placed material at-depth. Four 2-inch TLC tables were placed in the water with overlap as would typically be used in routine placement projects with the rain bucket at the center to capture the dynamics between areas where the table has been activated. The rain buckets showed 1.75 inches of TLC material placement for the in-water four 2-inch TLC table demonstration area. Rain buckets were placed throughout the 2-inch and 8-inch TLC areas at the beginning of each TLC placement shift as shown on Figure 4.
- Divers from Grette Associates, LLC, placed six graduated PVC stakes within an area the 2-inch TLC zone that would be addressed within the first day of placement. The stakes showed a placement thickness of 0.5 to 1.5 inches after using the table. However, when measuring the depth after placement, divers noted that the sand material appears to have caused some compression of the soft mudline native sediment (silt and a layer of organic detrital film) below the TLC. Thus, the stakes may underestimate sand TLC thickness. When the divers pushed their hand into the surface material they observed about 2 inches of the sand TLC material, confirming some compression of mudline sediment. While this method demonstrated some imperfection it provided additional information on the site and indicated the table would provide controlled, light, distribution of the TLC material.
- To compensate for lateral dispersion of the TLC sand as it falls through the water column, the image of the table on the crane operator’s screen was adjusted to be a 10-foot square. This calibrated the 2-inch table in-water demonstration and diver observations with placement areas on the “bucket map” on the crane operator’s screen to limit overlapping between tables and prevented excess mounding of TLC material.

A total of 424 CY of material was placed within the 2-inch TLC zone, covering about 1.7 acres of the project site.

5.5.1.1 Adjacent to Eelgrass

To limit migration of material between the 8-inch TLC and the existing eelgrass bed, the 2-inch TLC was extended by about 20 feet surrounding eelgrass to act as a transition zone. To navigate these borders, the project team used the pre-construction eelgrass survey to use up-to-date information and adjust as needed (see Section 5.8.1).

5.5.1.2 Eelgrass Areas

Placing 2-inch TLC within eelgrass was conducted using the placement table while limiting spudding to the minimum feasible, using the quantity submitted in the required eelgrass spudding plan as a base. The area identified for 2-inch TLC in the eelgrass bed is located in the south end of the project site (Figure 2), covering approximately 0.6 acres. When analyzing eelgrass survival on a small scale during the TLC Pilot Study, recommendations included expanding the experimental area to compensate for new areas of this large-scale bed (Hart Crowser, 2016a). This 0.6-acre area is intended to expand the area of analysis and determine eelgrass health and survival prior to addressing the remaining impacted areas. Additional information on eelgrass within the 2-inch TLC zone will be gathered during Year 1 monitoring, to be conducted in 2022.

5.5.2 8-Inch TLC

The 8-inch TLC zone was identified to address areas exceeding the 10 ppt TEQ dioxin action level. Sand was placed using a barge mounted crane equipped with a CY clamshell. Plans and specifications required ACC to place 8 inches of TLC material with a tolerance of 2 inches. Demonstration of reaching planned thickness was accomplished by placing rain buckets about every 8,000 square feet (Figure 4). The rain buckets were checked by laborers and a Hart Crowser representative after the operator placed material by holding the clamshell approximately 1 foot above the water surface and releasing it by swinging across the bow of the barge. Placement continued and was checked until 2-inch tolerance was met. Two of the total 36 rain bucket measurements exceeded the 10-inch maximum thickness threshold: rain bucket 9 (11 inches) and rain bucket 31 (12.5 inches) (Table 4).

A total of 6,124 CY (Table 2) of material was placed over about 4.3 acres.

5.6 SITE RESTORATION AND HABITAT IMPROVEMENTS

Under the Puget Sound Initiative, MTCA cleanup actions are designed to coincidentally enhance and/or restore marine habitat. The site restoration work that was completed as part of the Phase II interim remedial action included construction of habitat improvements and features designed to mitigate shoreline erosion. These enhancements included creating a jetty extension and softening the existing jetty; creating a protective spit; removing a bulkhead and improving shoreline; bank stabilization; and establishing wetland connectivity with the bay. The enhancements improved habitat for juvenile salmonids, forage fish spawning, shorebirds and waterfowl, and other aquatic species on and near the site (Phase II CMMP [Hart Crowser, 2012a], Year 1 CMM [Hart Crowser, 2015], Year 2 CMM [Hart Crowser, 2016b], Year 3 CMM [Hart Crowser, 2017).

5.6.1 Dredging/Backfill and Thin-Layer Capping

Phase III includes capping impacted sediment throughout subtidal parts of the site, including within the eelgrass bed, and removing 2 feet of dioxin/furan impacted sediment from the dredge prism. Backfill and capping material were selected to support aquatic habitat function. The sand TLC material was selected to contain some smaller sizes (beneficial for eelgrass growth) and balanced to not have too many fines, which may impact water quality during placement.

5.6.2 Eelgrass Protection/Improvements

As discussed in Section 3.5, extensive measures have been initiated to determine how to complete cleanup remedial actions, avoid damage to the eelgrass, and attempt to enhance the eelgrass. These include the pilot TLC study (Hart Crowser, 2016a), transplanting eelgrass, 2-inch TLC in eelgrass, TLC material selection, TLC transition area near eelgrass, and limiting spudding during TLC placement over eelgrass.

5.7 CLEANUP AND HABITAT OBSERVATIONS DURING CONSTRUCTION

Monitoring of the Phase III remedial action construction was conducted by Hart Crowser as Ecology's representative and the contractor. This included confirming and documenting that construction satisfied the construction contract documents (plans, specifications, and permit requirements). Observations also included monitoring the effects of construction on the environment at the site (e.g., eelgrass). As part of construction quality control, ACC completed water quality monitoring and provided progress surveys at work stages for Ecology's review and approval before proceeding to subsequent work stages. The following sections summarize these observations of the Phase III construction.

5.7.1 Construction Progress Surveys

The contractor was required to perform progress surveys at specific stages of the work for Ecology's review and approval. Bathymetry surveys were completed to inform construction methods, verify compliance with contract documents, and to accompany contractor payment requests. At a minimum, progress surveys were to be completed at these stages of work:

- Before construction to confirm baseline conditions.
- After completion of dredging, but before backfilling, to confirm that specified depths were achieved.
- After placement of backfill material, but before TLC placement.
- After placement of TLC material.

Specific progress survey results are discussed in the construction detail sections above. The pre-construction survey, post- dredging progress surveys, and post-construction survey and as-built drawings are illustrated on Figures 2 to 8 and provided in Appendix A.

5.7.2 Water Quality Monitoring and Controls

The Phase III construction work could potentially have detrimentally affected water quality at the site and of Fidalgo Bay. Disturbance of sediment during dredging and in-water filling could potentially have created turbidity that exceeded water quality criteria. Turbidity monitoring was performed to assure that compliance with water quality criteria was maintained. Best Management Practices (BMPs) were employed to mitigate the risk of exceedance(s), and controls were in place and ready to implement if an exceedance occurred.

The Phase III contract documents included a Water Quality Monitoring Plan (WQMP, Hart Crowser, 2021a) which described the objectives and procedures of the water quality monitoring program to be implemented during construction. The WQMP was designed to gather information to assess potential impacts on water quality during construction. ACC was the lead for water quality monitoring and was contracted with Ecology to conduct water quality monitoring and reporting. The on-site Hart Crowser representative served as support and quality control to observe methodology. As such, ACC submitted a WQMP as part of their pre-construction submittal.

The objectives of the water quality monitoring program were to:

- Assess potential impacts on water quality caused by in-water construction;
- Ensure compliance with water quality criteria (WQMP and permits);
- Provide information to evaluate the effectiveness of operational controls to achieve compliance with water quality criteria during dredging and placement; and
- Document the monitoring activities in daily data sheets, delivered to Ecology.

Water quality criteria from WAC 173-201A-210 for marine surface waters applied to the Phase III in-water work, as follows:

- 5 Nephelometric Turbidity Unit (NTU) over background when background is 50 NTU or less; or
- A 10 percent increase in turbidity when background turbidity is more than 50 NTU.

The point of compliance for water column monitoring during in-water work are as follows:

- 150 feet down-current during dredging with an early warning point of 75 feet; and
- 300 feet down-current during backfill and capping with an early warning point of 150 feet.

5.7.2.1 Monitoring Methodology

Two phases of monitoring are required for this project, Initial and Routine with a frequency of two samples per day. Target sample timing is mid-tide cycle or a minimum of 30 minutes before or after to avoid slack tide. All sampling was conducted at a minimum of 15 minutes after in-water work operations had started. Initial monitoring commenced with each new in-water work activity and continue for two consecutive workdays. If initial monitoring showed no exceedance, then visual-routine monitoring followed until a new activity started. Routine monitoring using visual methods includes random metered sampling (at least two per week). Initial monitoring and metered sampling during routine monitoring were conducted using a YSI ProDSS water quality sensor. Target depth of the monitoring equipment was determined using a vessel depth-sounder to gauge total water depth at the sampling point; actual depth of the YSI probe was determined using manual measurements marked along the meters cable.

5.7.2.2 Water Quality Controls

To help ACC work more efficiently and reduce risk of dragging through eelgrass, Ecology authorized the in-water work to proceed without deploying turbidity curtains. The WQMP included specific protocol for responding to and controlling water quality criteria exceedances. As the work progressed, localized turbidity was generated within work areas, but water quality criteria were not exceeded at the point of compliance.

Turbidity controls were installed on the material barges to remove suspended solids from the water draining from the dredged sediment before it discharged to the bay. Water was allowed to drain from the material on the barge back to the bay. The material barge was equipped with filtration systems (water pumped to woven geotextile bags, or geotubes) to reduce the suspended solids content of the discharging water. The filtration bags appeared to be effective, resulting in very little to no visible turbidity surrounding the discharge area.

As work approached winter in the latter portion of the construction schedule, the intensity of wind and storm events increased. At that time, placement activities were being conducted along the northern edge of the project site, at the mouth of the bay near the northernmost jetty (placed in Phase II). On 30 September 2021, during a high-wind day, on-site crew observed elevated turbidity readings at the early warning point, triggering a reduction in cycle speed while placing material. When testing the point of compliance, winds posed a challenge and may have caused the probe to drift out of the main plume; in response, the Hart Crowser representative requested an additional sample to confirm testing was conducted within the plume and determined an exceedance. ACC shut down work for the day (Appendix E). On 12 October 2021, while placing TLC material, the Hart Crowser representative observed a visible plume that appeared to be beyond the point of compliance in the direction the wind was going.

Upon testing at the point of compliance, ACC confirmed an exceedance and shut down work; due to the wind conditions, ACC elected to cease work for the day (Appendix E). We believe that a combination of the wind speed and direction, proximity to the mouth of Fidalgo Bay, and tide stage were contributing factors to the visible plumes while working near the jetty. Work resumed in following days in other areas of the site with attention to the wind speed and direction and continued water quality monitoring. Without high winds during placement, visible turbidity plumes were limited to approximately 75 feet from in water activity.

Due to aeration of the surface waters when backfill material and sand cap were placed, brown bubbles (foam like) would routinely appear along the surface surrounding the work zone. Exploratory water quality testing demonstrated the bubbles were not indicative of a turbidity exceedance; see Appendix B, Photo 8 and descriptions in the DFRs in Appendix E for details.

5.7.3 Eelgrass Observations

To access the project site from the deeper waters of the overnight staging area, the barge, tug, and survey vessels were required to pass over the eelgrass bed, as well as spud within it on limited occasions. Periodically, during times of high wind events (that necessitate increased thrust to navigate), the Hart Crowser staff would observe loose shoots of eelgrass with rhizomes at the water surface within the propellor wash of the support vessel or behind the barge while under transport. While drift eelgrass blades are very frequently observed within the project site and the surrounding Fidalgo Bay, both during a construction activity and not, it is less common to see drift shoots with intact first nodes of rhizomes. Because of this, we feel we cannot rule out the intense burst of propellor action due to weather contributing to these shoots becoming dislodged (Appendix E). Hart Crowser staff attempted to collect GPS locations when noticing the floating eelgrass/rhizomes; however, these observations occurred while moving and the propellor wash moved the floating shoots, so locations were imprecise. Best estimate of total shoots with rhizomes observed following spudding is approximately 40 to 44 shoots; estimated total of shoots with rhizomes observed at the surface while underway through the eelgrass bed is approximately 20 to 23 shoots. In other words, staff observations indicate that less than 70 shoots were potentially dislodged by propeller action or spudding during the duration of the project. Given the scale and density of the eelgrass bed, the project duration (several months), and the decision to count any eelgrass with rhizome intact that was visible from the construction barge as a potential project impact, we believe this quantity to be conservative and negligible.

In addition to observing eelgrass during marine vessel transport, Hart Crowser staff noted when eelgrass with rhizomes attached were observed shortly after spudding within the eelgrass bed. Near the end of the project, Ecology requested Hart Crowser staff periodically walk the beach to make qualitative note of drift eelgrass along the high tide line prior to work for the day. During beach observations, blades were predominately observed without attached rhizomes and showed signs of desiccation due to sun exposure. Observations of drift eelgrass along the beach appeared to increase following wind and storm events and were inconsistent in observing “fresh” shoots (those showing more recent signs of dislodgement, green in color, water within their cells, light signs of decay); in this time, only three shoots with rhizomes attached were found along the beach. The DFRs located in Appendix E make note of when and where eelgrass shoots with rhizomes were observed.

5.8 DEVIATIONS FROM PLANS AND SPECIFICATIONS

Some minor modifications from the plans and specifications were made during Phase III construction. These design modifications were made to improve construction methodology, adjust for unexpected conditions, and/or better protect eelgrass. The deviations from plans and specifications are discussed in detail in the respective construction element sections above and are summarized as follows.

5.8.1 TLC Area Adjustments

Following the pre-construction eelgrass survey, two small eelgrass patches in a planned 8-inch TLC area were switched to 2-inch TLC to not smother the eelgrass. This change from 8-inch TLC to 2-inch TLC totaled 4,217 square feet, reducing the total quantity of material needed by 78 CY (Figure 4). This was done by RFI #1 on September 30, 2021.

5.8.2 Spudding

When navigating, ACC on-deck staff could watch a live feed of the barge GPS relative to the eelgrass bed through screens displaying their ClamVision software. Thus, staff were able to observe when the barge and tug were passing over the mapped eelgrass bed and could determine where appropriate locations were to spud. Specifications required a spudding plan submittal to limit spudding in eelgrass to the greatest extent feasible. When placing sand cap material within the eelgrass bed, spudding was unavoidable, but limited and monitored. ACC proposed an estimated 32 locations would be needed to place 2-inch TLC in the eelgrass bed. By the end of TLC activities, a total of 42 spud locations were used within the eelgrass boundary. Although more spud locations were required than originally estimated, limited and conscious planned spud locations made a significant difference in the impact to the benthic surface. This is readily apparent by the number of spud marks visible though high-resolution bathymetry image on Figure 7. The amount of spudding is greatly reduced in the 2-inch TLC in eelgrass compared to the frequency in the 8-inch TLC. Several locations were inspected by divers for visual evidence of surface scarring and eelgrass damage, the majority of which showed no evidence of visible scarring or had patchy eelgrass distribution with no visual damage (five of six locations, Appendix I).

Spudding was prohibited within the 2014 and 2021 eelgrass transplant areas to prevent damaging the transplanted shoots. Hart Crowser requested spudding be avoided when within the area in which eelgrass biomass samples are collected for eelgrass monitoring to limit biasing future data.

6. Post-Dredge and TLC Sediment Documentation and Analysis

6.1 BASE OF DREDGE AREA SEDIMENT SAMPLING

Four sediment samples were collected at the bottom of the dredge area to document the concentration of dioxins/furans (polychlorinated dibenzodioxins/furans) remaining in the sediment after dredging. The sample locations were selected to be equally distributed across the dredging area and analyzed using EPA Method 1613. Dioxins/furans were detected in all of the samples collected, with TEQs ranging from 0.277 pg/g (picograms per gram or parts per trillion or nanograms per kilogram) at sample location CPP3-E to 6,910 pg/g (OCDD) at location CPP3-S. Dioxin toxicity equivalence (TEQ) values ranged from 0.876 pg/g (TEQ – PCDFs) at sample location CPP3-E to 19.365 (TEQ – PCDDs) at sample location CPP3-W.

Table 3 summarizes the laboratory analytical results for the collected samples, and Figure 4 shows the sample locations. Sample location coordinates and depths are provided in Table 3. The chemical data quality review and full laboratory report packages are provided in Appendix G.

ACC accommodated sediment sampling in the aquatic area by providing transport and access to the dredging barge and using the barge to collect sediment for sampling from the target location in the dredging prism floor. Once the target dredging depth was achieved, Hart Crowser staff collected the sediment documentation samples using an enclosed environmental bucket or the dredging/clamshell bucket. The sediment was either deposited on the barge's deck on a sheet of plastic or the Hart Crowser staff pulled a small volume of sediment from the interior part of the dredging bucket using a large decontaminated stainless-steel spoon. The sampled sediment was homogenized in a stainless-steel bowl before collecting the sample for laboratory analysis. Non-disposable sampling equipment was decontaminated after each sampling event.

6.2 TLC SURFACE SAMPLING

See Section 7.3.2 for 2-inch and 8-inch TLC surface sampling information and results.

7. Post-Construction Activities

7.1 DIVER TLC AND EELGRASS OBSERVATIONS

Post-construction diver observations of select locations within the project site were made by Grette Associates divers on 2 November 2021, which are summarized in the following sections.

7.1.1 Spudding Locations and TLC Placement

Several locations where spuds were placed were investigated by Grette divers following construction to gather additional information regarding the impact of spudding on benthic habitats. These areas were investigated visually though visibility proved to be challenging. Of the six locations observed, only two showed evidence of scarring or mounding likely caused by spudding. One spud location was directly adjacent to known eelgrass and was prioritized because of its proximity to the transplant area and potential for greater disturbance. Weather conditions led to movement of the barge while placing the spud, resulting in a small trench from the spud dragging before it was deep enough to stop barge movement. Divers did note a trench at this location approximately 2 feet wide by 8 to 10 feet long, about 1 to 1.5 feet deep. No eelgrass was present in or around the trench; therefore, we assume no eelgrass was damaged by this spud being dragged. This same trench is visible on the high-resolution bathymetry imagery included in Figure 7 (see call out).

While investigating the spudding areas, which is in the 8-inch TLC, divers noted that 6 to 8 inches of TLC sand was successfully placed.

7.1.2 Eelgrass Observations

While investigating the spudding locations on 2 November 2021, as described above, Grette divers also made anecdotal note of eelgrass within the area. Where eelgrass was encountered, most areas were densely populated and healthy, though had some seasonal loss of blades observed on the bottom. Hooded nudibranchs (*Melibe leionine*) and Dungeness crab (*Cancer magister*) were frequently observed within the eelgrass bed. Additional eelgrass surveys to gauge eelgrass extent and health were completed in summer 2022, “Year 1”.

7.2 WINTER 2022-2023 BATHYMETRIC SURVEY

A bathymetry survey was done in December 2022 and January 2023 to document mudline bathymetry conditions/changes since the post-construction survey (October 2021), and to provide a baseline for potential future 2-inch TLC work in the eelgrass bed within the remaining Phase III remedial action area. The approximate extent of the survey is shown on Figure 8. The survey bathymetry elevation contours are shown on Appendix Figure L-1. A comparison of the post-construction survey and the January 2023 survey are shown on Figure L-2 as a colored range to show elevation differences. It generally indicates that between 3 inches of sediment accumulation to 6 inches decrease have occurred between the 2021 and 2023 surveys. Some areas have more accumulation or decrease, but these are also similar to areas of additional TLC placement (e.g., south of dredge area) or mudline decrease in elevation outside of work area like in Figure A05 (e.g., east corner of eelgrass transplant area).

7.3 POST-CONSTRUCTION MONITORING

7.3.1 Eelgrass Monitoring

Following completion of the Phase III remedial action, post-construction monitoring was conducted per the Eelgrass Mitigation and Monitoring Plan for Phase III (Ecology, 2019a, dredging impact on eelgrass) and the Thin-Layer Capping Eelgrass Monitoring and Adaptive Management Plan (Ecology, 2019b, TLC impact on eelgrass) prepared for the Custom Plywood Site to satisfy the requirements of the NWP-38. The monitoring efforts were designed to document conditions of the eelgrass transplanted from the dredge prism, and to evaluate the health of eelgrass within the test placement 0.5-acres of 2-inch TLC within the eelgrass bed. Prior to continued placement of 2-inch TLC in the remaining Phase III eelgrass bed, biomass and density analysis will be conducted to inform the process.

Performance monitoring will be conducted for a minimum of 10 years after remediation is completed. However, the currently scheduled eelgrass monitoring has been established only through 2024. Appendix J includes the methods and results for post-construction Year 1 (summer 2023) eelgrass monitoring.

7.3.2 TLC Sediment Monitoring

Additional post-construction sediment sampling was completed in November of 2022 to analyze both the 8-inch and 2-inch TLC to inform the effectiveness of the cap and to inform possible additional 2-inch TLC over the remaining eelgrass in the remedial action area. Sediment samples were also collected in areas where no active remediation has occurred, to inform site-wide average contaminant concentrations and the need for additional remedial actions. A Sampling and Analysis Plan was created and reviewed by Ecology prior to performing sediment sampling.

Sediment sample analytical results are summarized in Table 5 and Figures 9 and 10 show the location of the samples and dioxin total TEQ. Appendix K has the analytical lab test results and Haley & Aldrich's data validation summary information. Only two 2-inch TLC samples at the edge of the TLC (TLC2-4 and TLC2-5) were slightly above the target cleanup limit of 5 ppt. Two samples outside of the current TLC construction area, PH3B-1 and PH3B-2, had dioxin TEQ values of 9.62 and 28.9, respectively. An area of wood waste accumulation was noticed south of the spit between the wetland/estuary entrance and the dredge area accumulated. Three sediment samples representing 4 inches of sediment below the bottom of the wood waste were collected and analyzed. Dioxin TEQ ranged from about 14 to 54 ppt in these samples. The source of this wood waste is uncertain, but it has accumulated over previously placed clean beach material placed during Phase II of the project. The extent and thickness of this material is being investigated more to determine a course of action for this material.

Figures 9 and 10 show the weighted average dioxin concentrations based on available sediment dioxin samples. The color banding was generated in GIS using the *nearest neighbor* interpolation method, but TLC area boundaries were made to have concentrations matching most samples within individual TLC areas. TLC areas almost entirely are below 5 ppt, except for TLC2-4 and TLC2-5 that had just over 5 ppt. The overall dioxin averages for both Figures 9 and 10 (top of each figure) are just below 7 and just above 6, respectively, which is just slightly above the target cleanup limit of 5 ppt. Dioxin samples north of the jetty are limited to the values from the Phase III CAP/EDR (Hart Crowser, 2019).

7.4 CONCLUSIONS

After reviewing the results of these post-construction monitoring activities, Ecology will determine if additional thin layer capping or other remedial actions should be performed.

8. Use of This Report

This report is for the exclusive use of Ecology for specific application to the subject project and site. We completed this work in general accordance with our scope of work dated 8 January 2020, and subsequent amendments. Work for this project was performed, and this report prepared, in general accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Ecology for specific application to the Custom Plywood Site. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

9. References

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TABLES

TABLE 1
CONSTRUCTION SCHEDULE SUMMARY
CUSTOM PLYWOOD MILL SITE, PHASE III SUBTIDAL SEDIMENT CLEANUP.
FIDALGO BAY
ANACORTES, WASHINGTON

Date	Item
19 to 21 April 2021	Pre-construction eelgrass transplant from dredge to mitigation area is completed.
23 to 24 June 2021	Pre-construction low-tide survey to delineate intertidal eelgrass margin.
1 July 2021	American Construction Company (ACC) receives construction Notice To Proceed (NTP).
6 to 8 July 2021	Pre-construction eelgrass survey is conducted.
6 July 2021	Pre-construction bathymetry survey is conducted.
27 July 2021	ACC mobilizes to site, installs tide gauge transducer, and conducts dry run.
28 July 2021	ACC begins dredging using environmental bucket (2 CY), but 3 to 6 inch deep cuts each grab, which is a production concern for ACC.
29 July 2021	ACC continues dredging, but switches to the larger 4 CY bucket to maintain production since water quality requirements are being met.
16 August 2021	Dredging completed.
17 August 2021	Post-dredging bathymetry survey conducted by Pacific Surveying & Engineering.
24 August 2021	Backfill of 8-inch Thin-Layer Cap (TLC) begins, using 4 CY bucket.
24 August to 8 September 2021	Backfilling of dredge area.
25 August 2021	Last dredge material barge received by Waste Management disposal facility.
16 September 2021	Dry (barge deck) and "wet" (in-water) demonstration testing of 2-inch TLC placement table performed with Ecology on site.
20 September 2021	Grette Associates, LLC (Grette) divers observed dredge area buffer where backfill occurred outside of the dredge prism to confirm eelgrass was not covered or smothered.
22 September 2021	2-inch TLC placement using spuds begins in the eelgrass bed.
3 October 2021	Placement of 2-inch TLC within the RFI #1 added area begins.
5 October 2021	8-inch TLC placement resumes, using 4CY bucket.
27 October 2021	TLC placement complete. Final bathymetry survey completed by Pacific Surveying & Engineering with ACC present.
2 November 2021	Substantial completion site visit by Ecology, Hart Crowser, and Grette performing dive observations.

TABLE 2
DREDGE AND THIN-LAYER CAP MATERIAL QUANTITIES SUMMARY
CUSTOM PLYWOOD MILL SITE, PHASE III SUBTIDAL SEDIMENT CLEANUP
FIDALGO BAY
ANACORTES, WASHINGTON

Item	Item Description	Unit	Bid Quantity	Final Quantity	Difference (Bid - Final)	Notes
F	Dredging	CY	1,500	1,411	89	Engineer Estimate (EE) had 1,492 CY with maximum thickness and 1,194 CY with average thickness. HC CAD check shows 1,408 CY dredged.
G	Transport & Off-Site Disposal	Ton	1,800	2,055	-255	EE had 2,400 ton assuming 1.6 ton/CY (high for wood waste, specifications says use 1.2 ton/CY) and maximum thickness; ,1910 ton if average thickness and 1.6t on/CY.
H	Dredge Backfill	CY	1,500	1,653	-153	Due to approximately 150 CY overdredge per HC CAD check.
I	8" TLC	CY	7,100	6,124	977	EE had 7,034 CY with maximum thickness and 4,689 CY with average thickness.
J	2" TLC	CY	660	424	236	EE had 653 CY with maximum thickness and 436 CY with average thickness.

Notes

a. Final quantities as of 10/28/21

TABLE 3
DREDGE BOTTOM DOCUMENTATION SAMPLE ANALYTICAL RESULTS
CUSTOM PLYWOOD MILL SITE, PHASE III SUBTIDAL SEDIMENT CLEANUP
FIDALGO ISLAND
ANACORTES, WASHINGTON

Sample ID	CPP3-S		CPP3-W		CPP3-E		CPP3-N	
Sampling Date	8/11/2021		8/12/2021		8/12/2021		8/13/2021	
Sample Depth (Inches)	0-3		0-3		0-3		0-3	
Sample Coordinates (Lat./Long., WGS 84)	-122.59958/ 48.49276		-122.59976/ 48.49288		-122.59939/ 48.49291		-122.59968/ 48.49302	
Dioxins in ng/Kg								
2,3,7,8-TCDF	0.648		1.89		0.429		0.681	
2,3,7,8-TCDD	0.624	U	0.953		0.341	U	0.438	U
1,2,3,7,8-PeCDF	0.802	U	1.71		0.355	U	0.451	
2,3,4,7,8-PeCDF	2.34		3.47		0.371	U	0.754	
1,2,3,7,8-PeCDD	3.52		5.25		0.96	U	1.9	
1,2,3,4,7,8-HxCDF	8.42		9.66		1.11		2.18	
1,2,3,6,7,8-HxCDF	3.44		3.97		0.622		0.989	
2,3,4,6,7,8-HxCDF	7.47		8.2		0.599		0.964	
1,2,3,7,8,9-HxCDF	1.68		2.12		0.277		0.475	
1,2,3,4,7,8-HxCDD	2.3		3.53		0.652		1.18	
1,2,3,6,7,8-HxCDD	26.7		30.3		5.12		8.22	
1,2,3,7,8,9-HxCDD	7.58		9.51		1.63		2.67	
1,2,3,4,6,7,8-HpCDF	220		189		34		45.4	
1,2,3,4,7,8,9-HpCDF	11.1		10.7		1.73		2.28	
1,2,3,4,6,7,8-HpCDD	875		743		123		165	
OCDF	1230	J	787	J	156	J	146	J
OCDD	6910		4660		825		1020	
Total TCDF	9.11		31.7		4.35		7.74	
Total TCDD	20.9		71.8		8.15		12.8	
Total PeCDF	33.9		50		3.18		10.9	
Total PeCDD	21.1		53		8.42		12.3	
Total HxCDF	205		219		31.3		56.1	
Total HxCDD	176		250		38.3		69.5	
Total HpCDF	891		719		127		159	
Total HpCDD	1440		1320		214		309	
Total Solids (percent)	67.96%		59.40%		59.11%		53.59%	
TEQ - PCDDs	18.625		19.365		3.5187		5.501	
TEQ - PCDFs	5.94086		6.1455		0.87655		1.33303	

Notes:

ng/Kg = nanogram per kilogram
U = Not detected at the reporting limit indicated
J = Estimated value
PCDDs = Polychlorinated dibenzo-p-dioxins
PCDFs = Polychlorinated dibenzofurans
TEQ = Toxic equivalent quantity

TABLE 4
THIN-LAYER CAP THICKNESS MEASUREMENTS
CUSTOM PLYWOOD MILL SITE, PHASE III SUBTIDAL SEDIMENT CLEANUP
FIDALGO BAY
ANACORTES, WASHINGTON

Date	Rain Bucket #	Required Thickness (in.)	Verified Thickness[1, 2] (in.)	Date	Diver Stake #	Required Thickness (in.)	Verified Thickness[1, 2] (in.)
9/9/2021	1	8 ±2	6.0	9/17/2022	1	2 ±1	1[5]
9/9/2021	2	8 ±2	8.0	9/17/2022	2	2 ±1	*0.5*[5]
9/14/2021	3	8 ±2	8.5	9/17/2022	3	2 ±1	*0.5*[5]
9/30/2021	4	8 ±2	8.0	9/17/2022	4	2 ±1	*0.5*[5]
9/15/2021	5	8 ±2	8.0	9/17/2022	5	2 ±1	1[5]
10/14/2021	6	8 ±2	7.75	9/17/2022	6	2 ±1	1.5[5]
10/8/2021	7	8 ±2	7.0				
10/7/2021	8	8 ±2	8.25				
10/6/2021	9	8 ±2	*11.0*				
10/6/2021	10	8 ±2	-[3]				
10/19/2021	11	8 ±2	6.25[4]				
10/14/2021	12	8 ±2	6.75				
10/8/2021	13	8 ±2	8.0				
10/7/2021	14	8 ±2	8.25				
10/19/2021	15	8 ±2	6.25				
10/18/2021	16	8 ±2	7.5				
10/8/2021	17	8 ±2	10.0				
10/11/2021	18	8 ±2	9.0				
10/27/2021	19	8 ±2	9.75				
10/18/2021	20	8 ±2	9.5				
10/18/2021	21	8 ±2	6.25				
10/12/2021	22	8 ±2	7.0				
9/16/2021	23	2 ±1	1.9				
9/20/2021	24	2 ±1	2.0				
9/21/2021	25	2 ±1	1.0				
10/5/2021	26	2 ±1	1.0				
10/4/2021	27	2 ±1	1.75				
10/11/2021	28	8 ±2	6.0				
10/4/2021	29	2 ±1	1.5				
10/2/2021	30	2 ±1	2.0				
10/11/2021	31	8 ±2	*12.5*				
9/28/2021	32	2 ±1	2.0				
9/27/2021	33	2 ±1	1.75				
9/27/2021	34	2 ±1	2.75				
9/23/2021	35	2 ±1	2.25				
9/22/2021	36	2 ±1	1.75				

Notes:

1. Verified thickness measured approximately.

2. Thickness measurements that exceeded the threshold identified in italics.

3. Rain bucket was knocked over during placement, accurate measurement unobtainable.

4. Mislabeled rain bucket as #1 (instead of #11) in Hart Crowser DFRs.

5. Diver observations indicate the sediment compressed below sand placement. Based on texture of the placed material, it is likely these quantities are underestimated by approximately 0.5 inch.

TABLE 5
SUMMARY OF SEDIMENT QUALITY DATA
CUSTOM PLYWOOD
ANACORTES, WASHINGTON

Location Name	Sediment Management Standards	Aquatic Remediation Capping	Aquatic Remediation Dredging	DS-10	DS-11	DS-8	DS-9	PH3B-1	PH3B-2
Sample Name				CP-DS-10-22	CP-DS-11-22	CP-DS-8-22	CP-DS-9-22	CP-PH3B-1-22	CP-PH3B-2-22
Sample Date				11/16/2022	11/16/2022	11/16/2022	11/16/2022	11/16/2022	11/16/2022
Lab Sample ID				22K0359-19	22K0359-20	22K0359-21	22K0359-18	22K0359-11	22K0359-12
Sample Depth (bgs)				0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)
Dioxins/Furans (ng/kg)									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	NA	NA	NA	**26.7**	**7.35**	**9.74**	**4.39**	**168**	**778**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	NA	NA	NA	**167**	**49.5**	**79**	10 U	**1300**	**6010 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	NA	NA	NA	**6.85**	**2.14 J**	**2.86**	**1.57**	**58.5**	**213**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	NA	NA	NA	**24.2**	**7.16**	**12.1**	**4.24**	**197**	**767**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	NA	NA	NA	0.311 UJ	0.997 U	0.996 U	1 U	**2.6**	**13.7**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	NA	NA	NA	0.297 UJ	0.997 U	0.996 U	1 U	**2.37 J**	**7.53**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NA	NA	NA	0.281 UJ	0.997 U	0.996 U	1 U	**2.06 J**	**4.94**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	NA	NA	NA	**0.247 J**	0.997 U	0.996 U	1 U	**1.33**	**3.94**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NA	NA	NA	**1.2**	0.997 U	0.996 U	1 U	**10.1**	**34.7**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	NA	NA	NA	0.999 U	0.997 U	0.996 U	1 U	0.999 U	**2.05**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	NA	NA	NA	**0.657 J**	0.997 UJ	0.996 U	1 U	**4.35 J**	**11.9**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	NA	NA	NA	0.999 U	0.997 U	0.996 U	1 U	**1.06 J**	**1.64**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	NA	NA	NA	0.315 UJ	0.997 U	0.996 U	1 U	**3.02**	**7.5**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	NA	NA	NA	**0.358 J**	0.997 U	0.395 UJ	1 U	**2.85**	**8.22**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	NA	NA	NA	0.999 U	0.997 U	0.996 U	1 U	**1.1 J**	**2.84**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	NA	NA	NA	0.166 UJ	0.997 U	0.996 U	1 U	**2.62**	**3.65**
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	NA	NA	NA	0.999 U	0.997 U	0.996 U	1 U	0.547 UJ	0.828 UJ
Total Heptachlorodibenzofuran (HpCDF)	NA	NA	NA	**22.9**	**4.89**	**2.86**	**1.57**	**181**	**805**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	NA	NA	NA	**46.2**	**13.8**	**23.3**	**8.76**	**389**	**1380**
Total Hexachlorodibenzofuran (HxCDF)	NA	NA	NA	**5.89**	**2.26**	**3.05**	**0.662 J**	**56.2**	**227**
Total Hexachlorodibenzo-p-dioxin (HxCDD), Mixture	NA	NA	NA	**12.7**	**0.397 J**	**3.68**	**0.894 J**	**102**	**283**
Total Pentachlorodibenzofuran (PeCDF)	NA	NA	NA	**2.06**	**0.256 J**	0.996 U	1 U	**19.8**	**53.4**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	NA	NA	NA	**1.19**	0.997 U	0.996 U	1 U	**41.8**	**40.1**
Total Tetrachlorodibenzofuran (TCDF)	NA	NA	NA	**0.624 J**	**0.178 J**	0.996 U	1 U	**16.7**	**32.5**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	NA	NA	NA	**2.19**	0.997 U	**1.66**	1 U	**72.1**	**38.8**
2,3,7,8-TCDD (TEQ)	5	10	25	**2.44**	**3.24**	**3.24**	**3.2**	**9.62**	**28.9**

Location Name	TLC2-1	TLC2-2	TLC2-3		TLC2-4	TLC2-5	TLC2-6	TLC2-7
Sample Name	CP-TLC-2-1-22	CP-TLC-2-2-22	CP-TLC-2-3-22	CP-TLC2-3-22-D	CP-TLC2-4-22	CP-TLC2-5-22	CP-TLC2-6-22	CP-TLC2-7-22
Sample Date	11/15/2022	11/15/2022	11/15/2022	11/15/2022	11/16/2022	11/16/2022	11/16/2022	11/16/2022
Lab Sample ID	22K0359-04	22K0359-05	22K0359-10	22K0359-26	22K0359-22	22K0359-13	22K0359-14	22K0359-15
Sample Depth (bgs)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)
Dioxins/Furans (ng/kg)								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**51.1**	**90.8**	**69.8**	**89.2**	**75**	**35**	**92.1**	**79.4**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**450**	**681**	**314**	**439**	**1680**	**243**	**699**	**790**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**16.3**	**28.7**	**18.4**	**15.6**	**24.5**	**10.7**	**26.2**	**24.6**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**62.9**	**105**	**47**	**52.8**	**142**	**34.7**	**94.5**	**91**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	**1.05 J**	**1.42 J**	**0.789 J**	**1.06 J**	0.998 U	**0.719 J**	**1.57 J**	**1.57**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**0.75 J**	**1.17 J**	**0.593 J**	0.391 UJ	0.998 U	0.488 UJ	**1.1 J**	**1.06**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.686 UJ	**0.958 J**	1 U	**0.333 J**	**1.03 J**	**0.269 J**	0.841 UJ	**1.05**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**0.531 J**	0.703 UJ	0.211 UJ	0.996 U	0.998 U	0.999 U	0.587 UJ	0.484 UJ
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**2.98**	**5.28**	**2.53 J**	**1.89**	**4.52 J**	**1.99**	**4.48**	**4.5**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	**0.231 J**	1 U	1 U	0.996 U	0.998 U	0.999 U	0.999 U	1 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**1.49**	**2.6**	**1.1 J**	0.996 UJ	**2**	**1.07**	**2.21**	**2.36**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.999 UJ	1 U	1 U	0.996 U	0.998 U	0.999 U	0.999 U	1 UJ
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.647 UJ	**1.27**	**0.591 J**	0.573 UJ	**0.776 J**	0.549 UJ	**1.22**	**1.2**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	**0.876 J**	**1.19**	**0.672 J**	0.996 U	**1.09 J**	0.999 U	**1.17**	**1.24**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.315 UJ	**0.586 J**	1 U	0.996 U	0.998 U	0.999 U	**0.294 J**	**0.483 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**0.624 J**	**0.971 J**	**0.339 J**	0.339 UJ	0.998 U	**0.481 J**	**1.6**	0.899 UJ
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.999 U	0.31 UJ	0.182 UJ	0.996 U	0.998 U	0.999 U	0.999 U	0.328 UJ
Total Heptachlorodibenzofuran (HpCDF)	**52.1**	**92.3**	**70.8**	**65.4**	**87.2**	**36.3**	**92.8**	**81.5**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**130**	**211**	**101**	**93.5**	**245**	**67.9**	**188**	**181**
Total Hexachlorodibenzofuran (HxCDF)	**17.8**	**24.5**	**19 J**	**9.77 J**	**19.1**	**11.2**	**29.4**	**25.6**
Total Hexachlorodibenzo-p-dioxin (HxCDD), Mixture	**27.4**	**51.9**	**24.3 J**	**13.5 J**	**16.5**	**12**	**33.9**	**57.2**
Total Pentachlorodibenzofuran (PeCDF)	**4.72**	**9.97**	**3.6 J**	**1.87 J**	**3.49**	**2.94**	**9.04**	**6.67**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**4.25**	**15.3**	**2.43**	**2.13**	**2.4**	**1.3**	**8.3**	**17.3**
Total Tetrachlorodibenzofuran (TCDF)	**3.85**	**8.94**	**2.11 J**	0.996 UJ	0.998 U	**1.28**	**6.09**	**5.84**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**4.57**	**41.9**	**5.61 J**	**2.25 J**	**4.02**	**1.09**	**13**	**18.9**
2,3,7,8-TCDD (TEQ)	**3.54**	**4.76**	**2.62**	**3.44**	**5.57**	**3.15**	**5.1**	**4.39**

Location Name	TLC2-8	TLC8-1	TLC8-12	TLC8-2	TLC8-3	TLC8-4	TLC8-5	TLC8-6
Sample Name	CP-TLC2-8-22	CP-TLC-8-1-22	CP-TLC8-12-22	CP-TLC-8-2-22	CP-TLC-8-3-22	CP-TLC-8-4-22	CP-TLC-8-5-22	CP-TLC-8-6-22
Sample Date	11/16/2022	11/15/2022	11/16/2022	11/15/2022	11/15/2022	11/15/2022	11/15/2022	11/15/2022
Lab Sample ID	22K0359-16	22K0359-02	22K0359-17	22K0359-03	22K0359-01	22K0359-07	22K0359-08	22K0359-06
Sample Depth (bgs)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)
Dioxins/Furans (ng/kg)								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**32**	**55.2**	**6.51**	**8.52**	**12**	**4.27**	**2.58 J**	**2.53**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**244**	**433**	**38.9**	**75.2**	**93.8**	10 U	9.99 U	10 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**12**	**15.8**	**2.01**	**2.86**	**3.6**	0.987 UJ	0.855 UJ	0.899 UJ
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**40.3**	**57.6**	**4.74**	**9.8**	**12.8**	**3.17 J**	**2.22 J**	**3.22**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.563 UJ	1 U	0.999 U	0.999 U	**0.238 J**	1 U	0.203 UJ	1 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**0.524 J**	**0.95 J**	0.999 U	0.999 U	1 U	1 U	0.999 U	1 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.38 UJ	**0.749 J**	0.999 U	0.999 U	1 U	1 U	0.999 U	1 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	**0.46 J**	**0.586 J**	0.999 U	0.999 U	0.176 UJ	0.14 UJ	0.123 UJ	1 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**2.21**	**2.94**	0.999 U	0.601 UJ	**0.685 J**	**0.243 J**	**0.165 J**	**0.253 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	1 U	1 U	0.999 U	0.999 U	1 U	1 U	0.999 U	1 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	**1.27 J**	**1.49**	0.999 U	0.999 U	0.378 UJ	0.17 UJ	0.999 U	1 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	1 UJ	1 UJ	0.999 U	0.999 U	1 U	1 U	0.999 U	1 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.58 UJ	1 U	0.999 U	0.999 U	0.35 UJ	1 U	0.999 U	1 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.572 UJ	1 U	0.999 U	0.999 U	0.293 UJ	**0.19 J**	0.999 U	1 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.3 UJ	**0.393 J**	0.999 U	0.999 U	**0.156 J**	1 U	0.999 U	1 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	**0.578 J**	**0.517 J**	0.999 U	0.999 U	1 U	1 U	0.999 U	1 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.266 UJ	1 U	0.999 U	0.999 U	1 U	1 U	0.999 U	1 U
Total Heptachlorodibenzofuran (HpCDF)	**37**	**50.8**	**2.01**	**2.86**	**11**	**2.45**	0.999 U	**1.91**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**82.9**	**114**	**10.2**	**20.2**	**28.1**	**3.25**	**4.92**	**7.45**
Total Hexachlorodibenzofuran (HxCDF)	**12.1**	**15.7**	**1.35**	**2.63**	**2.85**	**0.451 J**	**0.318 J**	**0.453 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD), Mixture	**20.2**	**28.9**	**0.903 J**	**2.18**	**4.63**	**0.665 J**	**0.616 J**	**0.253 J**
Total Pentachlorodibenzofuran (PeCDF)	**3.05**	**4.23**	**0.389 J**	**0.527 J**	**0.691 J**	1 U	0.999 U	**0.215 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**3.12**	**3.28**	0.999 U	0.999 U	**0.504 J**	1 U	0.999 U	1 U
Total Tetrachlorodibenzofuran (TCDF)	**3.12**	**4.03**	0.999 U	0.999 U	1 U	1 U	0.999 U	1 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	**8.34**	**4.5**	0.999 U	**0.388 J**	1 U	1 U	**0.149 J**	**0.247 J**
2,3,7,8-TCDD (TEQ)	**2.28**	**3.96**	**3.22**	**3.25**	**2.18**	**2.86**	**2.99**	**3.11**

Location Name	TLC8-7	WW-1	WW-2	WW-3
Sample Name	CP-TLC-8-7-22	CP-WW-1-22	CP-WW-2-22	CP-WW-3-22
Sample Date	11/15/2022	07/20/2022	07/20/2022	07/20/2022
Lab Sample ID	22K0359-09	22K0359-23	22K0359-24	22K0359-25
Sample Depth (bgs)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)	0 - 4 (in)
Dioxins/Furans (ng/kg)				
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	**10.2**	**214**	**391**	**937**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	**69.3**	**2360**	**4940**	**23500**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	**3.09**	**74.3**	**136**	**221**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	**8.49**	**343**	**557**	**1550**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.999 U	**4.07**	**7.37**	**14.9**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	**0.216 J**	**3.22**	**6.27**	**10.5**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.29 UJ	**3.19**	**4.25**	**8.99**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.138 UJ	**1.59**	**3.26**	**4.9**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	**0.655 J**	**16.1**	**28.6**	**49.2**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.999 U	0.999 U	0.999 U	**4.46**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	0.999 U	**6.31**	**9.66**	**20.3**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.999 U	**0.98 J**	**1.53 J**	**2.5**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.999 U	**4.44**	**8.02**	**13.8**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.999 U	**4.03**	**6.79**	**10.9**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.999 U	**1.76**	**3.09 J**	**4.13**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.999 U	**2.33**	**5.26**	**6.45**
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.999 U	**0.694 J**	**0.906 J**	**1.97**
Total Heptachlorodibenzofuran (HpCDF)	**9.68**	**260**	**517**	**1000**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	**16.7**	**804**	**1100**	**2740**
Total Hexachlorodibenzofuran (HxCDF)	**1.78**	**97**	**211**	**306**
Total Hexachlorodibenzo-p-dioxin (HxCDD), Mixture	**3.01**	**246**	**291**	**481**
Total Pentachlorodibenzofuran (PeCDF)	0.999 U	**25.2**	**63.7**	**114**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	**0.352 J**	**52.4**	**72.3**	**139**
Total Tetrachlorodibenzofuran (TCDF)	0.999 U	**16.8**	**37.1**	**72.8**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	0.999 U	**41.9**	**69.1**	**231**
2,3,7,8-TCDD (TEQ)	**3.01**	**14.45**	**25.01**	**53.84**

ABBREVIATIONS AND NOTES:

J: value is an estimate

U: not detected, value is the laboratory reporting limit

ng/kg = nanogram per kilogram

***Bold** values indicate a detected concentration.*

Yellow shading indicates a detected analyte concentration exceeding Sediment Management Standards Cleanup Level (CL) (5 nk/kg or ppt).

Orange shading indicates a detected analyte concentration exceeding Aquatic Remediation Capping CL (10 ng/kg or ppt).

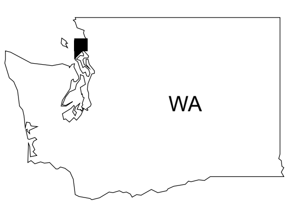
Red shading indicates a detected analyte concentration exceeding Aquatic Remediation Dredging CL (25 ng/kg or ppt).

Dioxins / Furans contribution to toxicity equivalence (TEQ) concentrations calculated for 2,3,7,8-TCDD using 2005 World Health Organization toxicity equivalency factors (TEF).

Aquatic Remediation Screening Level from Department of Ecology (DOE) State of Washington, 2019. Custom Plywood Cleanup Action Plan/Engineering Design Report - Phase III

Sediment Management Standard from DOE, 2013. Sediment Management Standards, Chapter 173-204 WAC

FIGURES



N

MAP SOURCE: ESRI
SITE COORDINATES: 48°29'40"N, 122°36'01"W

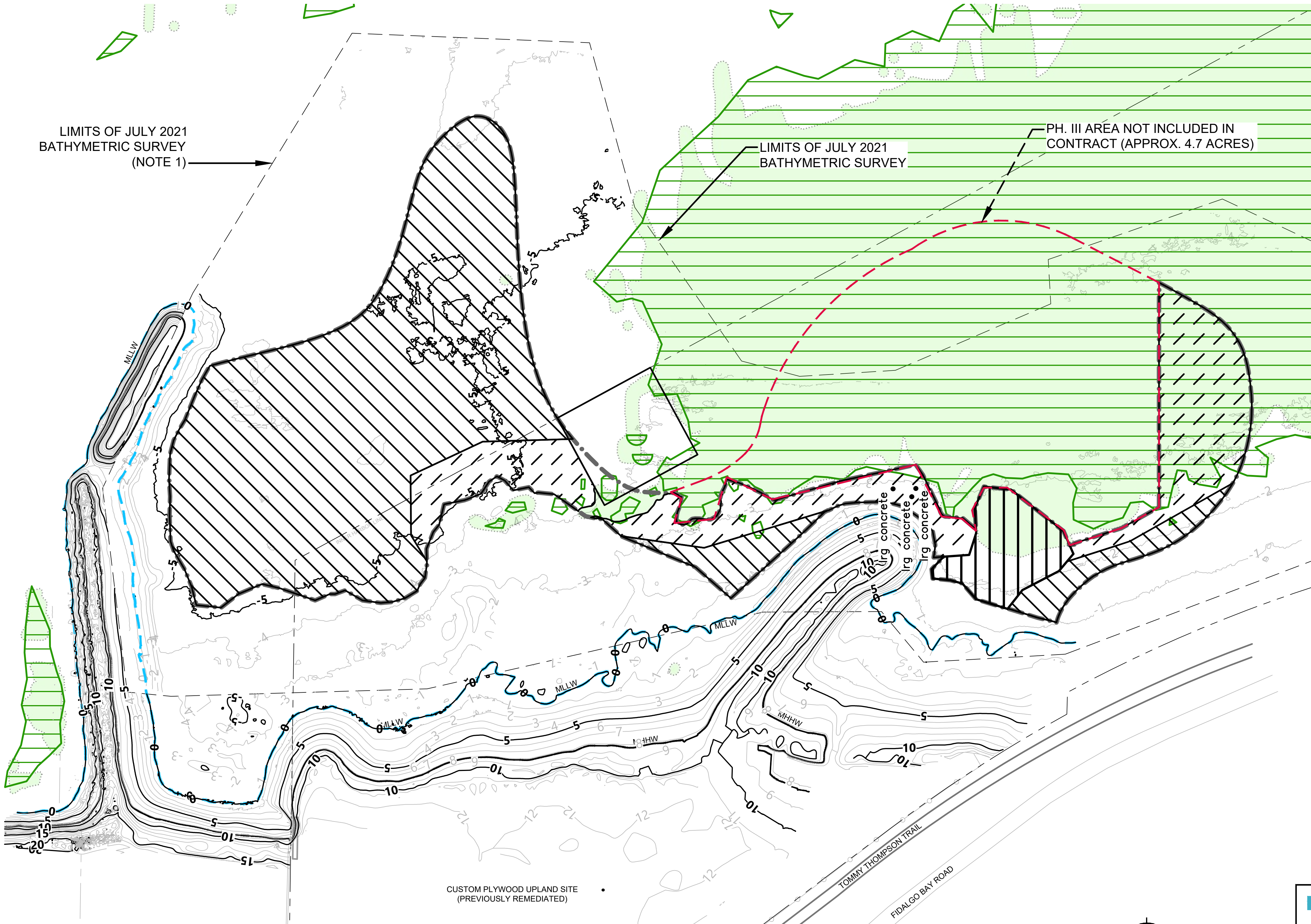
HALEY ALDRICH

CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

VICINITY MAP

APPROXIMATE SCALE: 1 IN = 2000 FT
MAY 2022

FIGURE 1



LEGEND

- PROPERTY LINE
- PROJECT LIMIT LINE
- MLLW — MEAN LOWER LOW WATER
- DREDGE & BACKFILL AREA
- 2-INCH THIN LAYER CAP (TLC) AREA
- 8-INCH TLC AREA
- JULY 2021 EELGRASS SURVEY
- JULY 2019 EELGRASS SURVEY

NOTES

1. UPLAND TOPOGRAPHIC CONTOURS (GENERALLY ABOVE MLLW) FROM ETRAC ENGINEERING 12/19/2013 SURVEY. BATHYMETRY CONTOURS (GENERALLY BELOW MLLW) FROM 7/6/2021 SOLMER HYDRO. SEE SHEET G1.1 OF CONSTRUCTION PLANS (2/10/2021) FOR DESIGN ELEVATION CONTOURS.
2. HORIZONTAL DATUM: NAD83 WASHINGTON STATE PLANE, NORTH ZONE, US SURVEY FEET.

   VERTICAL DATUM: MLLW, US SURVEY FEET.

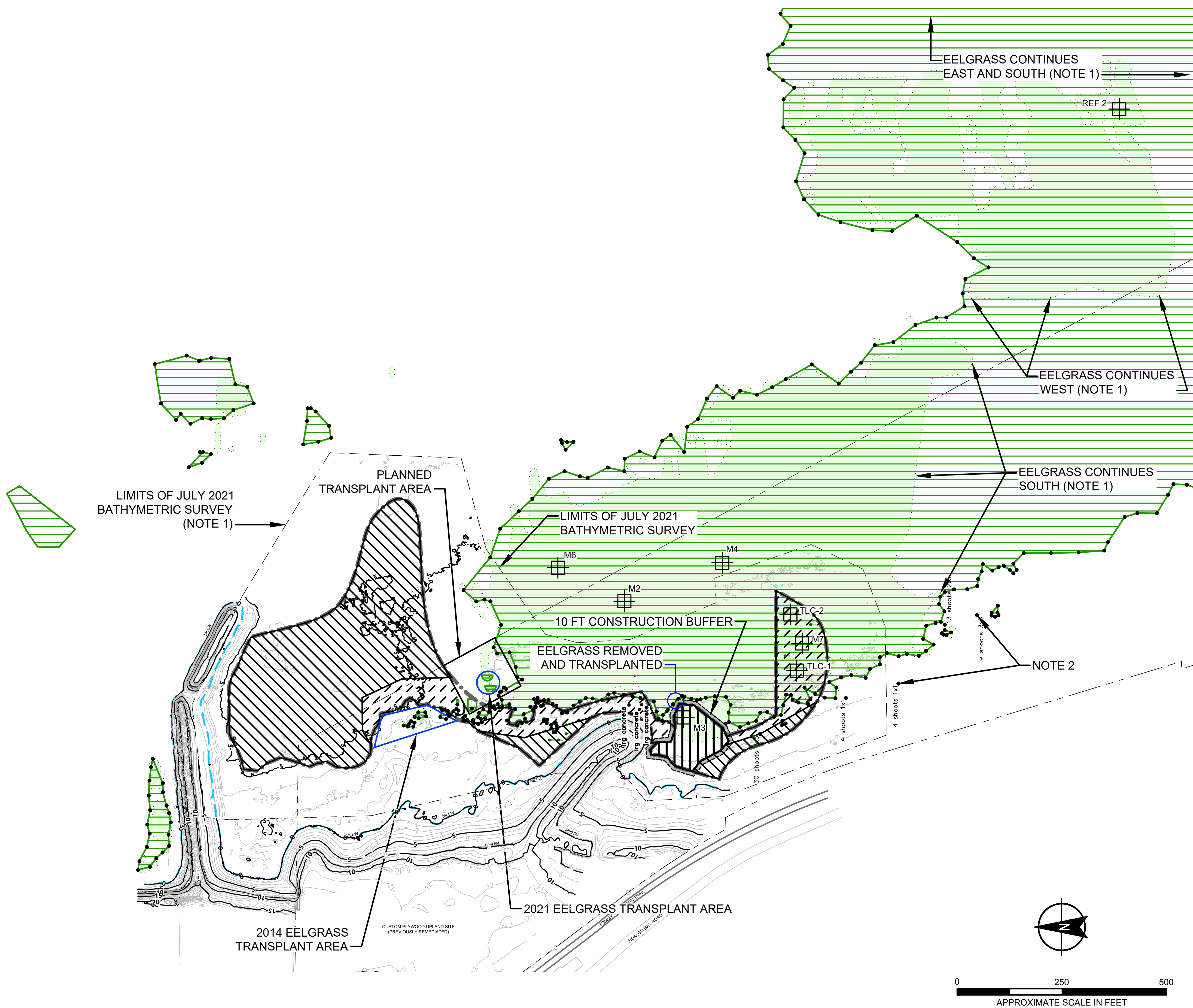
HALEY ALDRICH

CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

PRE-CONSTRUCTION SITE BATHYMETRY AND WORK AREAS

SCALE: AS SHOWN
JUNE 2022

FIGURE 2



LEGEND

- EELGRASS BIOMASS & DENSITY (REF# & M#) OR BIOMASS (TLC-#) MONITORING LOCATION (SEE NOTE 3)
- PROPERTY LINE
- PROJECT LIMIT LINE
- MLLW — MEAN LOWER LOW WATER
- DREDGE & BACKFILL AREA
- 2-INCH THIN LAYER CAP (TLC) AREA
- 8-INCH TLC AREA
- JULY 2021 EELGRASS SURVEY
- SURVEY GPS POINTS
- JULY 2019 EELGRASS SURVEY

NOTES

1. ROUGH APPROXIMATE EDGE OF 2019 AND 2021 SURVEYS, EELGRASS CONTINUES IN DIRECTIONS NOTED.
2. ISOLATED EELGRASS AREA (ESTIMATED NUMBER OF SHOOTS AND SIZE L' X W'; TYP.).
3. EXCEPTION, SAMPLE M6 IS ONLY EELGRASS DENSITY.

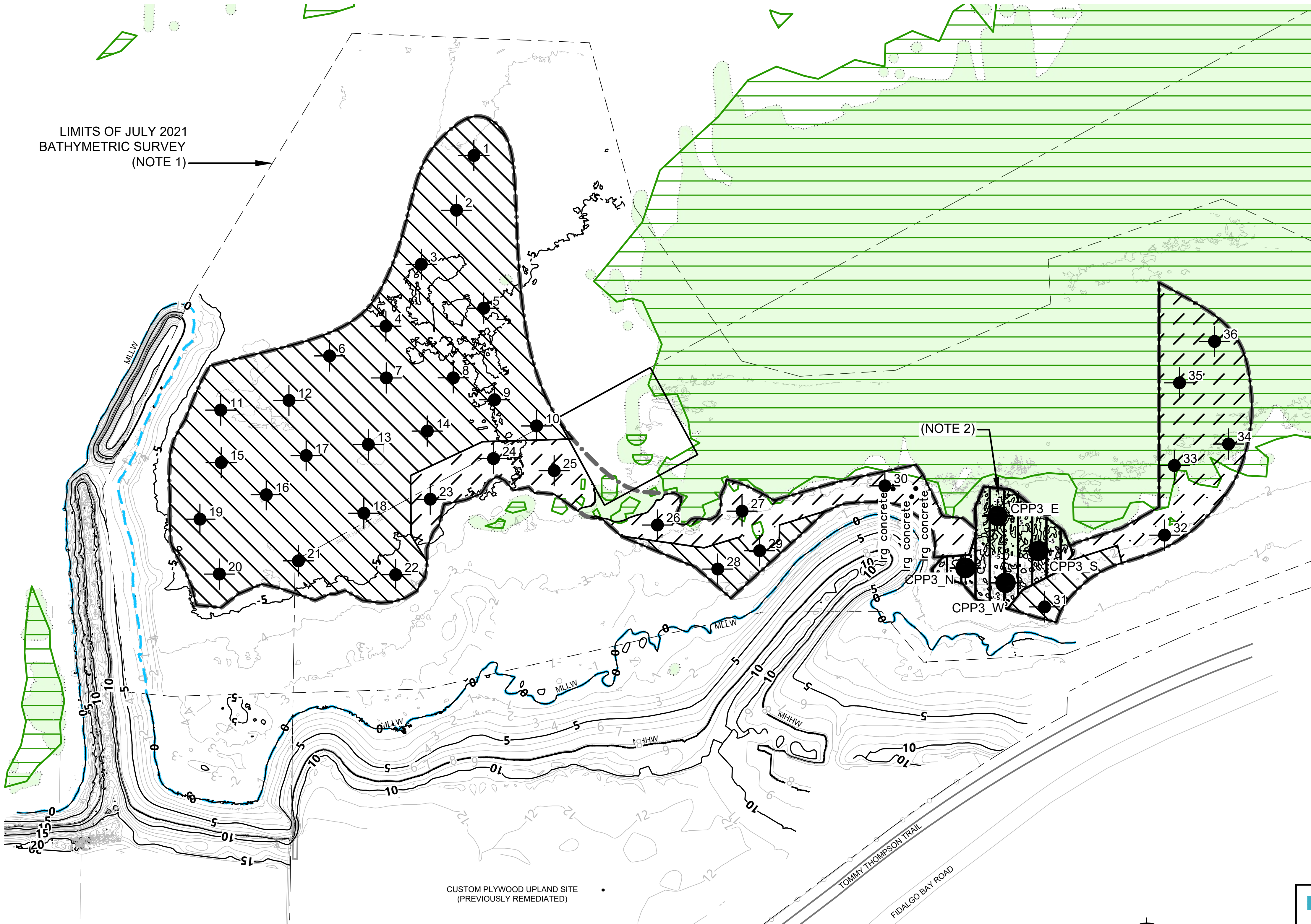
HALEY ALDRICH

CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

PRE-CONSTRUCTION EELGRASS EXTENT

SCALE: AS SHOWN
JUNE 2022

FIGURE 3



LEGEND

CPP3_3	DREDGE BOTTOM SAMPLE
36	THIN LAYER CAP (TLC) THICKNESS MEASUREMENT POINTS (NOTE 3)
	PROPERTY LINE
	PROJECT LIMIT LINE
MLLW	MEAN LOWER LOW WATER
	DREDGE & BACKFILL AREA
	2-INCH THIN LAYER CAP (TLC) AREA
	8-INCH TLC AREA
	JULY 2021 EELGRASS SURVEY
	JULY 2019 EELGRASS SURVEY

NOTES

1. UPLAND TOPOGRAPHIC CONTOURS (GENERALLY ABOVE MLLW) FROM ETRAC ENGINEERING 12/19/2013 SURVEY. BATHYMETRY CONTOURS (GENERALLY BELOW MLLW) FROM 7/6/2021 SOLMER HYDRO. SEE SHEET G1.1 OF CONSTRUCTION PLANS (2/10/2021) FOR DESIGN ELEVATION CONTOURS.
2. POST DREDGING BATHYMETRY FROM 8/17/2021 SURVEY BY PACIFIC ENGINEERING & SURVEYING.
3. TLC MEASUREMENTS MADE USING "RAIN BUCKETS" AS DISCUSSED IN TEXT, AND INITIALLY CROSS-CHECKED BY DIVERS.

0 150 300
APPROXIMATE SCALE IN FEET

HALEY ALDRICH

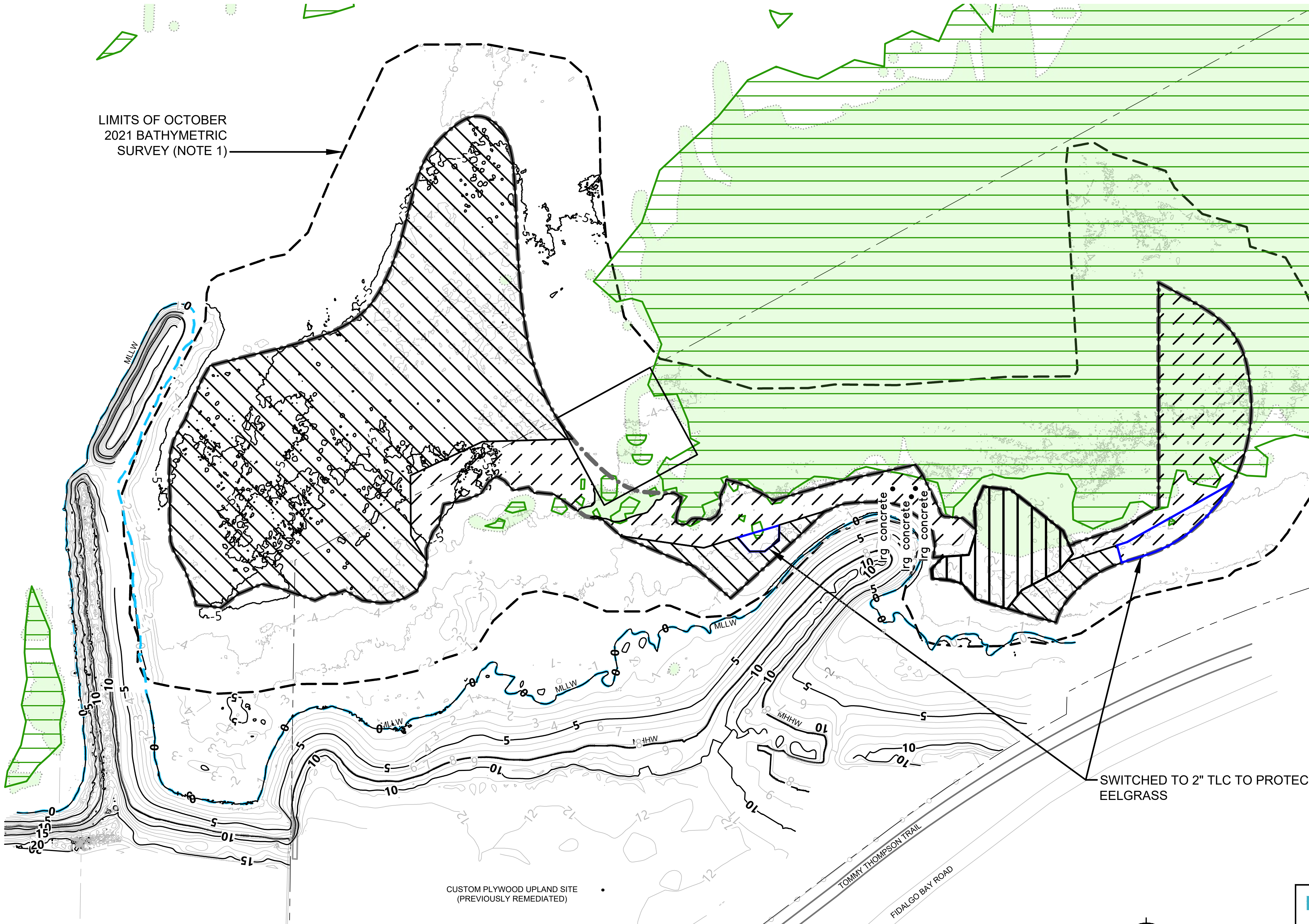
CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

DREDGE BOTTOM DOCUMENTATION SAMPLES AND TLC THICKNESS CHECK POINTS

SCALE: AS SHOWN
JUNE 2022

FIGURE 4

\\HALEYALDRICH.COM\SHARE\SEA_PROJECTS\NOTEBOOKS\1960000_CUSTOM_PLYWOOD_SUBTIDAL_SEDIMENT_CLEANUP\CAD\1960000_000_0003_SITE PLANS.DWG
KPOSTOLOWSKI Printed: 6/28/2022 5:57 PM Sheet: FIG 4



LEGEND

- PROPERTY LINE
- PROJECT LIMIT LINE
- MLLW — MEAN LOWER LOW WATER
- DREDGE & BACKFILL AREA
- 2-INCH THIN LAYER CAP (TLC) AREA
- 8-INCH TLC AREA
- JULY 2021 EELGRASS SURVEY
- JULY 2019 EELGRASS SURVEY

NOTES

1. UPLAND TOPOGRAPHIC CONTOURS (GENERALLY ABOVE MLLW) FROM ETRAC ENGINEERING 12/19/2013 SURVEY. BATHYMETRY CONTOURS (GENERALLY BELOW MLLW) FROM 10/28/2021 SURVEY BY PACIFIC SURVEYING & ENGINEERING. SEE SHEET G1.1 OF CONSTRUCTION PLANS (2/10/2021) FOR DESIGN ELEVATION CONTOURS.

0 150 300
APPROXIMATE SCALE IN FEET

HALEY ALDRICH

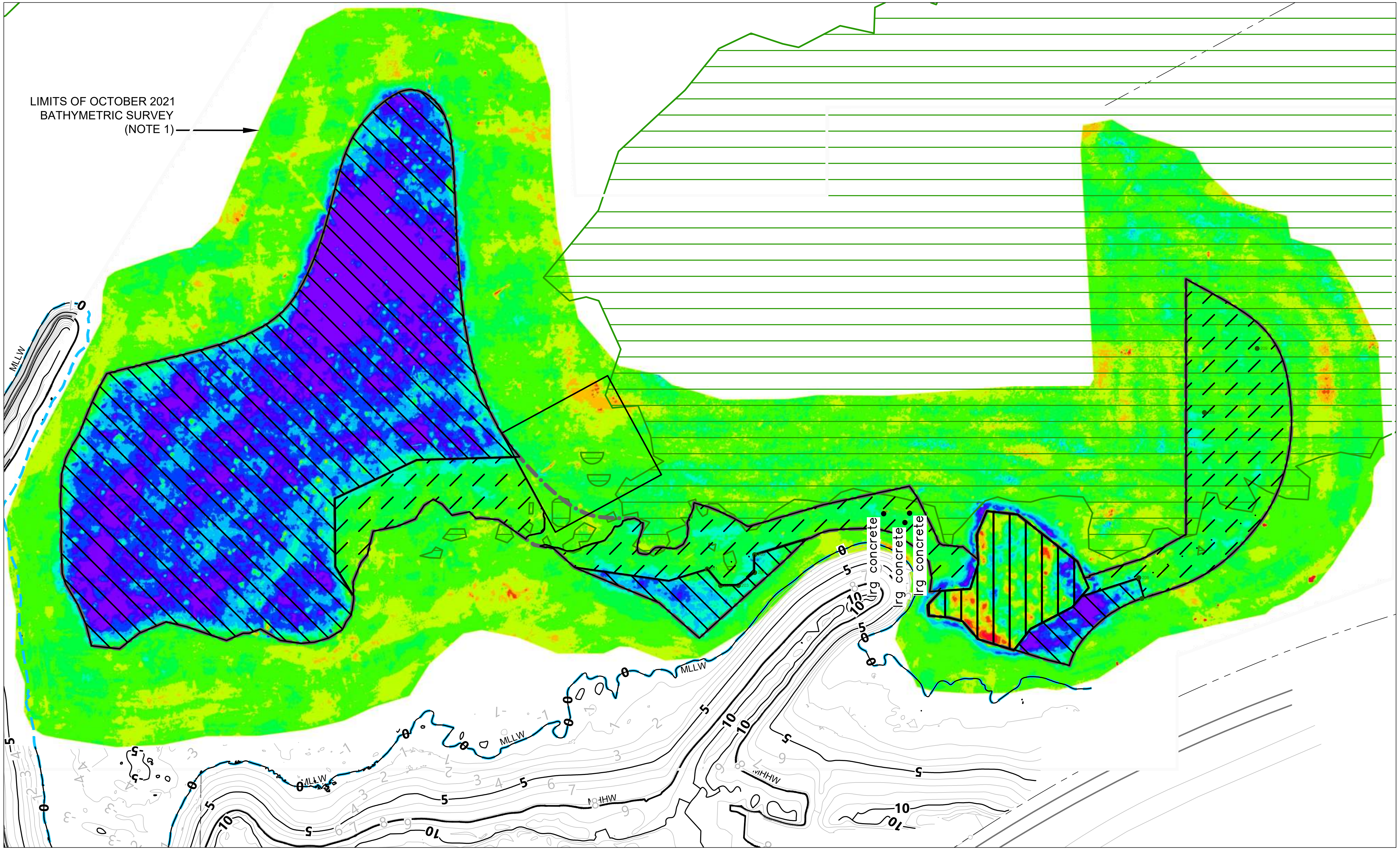
CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

POST-CONSTRUCTION CONDITIONS - BATHYMETRY CONTOURS

SCALE: AS SHOWN
JUNE 2022

FIGURE 5

\\HALEYALDRICH.COM\SHARE\SEA_PROJECTS\NOTEBOOKS\1960000_CUSTOM_PLYWOOD_SUBTIDAL_SEDIMENT_CLEANUP\CAD\1960000_000_0003_SITE PLANS.DWG
KPOSTOLOWSKI Printed: 6/28/2022 5:58 PM Sheet: FIG 5



Cut(−)/Fill(+) Table			
Range	Cut(−)/Fill(+)	Cut(−)/Fill(+)	Color
1	−2'−3"	−6"	
2	−6"	−4"	
3	−4"	−2"	
4	−2"	0"	
5	0"	2"	
6	2"	4"	
7	4"	6"	
8	6"	8"	
9	8"	10"	
10	10"	12"	
11	12"	2'−3"	

LEGEND

PROPERTY LINE

PROJECT LIMIT LINE

DREDGE & BACKFILL AREA

2-INCH THIN LAYER CAP (TLC) AREA

8-INCH TLC AREA

JULY 2021 EELGRASS SURVEY

NOTES

1. UPLAND TOPOGRAPHIC CONTOURS (GENERALLY ABOVE MLLW) FROM ETRAC ENGINEERING 12/19/2013 SURVEY. BATHYMETRY DIFFERENCES BETWEEN PRE- (7/6/2021, FIG. 2) AND POST-CONSTRUCTION (10/28/2021, FIG. 4) SURVEYS.
2. BATHYMETRY CHART ELEVATION RANGES ARE APPROXIMATE.

0 120 240
APPROXIMATE SCALE IN FEET

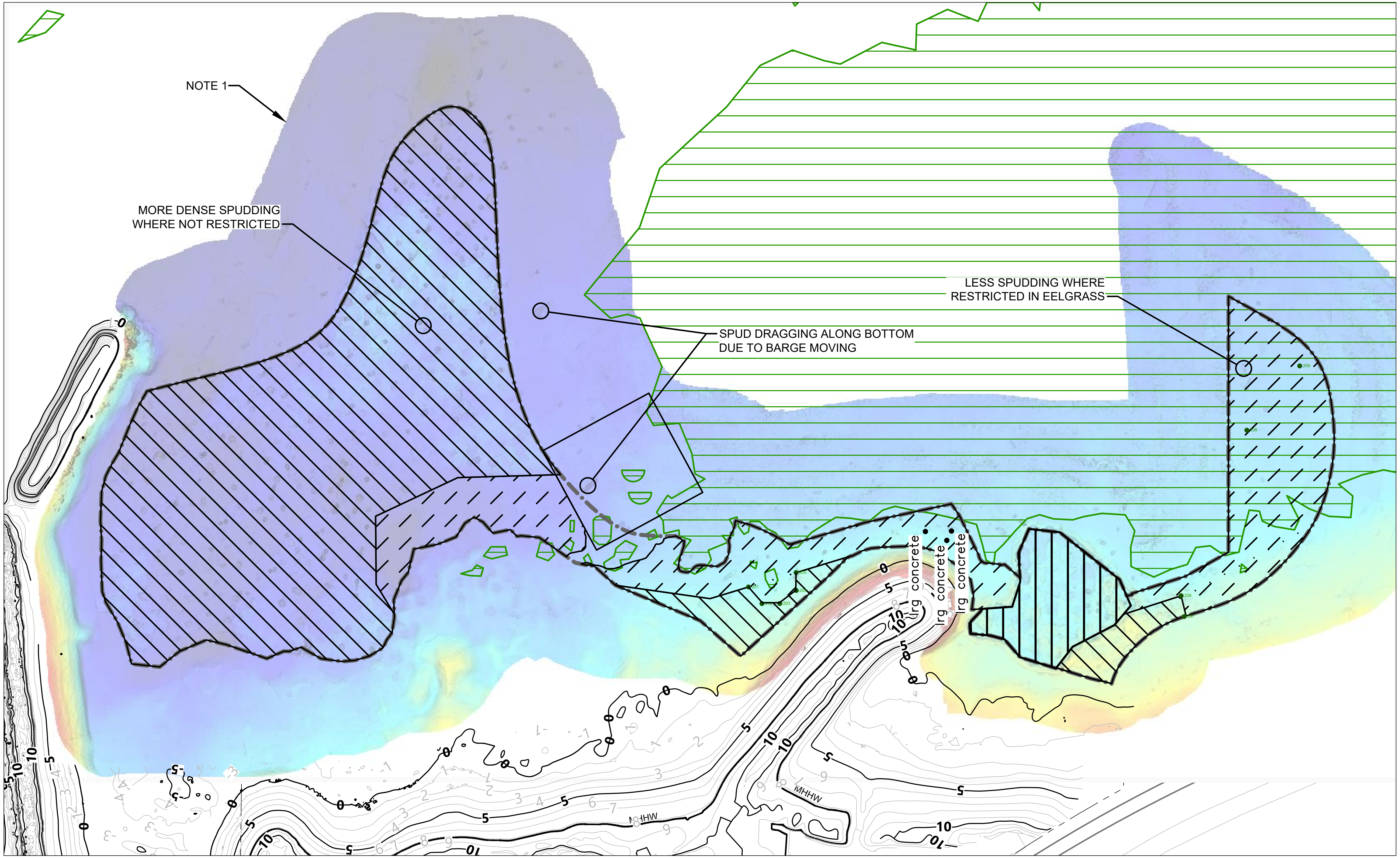
HALEY ALDRICH

CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

POST- VERSUS PRE-CONSTRUCTION BATHYMETRY DIFFERENCES

SCALE: AS SHOWN
JUNE 2022

FIGURE 6



BATHYMETRY APPROXIMATE ELEVATIONS RANGE (FT.)		
START	END	COLOR
1	0	
0	-1'	
-1'	-2'	
-2'	-3'	
-3'	-4'	
-4'	-5'	
-5'+		

LEGEND

- PROPERTY LINE
- PROJECT LIMIT LINE
- DREDGE & BACKFILL AREA
- 2-INCH THIN LAYER CAP (TLC) AREA
- 8-INCH TLC AREA
- JULY 2021 EELGRASS SURVEY

NOTES

1. UPLAND TOPOGRAPHIC CONTOURS (GENERALLY ABOVE MLLW) FROM ETRAC ENGINEERING 12/19/2013 SURVEY. BATHYMETRY FROM 10/27/2021 SURVEY BY AMERICAN CONSTRUCTION COMPANY.
2. BATHYMETRY CHART ELEVATION RANGES ARE APPROXIMATE.

0 120 240
APPROXIMATE SCALE IN FEET

HALEY ALDRICH

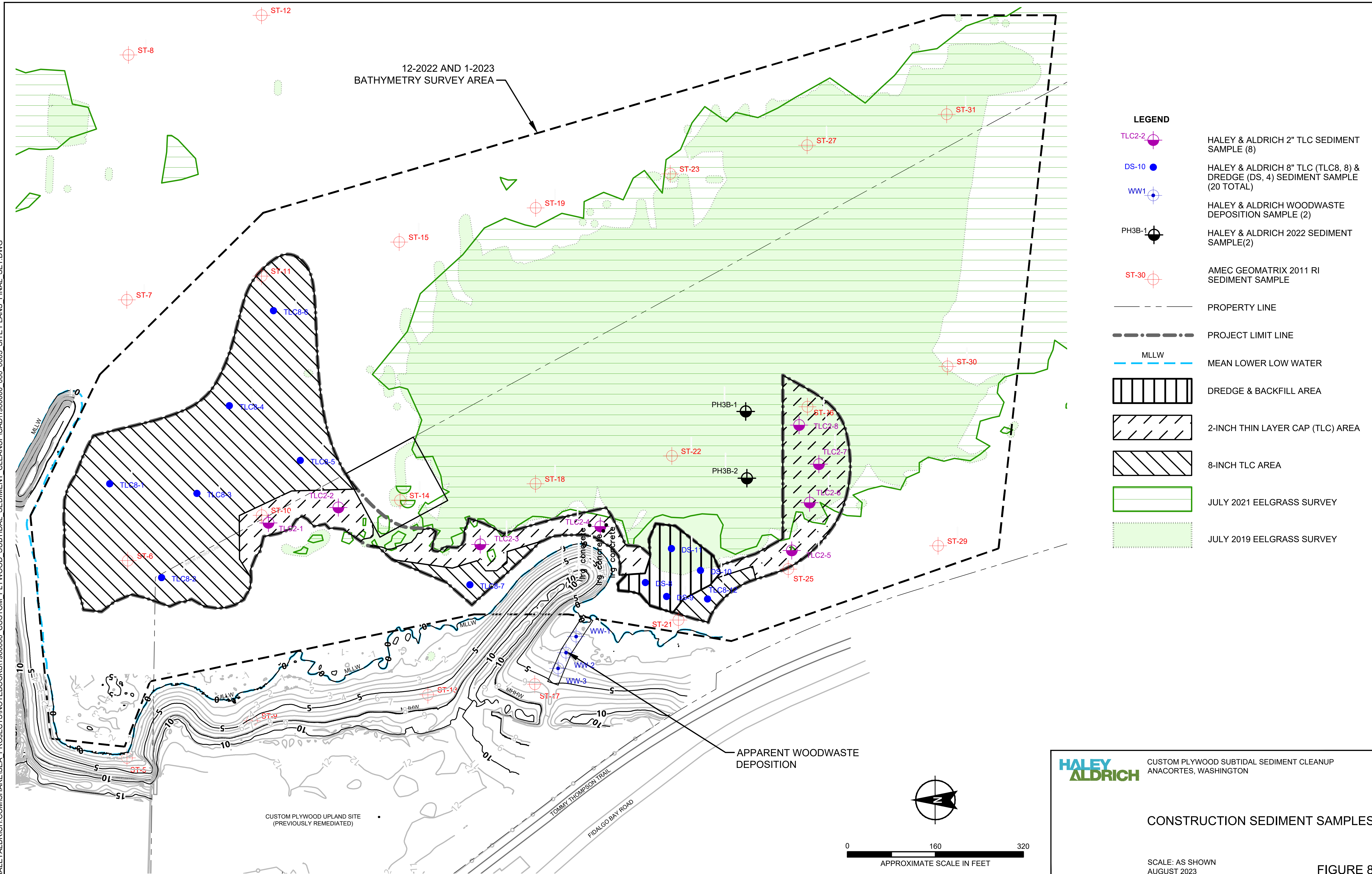
CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

POST-CONSTRUCTION CONDITIONS - HIGH RESOLUTION BATHYMETRIC SURFACE

SCALE: AS SHOWN
JUNE 2022

FIGURE 7

\\HALEYALDRICH.COM\SHARE\SEA_PROJECTS\NOTEBOOKS\1960000_CUSTOM_PLYWOOD_SUBTIDAL_SEDIMENT_CLEANUP\CAD\1960000_000_0003_SITE PLANS.DWG
KPOSTOLOWSKI Printed: 6/28/2022 5:59 PM Sheet: FIG 7



HALEY ALDRICH

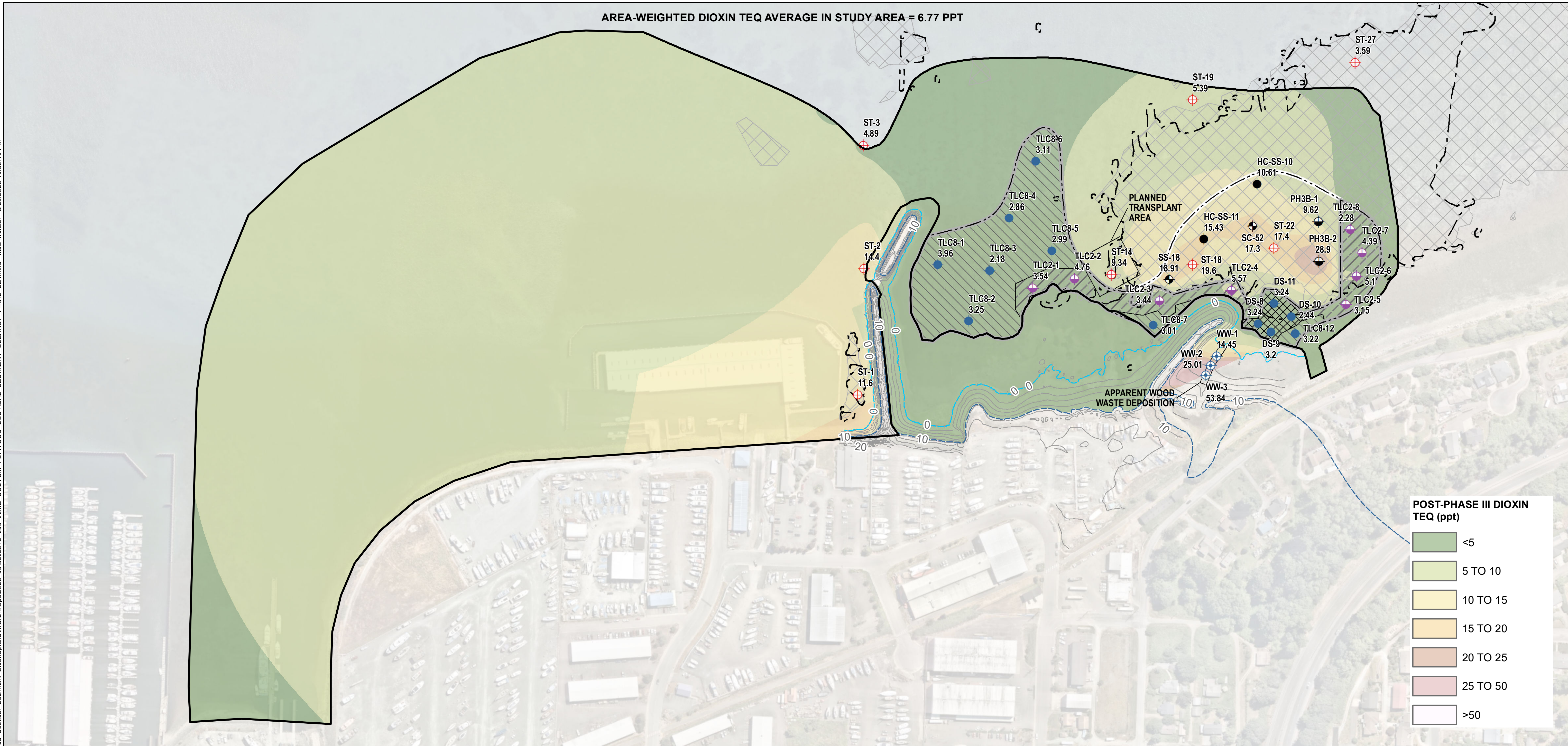
CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

CONSTRUCTION SEDIMENT SAMPLES

SCALE: AS SHOWN
AUGUST 2023

FIGURE 8

MSCHWEITZER Printed: 8/28/2023 11:04 PM Sheet: FIG 8
\\HALEYALDRICH.COM\SHARE\SEA_PROJECTS\NOTEBOOKS\1960000_CUSTOM_PLYWOOD_SUBTIDAL_SEDIMENT_CLEANUP\CAD\1960000_000_0003_SITE_PLANS_FINAL_SET.DWG



LEGEND

- AMEC GEOMATRIX 2011 RI SEDIMENT SAMPLE
- HALEY & ALDRICH 2022 SEDIMENT SAMPLE
- HALEY & ALDRICH 2-INCH TLC SEDIMENT SAMPLE
- HALEY & ALDRICH 8-INCH TLC SEDIMENT SAMPLE
- HALEY & ALDRICH WOODWASTE DEPOSITION SAMPLE
- HART CROWSER 2012 SEDIMENT SAMPLE
- HART CROWSER 2010 SEDIMENT SAMPLE
- MEAN LOWER LOW WATER (MLLW)
- ORDINARY HIGH WATER (OHW, NOTE 5)
- BATHYMETRIC ELEVATIONS (MLLW DATUM)
- FUTURE PHASE III BOUNDARY
- 2022 PHASE III BOUNDARY
- AREA WEIGHTED AVERAGE DIOXIN TEC EXTENT AFTER PHASE II (NOTE 2)
- JULY 2021 EELGRASS SURVEY
- JULY 2019 EELGRASS SURVEY
- 2-INCH THIN LAYER CAP (TLC) AREA
- 8-INCH TLC AREA
- DREDGE & BACKFILL AREA

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. DIOXIN TOXIC EQUIVALENCE QUOTIENT (TEQ) IN PARTS PER TRILLION (PPT).
3. PRIOR CLEANUP AREAS ASSUMED TO BE LESS THAN 5 PPT. TEC OF CAPPED AREAS ASSUMED TO EXTEND TO EDGE OF CAPPING.
4. ORDINARY HIGH WATER (OHW) IS 9.2 FEET MLLW PER 2012 PH. 2 CMMP.
5. AERIAL IMAGERY SOURCE: NEARMAP, 11 JULY 2022

0 300 600
SCALE IN FEET

HALEY ALDRICH

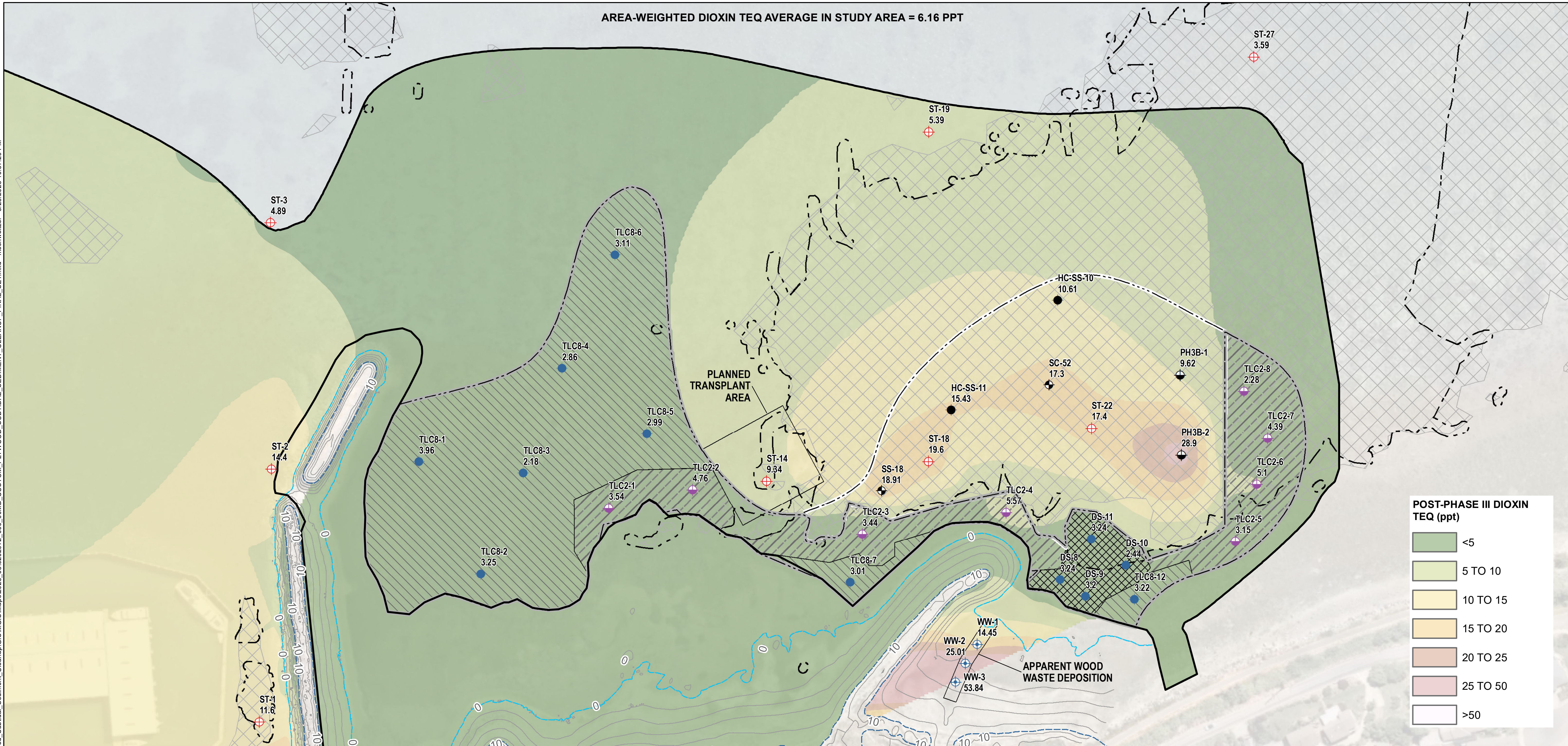
CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

POST-CONSTRUCTION
AREA-WEIGHTED DIOXIN
CONCENTRATION
(REMEDIAL ACTION AREA)

AUGUST 2023

FIGURE 9

GIS:\\haleyaldrich.com\share\sea_projects\Notebooks\1960000_Custom_Plywood_Subtidal_Sediment_Cleanup\GIS\MGIS\Maps\2023_08\0202972_000_00MB_CUSTOM_PLYWOOD_SUBTIDAL_SEDIMENT_CLEANUP_FINAL_SET.mxd - mschweitzer - 8/28/2023 10:39:16 PM



LEGEND

- AMEC GEOMATRIX 2011 RI SEDIMENT SAMPLE
- HALEY & ALDRICH 2022 SEDIMENT SAMPLE
- HALEY & ALDRICH 2-INCH TLC SEDIMENT SAMPLE
- HALEY & ALDRICH 8-INCH TLC SEDIMENT SAMPLE
- HALEY & ALDRICH WOODWASTE DEPOSITION SAMPLE
- HART CROWSER 2012 SEDIMENT SAMPLE
- HART CROWSER 2010 SEDIMENT SAMPLE
- MEAN LOWER LOW WATER (MLLW)
- ORDINARY HIGH WATER (OHW, NOTE 5)
- BATHYMETRIC ELEVATIONS (MLLW DATUM)
- FUTURE PHASE III BOUNDARY
- 2022 PHASE III BOUNDARY
- AREA WEIGHTED AVERAGE DIOXIN TEC EXTENT AFTER PHASE II (NOTE 2)
- JULY 2021 EELGRASS SURVEY
- JULY 2019 EELGRASS SURVEY
- 2-INCH THIN LAYER CAP (TLC) AREA
- 8-INCH TLC AREA
- DREDGE & BACKFILL AREA

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. DIOXIN TOXIC EQUIVALENCE QUOTIENT (TEQ) IN PARTS PER TRILLION (PPT)
3. PRIOR CLEANUP AREAS ASSUMED TO BE LESS THAN 5 PPT. TEC OF CAPPED AREAS ASSUMED TO EXTEND TO EDGE OF CAPPING.
4. ORDINARY HIGH WATER (OHW) IS 9.2 FEET MLLW PER 2012 PH. 2 CMMP.
5. AERIAL IMAGERY SOURCE: NEARMAP, 11 JULY 2022

0 150 300
SCALE IN FEET

HALEY ALDRICH

CUSTOM PLYWOOD SUBTIDAL SEDIMENT CLEANUP
ANACORTES, WASHINGTON

POST-CONSTRUCTION
AREA-WEIGHTED DIOXIN
CONCENTRATION
(SOUTH OF JETTY)

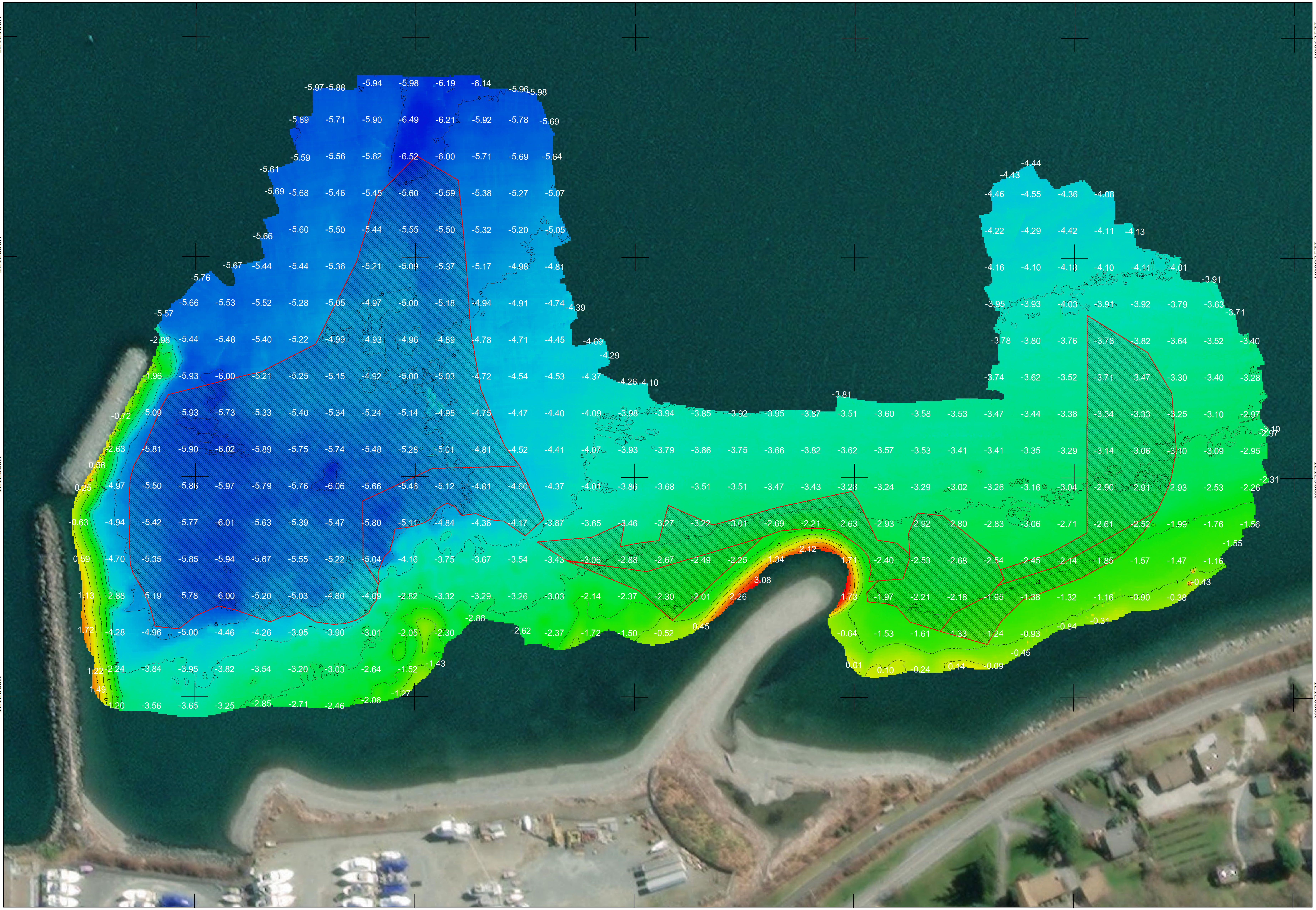
AUGUST 2023

FIGURE 10

GIS:\\haleyaldrich.com\share\sea_projects\Notebooks\1960000_Custom_Plywood_Subtidal_Sediment_Cleanup\GIS\MGIS\Maps\2023_08\0202972_000_00MB_CUSTOM_PLYWOOD_SUBTIDAL_SEDIMENT_CLEANUP_FINAL_SET.mxd - mschweitzer - 8/28/2023 10:37:29 PM

APPENDIX A
Survey and As-Built Drawings

A01 - Pre-Construction Bathymetry Survey and Notes, Solmer Hydro, 2021.07.06
A02 - Post Dredge Bathymetry Survey, Pacific Surveying & Engineering, 2021.08.17
A03 - Pre vs Post Dredge Area Bathymetry Difference, 2021.10.28
A04 - Post Construction Site Bathymetry Survey, Pacific Surveying & Engineering, 2021.10.28
A05 - Post Construction Site Bathymetry Difference, Pacific Surveying & Engineering, 2021.10.28



CUSTOM PLYWOOD SITE
Anacortes, Washington
Bathymetric Condition Survey

Survey Date: July 6, 2021
Horizontal Datum: NAD83/11 WA N.
Vertical Datum: MLLW
Units: US Survey Feet
Contour Interval: 1ft

Jason Magalen, C.H., P.E.

solmar hydro
Marine Engineering & Surveying

SOLMAR HYDRO, INC.
SURVEY LOG

Survey Date:	7/6/2021
Project Name:	Custom Plywood - Anacortes, WA
Contract Number:	Pre-Construction Survey

Project Information

Description of Operations	MBES
Time Zone	UTC
Locality	Anacortes, WA
Sub-Locality	Custom Plywood Site

Horizontal Control

Positioning System	Applanix POS/MV Wavemaster II
Antennae Type	Aero
GNSS Reference Station	Trimble R7
Antennae Type	Zephyr Model II
Horizontal Coordinate System	NAD83/11
Horizontal Projection	SPCS WA-North Zone
Horizontal Units	U.S. Survey Feet

Vertical Control

Primary Water Levels	RTK-derived
Secondary Water Levels	0' NAVD88 = 0.51' MLLW
Vertical Datum/Geoid Model	MLLW, Converted from NAVD88 (2012B)
Vertical Units	International Feet

Instrumentation

Sonar	R2 Sonic 2024 - 450 kHz
Vessel Attitude System	Applanix POS/MV Wavemaster II
Vessel Heading System	Applanix POS/MV Wavemaster II
Primary Sound Velocity	YSI Castaway
Secondary Sound Velocity	YSI Castaway
Data Acquisition Software	Hypack Hysweep 2021
Additional Sensors/Systems	Trimble R8 RTK GNSS Rover

Vessel And Crew

Vessel Name/Description	SHI 24' Aluminum Survey Vessel
Pilot/Captain	T. Brennan
Crew	B. Churchwell
Comments	

SOLMAR HYDRO, INC.
SURVEY LOG

Survey Date:	7/6/2021
Project Name:	Custom Plywood - Anacortes, WA
Contract Number:	Pre-Construction Survey

Time Zone: UTC

Start Time	Stop Time	Raw Filename	Line Type	Comments
				RTK GNSS Corrections received via WSRN Station "JOBO"
12:00				Rover Check Shot on WS DOT Benchmark "GP29090-78"
				ΔE = 0.043 sft (compared to published)
				ΔN = 0.071 sft (compared to published)
				ΔZ = 0.106 sft (compared to published)
14:30				On-site to start MBES Survey
		20210706.000		Logging POSPAC raw data (20210706.000)
				Set TBM for American Construction on Dolphn at a steel "staple" using RTK Rover (Points 100-103)
14:46				SVP Cast at site
				Set R2Sonic 2024 Power/Ocean Settings
				Absorption = 112 dB/km
				Spreading = 20
				Power = 206 dB
				Gain = 3
				Start Survey
17:21				SV Cast at site
18:00				Complete Survey
				SV Cast at site

Washington State Department of Transportation

Geographic Services

SURVEY INFORMATION SYSTEM Report of Survey Mark

Designation:	GP29020-78	**T.R.S:**	35N, 2E, 18	**ACCOUNTS INFORMATION**		
Monument ID:	2488	**Corner Code:**		**BOOK**	**PROJECT**	**INVOICE**
NGS Pid:		**State Route:**	020 SPUR	110	0L2563	23-96084
State:	WASHINGTON	**Mile Post:**	51.9	284	MS5400	23-05032
County:	SKAGIT	**Station:**		NA	MT0326	23-11026
Region:	NW	**Offset:**				
Nearest Town:	ANACORTES	**Owner:**	GS			
USGS Quad:	ANACORTES NORTH	**Bearing:**	M			

THE STATION IS LOCATED IN ANACORTES, IN THE SOUTHEAST QUADRANT OF THE INTERSECTION OF COMMERCIAL AVE AND 12TH ST (A 90 DEGREE CURVE IN SR 020 SPUR), IN THE CONCRETE SIDEWALK, 5.1 METERS SOUTH OF A METAL SIGNAL POLE, 40 CM NORTHEAST OF AN ELECTRICAL JUNCTION BOX AND 1.3 METERS NORTHEAST OF THE WEST EDGE OF CONCRETE SIDEWALK. THE MARK IS A WSDOT BRASS DISK CEMENTED INTO A DRILL HOLE AND SET LEVEL WITH THE CONCRETE SURFACE.

Survey Control

Datum: NAD 83/11 **Date:** 11/07/2012

Lat: 48 30 44.938979 N **Long:** 122 36 44.804055 W **Ellips:** -16.232 (M) -53.254 (USFt) **Geoid:** -21.890 (M)

Washington State Plane Zone: North

Northing	**Easting**	**Scale**	**Comb Factor**	**Conv Angle**
169684.047 (M) 556705.078 (USFt)	368569.564 (M) 1209215.311 (USFt)	0.99996596	0.99996851	-1 19 28.5

		Survey Info	Accuracy	Network	Method
Ortho:	Date: 04/03/2008	Horizontal	2 CM	PRIMARY	GPS
Datum:	NAVD 88	Ellips	5 CM		GPS
Elevation:	5.658 (M) 18.563 (USFt)	Ortho	1 CM	PRIMARY	DIFF LEVELS

Datum: NAD 83/07		**Date:** 07/28/2008				
Lat: 48 30 44.938361 N	**Long:** 122 36 44.805371 W	**Ellips:** -16.226 (M) -53.235 (USFt)		**Geoid:** -21.884 (M)		
Washington State Plane Zone: North						
Northing	**Easting**		**Scale**	**Comb Factor**	**Conv Angle**	
169684.028 (M) 556705.015 (USFt)	368569.537 (M) 1209215.223 (USFt)		0.99996596	0.99996851	-1 19 28.5	
Ortho:	Date: 04/03/2008	Survey Info	Accuracy	Network	Method	
Datum:	NAVD 88	Horizontal	2 CM	PRIMARY	GPS	
Elevation:	5.658 (M) 18.563 (USFt)	Ellips	5 CM		GPS	
		Ortho	1 CM	PRIMARY	DIFF LEVELS	

Datum: NAD 83/91		**Date:** 10/10/1996				
Lat: 48 30 44.934253 N	**Long:** 122 36 44.808412 W	**Ellips:** -16.014 (M) -52.539 (USFt)		**Geoid:** -21.672 (M)		
Washington State Plane Zone: North						
Northing	**Easting**		**Scale**	**Comb Factor**	**Conv Angle**	
169683.903 (M) 556704.605 (USFt)	368569.471 (M) 1209215.006 (USFt)		0.99996596	0.99996847	-1 19 28.5	
Ortho:	Date: 04/03/2008	Survey Info	Accuracy	Network	Method	
Datum:	NAVD 88	Horizontal	2 CM	PRIMARY	GPS	
Elevation:	5.658 (M) 18.563 (USFt)	Ellips	5 CM		GPS	
		Ortho	1 CM	PRIMARY	DIFF LEVELS	

Datum: NAD 83/91		**Date:** 10/10/1996				
Lat: 48 30 44.934253 N	**Long:** 122 36 44.808412 W	**Ellips:** -16.014 (M) -52.539 (USFt)		**Geoid:** -21.686 (M)		
Washington State Plane Zone: North						
Northing	**Easting**		**Scale**	**Comb Factor**	**Conv Angle**	
169683.903 (M) 556704.605 (USFt)	368569.471 (M) 1209215.006 (USFt)		0.99996596	0.99996847	-1 19 28.5	
Ortho:	Date: 10/10/1996	Survey Info	Accuracy	Network	Method	
Datum:	NAVD 88	Horizontal	2 CM	PRIMARY	GPS	
Elevation:	5.672 (M) 18.609 (USFt)	Ellips	5 CM		GPS	
		Ortho	1 CM	PRIMARY	DIFF LEVELS	

History

Recovered On	Recovered By	Action	Condition
4/27/2015	GEOGRAPHIC SERVICES	RECOVERED	GOOD
11/7/2012	GEOGRAPHIC SERVICES	UPDATED	
7/28/2008	GEOGRAPHIC SERVICES	UPDATED	
4/3/2008	GEOGRAPHIC SERVICES	UPDATED	
10/10/1996	GEOGRAPHIC SERVICES	MONUMENTED	

Marine Construction   Dredging   Pile Driving
1501 Taylor Way • Tacoma, Washington 98421
PHONES: Tacoma (253) 254-0118,
Seattle (206) 623-0114,
Fax (253) 254-0155

CONTRACTORS LIC NO. AMERIC*372NO

AMERICAN CONSTRUCTION COMPANY

DATE July 19, 2021

TO:
Ecology & Hart Crowser
Hun Seak Park hpar461@ecy.wa.gov
Arianne Fernandez afer461@ecy.wa.gov
Susannah Edwards sued461@ecy.wa.gov
John Bingham john.bingham@hartcrowser.com
Andrew Kaparos andrew.kaparos@hartcrowser.com

JOB #: MC 12-21

TITLE: DOE-Custom Plywood Mill Phase 3 Subtidal Sediment Cleanup

THE FOLLOWING ITEMS ARE BEING SENT:

- [x] Herewith
- [ ] Under Separate Cover
- [ ] Direct

QUANTITY	DESCRIPTION
1 EA	01 33 00 – Pre-Construction Survey, SM#011

These items are being sent:

- [ ] Per your request
- [ ] Please keep us advised of action taken
- [ ] For you to process
- [ ] For your inspection and approval
- [ ] For your general information and file
- [x] For your approval or corrections

REMARKS:

Please contact us promptly if there is a problem or question

COPY TO: File

AMERICAN CONSTRUCTION CO., INC.

BY: [signature]
Christopher Raymond, Project Superintendent

SURVEY NOTES

1) THIS MAP REPRESENTS SITE DREDGING PRIOR TO BACKFILL.

2) THIS TOPOGRAPHIC BATHYMETRIC SURVEY WAS PERFORMED AND PREPARED IN ACCORDANCE WITH WAC 332-130-145.

3) DATA FOR THIS SURVEY WAS GATHERED BY DEPTH SOUNDING UTILIZING ELECTRONIC DATA COLLECTION IN OCTOBER 2021.

4) EQUIPMENT USED: THEOMAT 00'01.5"
EDM: ± 2 PPM, ± 3 MM

5) HORIZONTAL DATUM: NAD 83/11, WASHINGTON STATE PLANE NORTH ZONE

6) VERTICAL DATUM: TIDAL – MLLW

7) CONTOURS DEPICTED HEREON MEET OR EXCEED NATIONAL MAPPING STANDARDS FOR 1-FOOT ACCURACY TOPOGRAPHIC SURVEYS AND HAVE BEEN COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SURVEY UTILIZING ELECTRONIC DATA COLLECTION.

CALL BEFORE YOU DIG 1-800-424-5555

REVISION	DATE	DESCRIPTION

ISSUE	DATE	DESCRIPTION
1	8.17.2021	DREDGE AS-BUILT SURVEY

AMERICAN CONSTRUCTION
1501 TAYLOR WAY
TACOMA, WA 98421

AS-BUILT SURVEY
CUSTOM PLYWOOD MILL CLEANUP SITE, ANACORTES, WA
PHASE III SUBTIDAL SEDIMENT CLEANUP

PSE
PACIFIC SURVEYING & ENGINEERING, INC.
909 Squalicum Way, Suite 111 | BELLINGHAM, WA 98225
T: 360.671.7387 | F: 360.671.4685
WWW.PSESURVEY.COM | INFO@PSESURVEY.COM

DATA	DRAWN BY	CHECKED BY
BASE	RMT	PKB
DESIGN	–	–
XREF:	–	
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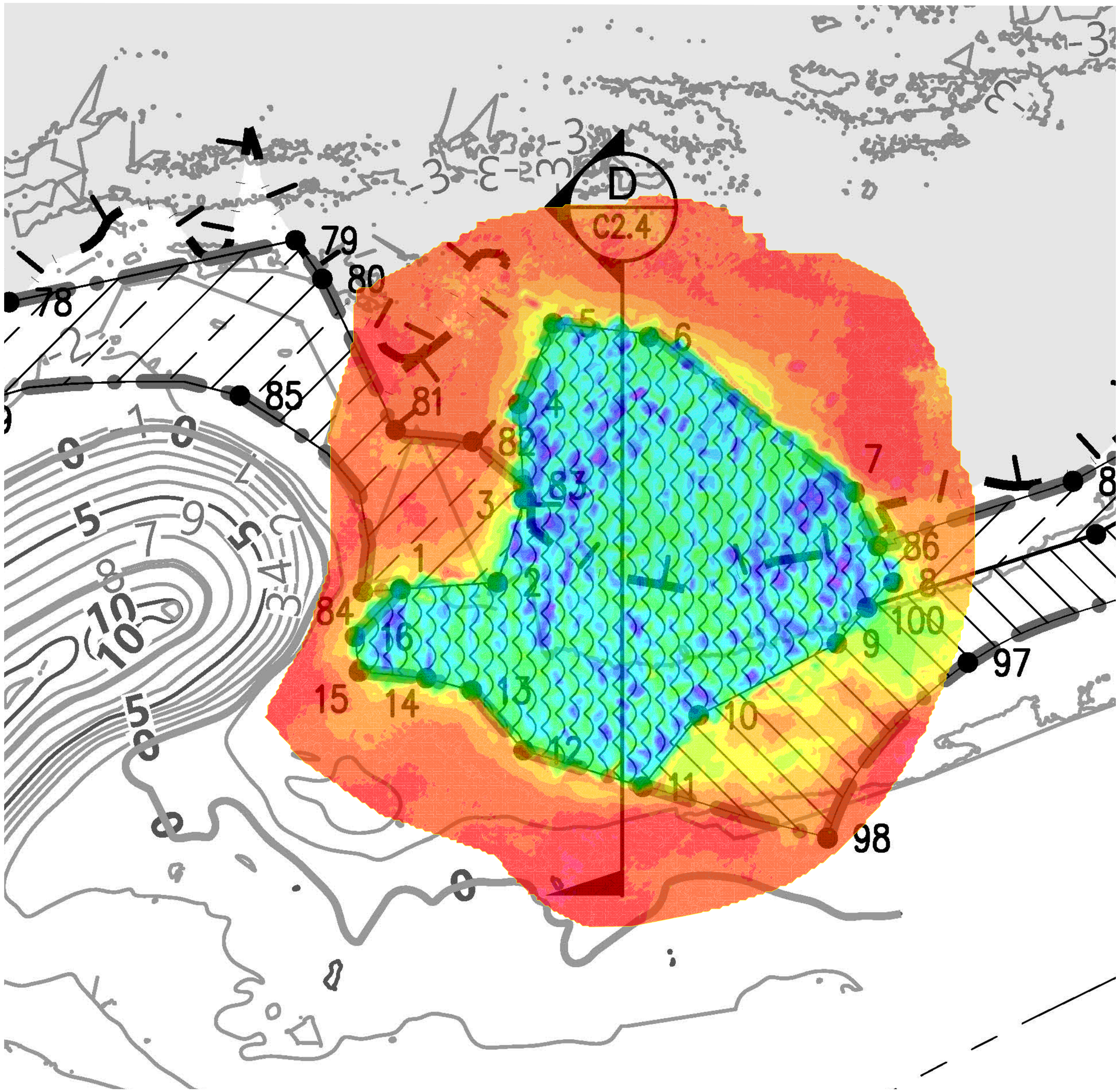
HORIZ. SCALE:	1" = 20'	
VERT. SCALE:	–	
JOB#:	2021234	

FIELD BOOKS	
DESIGN:	–
STAKING:	–
ASBUILT:	483.01
DATUM	
HORIZ.:	NAD 83/91
VERT.:	MLLW

SHEET 1 OF 1

PETER K. BRANDS
STATE OF WASHINGTON
35147
REGISTERED PROFESSIONAL LAND SURVEYOR
11/2/21



Range	Cut(−)/Fill(+)	Cut(−)/Fill(+)	Color
1	−0.45	−0.40	
2	−0.40	−0.30	
3	−0.30	−0.20	
4	−0.20	−0.10	
5	−0.10	0.00	
6	0.00	0.10	
7	0.10	0.20	
8	0.20	0.30	
9	0.30	0.40	
10	0.40	0.50	
11	0.50	0.60	
12	0.60	0.70	
13	0.70	0.80	
14	0.80	0.90	
15	0.90	1.00	
16	1.00	1.10	

Cut(−)/Fill(+) Table

Range	Cut(−)/Fill(+)	Cut(−)/Fill(+)	Color
17	1.10	1.20	
18	1.20	1.30	
19	1.30	1.40	
20	1.40	1.50	
21	1.50	1.60	
22	1.60	1.70	
23	1.70	1.80	
24	1.80	1.90	
25	1.90	2.00	
26	2.00	2.10	
27	2.10	2.20	
28	2.20	2.30	
29	2.30	2.40	
30	2.40	2.50	
31	2.50	2.60	
32	2.60	2.70	

Cut(−)/Fill(+) Table

Range	Cut(−)/Fill(+)	Cut(−)/Fill(+)	Color
33	2.70	2.80	
34	2.80	2.90	
35	2.90	3.00	
36	3.00	3.10	
37	3.10	3.20	
38	3.20	3.30	
39	3.30	3.40	
40	3.40	3.50	
41	3.50	3.60	
42	3.60	3.70	
43	3.70	3.80	
44	3.80	3.90	
45	3.90	4.00	
46	4.00	4.10	
47	4.10	4.20	

GRAPHIC SCALE
(US SURVEY FEET)
0 50
50 25 100
1 inch = 50 feet

PSE

SURVEY NOTES

1) THIS MAP COMPARES DREDGE EXCAVATION TO POST-CONSTRUCTION FINAL CONDITIONS

2) THIS TOPOGRAPHIC BATHYMETRIC SURVEY WAS PERFORMED AND PREPARED IN ACCORDANCE WITH WAC 332-130-145.

3) DATA FOR THIS SURVEY WAS GATHERED BY DEPTH SOUNDING UTILIZING ELECTRONIC DATA COLLECTION IN OCTOBER 2021.

4) EQUIPMENT USED: THEOMAT 00'01.5"
EDM: ± 2 PPM, ± 3 MM

5) HORIZONTAL DATUM: NAD 83/11, WASHINGTON STATE PLANE NORTH ZONE

6) VERTICAL DATUM: TIDAL – MLLW

7) CONTOURS DEPICTED HEREON MEET OR EXCEED NATIONAL MAPPING STANDARDS FOR 1-FOOT ACCURACY TOPOGRAPHIC SURVEYS AND HAVE BEEN COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SURVEY UTILIZING ELECTRONIC DATA COLLECTION.

CALL BEFORE YOU DIG 1-800-424-5555

REVISION	DATE	DESCRIPTION	ISSUE	DATE	DESCRIPTION
			1	10.29.2021	VOLUMETRIC COMPARISON

AMERICAN CONSTRUCTION
1501 TAYLOR WAY
TACOMA, WA 98421

AS-BUILT SURVEY
CUSTOM PLYWOOD MILL CLEANUP SITE, ANACORTES, WA
PHASE III SUBTIDAL SEDIMENT CLEANUP

PSE
PACIFIC SURVEYING & ENGINEERING, INC.
909 Squalicum Way, Suite 111 | BELLINGHAM, WA 98225
T: 360.671.7387 | F: 360.671.4685
WWW.PSESURVEY.COM | INFO@PSESURVEY.COM

DATA	DRAWN BY	CHECKED BY	FIELD BOOKS	
BASE	RMT	PKB	DESIGN:	–
DESIGN	–	–	STAKING:	–
XREF:	–		ASBUILT:	483.01
DWG:	2021234_svE_Volumes.dwg		DATUM	
HORIZ. SCALE:	1" = 20'			
VERT. SCALE:	–		HORIZ.:	NAD 83/91
JOB#:	2021234		VERT.:	MLLW
SHEET 1 OF 1				

PETER K. BRANDS
STATE OF WASHINGTON
35147
REGISTERED PROFESSIONAL LAND SURVEYOR
11/2/21

SURVEY NOTES

1) THIS MAP REPRESENTS SITE EXISTING CONDITIONS POST SEDIMENT CLEANUP/CONSTRUCTION.

2) THIS TOPOGRAPHIC BATHYMETRIC SURVEY WAS PERFORMED AND PREPARED IN ACCORDANCE WITH WAC 332-130-145.

3) DATA FOR THIS SURVEY WAS GATHERED BY DEPTH SOUNDING UTILIZING ELECTRONIC DATA COLLECTION IN OCTOBER 2021.

4) EQUIPMENT USED: THEOMAT 00'01.5"
EDM: ± 2 PPM, ± 3 MM

5) HORIZONTAL DATUM: NAD 83/11, WASHINGTON STATE PLANE NORTH ZONE

6) VERTICAL DATUM: TIDAL – MLLW

7) CONTOURS DEPICTED HEREON MEET OR EXCEED NATIONAL MAPPING STANDARDS FOR 1-FOOT ACCURACY TOPOGRAPHIC SURVEYS AND HAVE BEEN COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SURVEY UTILIZING ELECTRONIC DATA COLLECTION.

CALL BEFORE YOU DIG 1-800-424-5555

REVISION	DATE	DESCRIPTION	ISSUE	DATE	DESCRIPTION
			1	10.28.2021	POST–CONSTRUCTION BATHYMETRIC SURVEY

AMERICAN CONSTRUCTION
1501 TAYLOR WAY
TACOMA, WA 98421

AS-BUILT SURVEY
CUSTOM PLYWOOD MILL CLEANUP SITE, ANACORTES, WA
PHASE III SUBTIDAL SEDIMENT CLEANUP

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DATA	DRAWN BY	CHECKED BY
BASE	RMT	PKB
DESIGN	–	–
XREF:	–	
DWG:	2021234_SVX_FINALCONDITIONS.dwg	
HORIZ. SCALE:	1" = 50'	
VERT. SCALE:	–	
JOB#:	2021234	

FIELD BOOKS	
DESIGN:	–
STAKING:	–
ASBUILT:	483.01
DATUM	
HORIZ.:	NAD 83/91
VERT.:	MLLW

SHEET 1 OF 1

PETER K. BRANDS
STATE OF WASHINGTON
35147
REGISTERED PROFESSIONAL LAND SURVEYOR
11/3/21