Revised (Version 3) Tier 1 Evaluation for Dredged Materials Management

In-water and Overwater Structures Removal Project

Camas Mill, Camas, Washington

March 10, 2023

Original Submittal: August 5, 2020
Revised Submittal: November 16, 2020
Revised (Version 2) Submittal: January 21, 2021
Revised (Version 3) Submittal: March 10, 2023

Prepared for

Georgia-Pacific

Georgia-Pacific Consumer Operations LLC
Camas, Washington

Prepared by

TETRA TECH

19803 North Creek Parkway
Bothell, WA 98011

Exhibit 8 SHOR23-01

Table of Contents

1.0 INTRODUCTION 1

2.0 BRIEF PROJECT OVERVIEW 1

2.1 General Site Information 2

2.2 Dredging Locations and Activity Details 3

3.0 INFORMATION SUPPORTING TIER 1 EVALUATIONS 3

3.1 Recent Surveys and History 3

3.2 Conceptual Dredging Plans 5

3.3 Camas Slough Riverbank Design and Materials Disposal 7

3.4 New Riverbank Surfaces 7

4.0 LADY ISLAND DREDGED MATERIALS AREA 7

5.0 REFERENCES 8

List of Tables

Table 1. Dredging Locations and Descriptions 3
Table 2. Camas Slough Conceptual Dredge Prisms and Estimated Quantities 6

List of Figures

Figure 1 Site Plan Showing Locations of Structures to Be Removed
Figure 2 Outfall 002 Historical Sample Locations
Figure 3A Preliminary Grading Plan, Dock Warehouse Piers Plan View
Figure 3B Dock Warehouse Piers Dredge Prism, Cross Sections
Figure 4 Preliminary Grading Plan, PECO Dock

List of Appendices

Appendix A Bathymetry and Existing Conditions Survey
Appendix B Sediment Quality Result for NDPES Compliance at Outfalls 001 and 002

Exhibit 8 SHOR23-01

Acronyms and Abbreviations

City	City of Camas
COC	constituent of concern
CRD	Columbia River Datum
CSL	Cleanup Screening Level
DMA	Dredged Materials Area
DMMO	Dredged Materials Management Office
DMMP	Dredged Materials Management Program
DMMU	Dredged Materials Management Unit
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
GP	Georgia-Pacific Consumer Operations LLC
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyl
RM	river mile
SCO	Sediment Cleanup Objective
SMS	Sediment Management Standards
USACE	U.S. Army Corps of Engineers
WAC	Washington Administrative Code

Record of Coordination

Action	Date	Note
Document Submitted to DMMP	August 10, 2020	Tier 1 only, no Sediment Sampling and Analysis Plan (SSAP) submitted
Comments Received from DMMP	September 2, 2020	Coordination meeting held between GP and DMMP
Document Revised	November 16, 2020	Substantive changes from August submission in response to DMMP comments were in Blue Text. An SSAP will be prepared as a separate document
Submitted to DMMP	December 2020	SSAP to be submitted as a separate document and references this document for introduction and background information
Comments Received from DMMP on 11/16/2020 Revised Tier 1	December 4, 2020	Comments received from DMMP
Revised (version 2)	January 21, 2021	Substantive changes from December 2020 submission in response to DMMP comments were in Blue Text. (Draft SSAP submitted as a separate document)
Comments Received from DMMP on 02/11/2021 Revised (version 2) Tier 1	February 11, 2021	Comments received from DMMP
Revised (version 3)	March 10, 2023	Substantive changes from January 2021 submission in response to DMMP comments and for changes in project scope. (Revised draft SSAP submitted as a separate document)

Exhibit 8 SHOR23-01

1.0 INTRODUCTION

Georgia-Pacific Consumer Operations LLC (GP) plans to abate and demolish structures located in-water and/or overwater along the Columbia River and Camas Slough in the City of Camas (the City) and unincorporated Clark County, Washington. Dredging will be required to enable barge access to remove some pilings. Dredging will also occur where the Camas Slough riverbank is to be reshaped following the removal of overwater structures. **Figure 1** provides a map of the locations of structures to be removed and shows two outfalls that are operational in the project area and are to be retained (Outfalls 001 and 002). Note all figures are attached following this narrative.

This memorandum was developed to supply information to the Dredged Material Management Program (DMMP) for a Tier 1 Evaluation following guidance for evaluation of environmental impacts of dredging and aquatic disposal of dredged sediments (DMMO 2021). A draft Tier I memorandum was submitted in August 2020 to DMMP and comments were received following a coordination call on September 2, 2020. A revised Tier I memo was submitted to DMMP in January 2021 and comments provided in February 2021. Comments on the January 2021 draft have been incorporated into this updated memorandum, along with changes to the project scope, which is primarily that pipelines in the Columbia River and Camas Slough are no longer proposed to be removed.

A change in the project description from the January 2021 version of this document is a decrease in proposed sediment quantities to be dredged because some structures originally proposed for removal are no longer included in the proposed project.

The purposes of this memorandum are to:

- Provide information needed for the DMMP to initiate a process to determine the suitability of dredged sediments for disposal.
- Initiate the process to understand project needs for compliance with antidegradation requirements, where needed.
- Provide a common understanding upon which to develop a Sampling and Analysis Plan, if needed.

To support a Tier 1 Evaluation, this memorandum provides the following detailed information:

- A general project description of the activities proposed for the GP Camas Mill's In-water/Overwater Structures Removal Project;
- Focused details on the areas requiring dredged sediment management, including a *Conceptual Dredging Plan* and preliminary sampling areas for dredged areas; and
- *Site History* and *Existing Conditions* related to sediment characteristics.

2.0 BRIEF PROJECT OVERVIEW

The In-water/Overwater Structures Removal project includes removal of one building-like industrial structure, five docks/piers, and approximately 3,000 piles/dolphins. Dredged materials management is required for dredging needed to facilitate riverbank repair/restoration following the removal of structures.

Exhibit 8 SHOR23-01

The project footprint includes:

- Areas along the Camas Slough, both north riverbank within the Camas Mill main site and south riverbank on Lady Island;
- Several other locations in the Camas Slough;
- Dolphins extending approximately 3 miles downriver from the Camas Mill in Camas Slough and the Columbia River.

Structures to be removed are shown in gold color on **Figure 1**. Work would occur following receipt of all permits and approvals during appropriate river conditions and regulatory open work windows. Several open work window periods are assumed to be needed.

2.1 General Site Information

The Camas Mill has been in operation since the 1880s making pulp and paper through a variety of technologies. Currently, the Camas Mill is an active industrial site operating one paper production line and covering approximately 190 acres north of the Camas Slough, as well as approximately 450 acres on Lady Island. The mill no longer manufactures pulp, does not perform any significant on-site chemical manufacturing/processing, nor does it utilize the waterways for shipping or log transport/storage.

Dredged materials have routinely been disposed of at the Lady Island Dredged Materials Area (DMA; see location shown on **Figure 1** at the western extent of Lady Island). The project area lies within Township 1 North, Range 3 East, Sections 8, 9, 10, 11, 15, and 16 Willamette Meridian. The project area lies within the City of Camas, Washington, with the exception of one dolphin to be removed on the Columbia River, located outside the City within unincorporated Clark County, Washington.

Lady Island lies between the Camas Slough and the Columbia River main channel and is owned in its entirety by GP. GP has an established state aquatic lands lease and several easements with the Washington State Department of Natural Resources (DNR) in Camas Slough and the Columbia River.

Water elevation of the Columbia River and Camas Slough in the project reach is controlled principally by releases from the upriver Bonneville Dam, flows from the Washougal River, and, to a smaller extent, diurnal tidal fluctuations (tidal prism is generally about 1 foot in the project area). Water elevations are seasonal, with peak high elevations reached most years in June and low water elevations occurring in September and October.

The Columbia River and Camas Slough are listed for water quality impairment under Section 303(d) of the Clean Water Act due to temperature exceedance and low dissolved oxygen concentrations.

The Washington State Department of Ecology (Ecology) notified GP in 2020 of credible evidence of liability for previous releases of hazardous substances under the state's Model Toxics Control Act based on previously known spills (no new or recent occurrences) (Ecology 2020). Ecology assigned soils on the main Camas Mill parcel to Site No. 15156, and did not assign groundwater, surface waters, or sediments. The presence of contaminants has not been confirmed, no specific contaminants of concern have been identified for the site, and no site actions have been identified at this time. No other sites are listed in the project vicinity.

Exhibit 8 SHOR23-01

Invasive plant species have been reported in the vicinity of Lady Island and Camas Slough and include poison hemlock, garlic mustard, tansy ragwort, indigo bush, and Japanese knotweed (WSDA 2022). No aquatic invasive plant species were identified in WSDA documents.

Bathymetric and upland surveys of the project area were completed in 2020 (see **Appendix A**).

2.2 Dredging Locations and Activity Details

The following locations and activities are proposed:

- Barge access to enable removal of the Dock Warehouse piers and portion of the Camas Slough riverbank will require dredging of sediments.
- Structures and approximately 3,000 piles would be removed, including those along approximately 1,000 feet of Camas Slough riverbank where portions of the riverbank would be reshaped to a slope of approximately 3 horizontal to 1 vertical.

Table 1 provides details on the proposed activities that will involve dredging. **Figure 1** shows the overall project locations indicating structures to be removed**.**

Table 1. Dredging Locations and Descriptions

Location	Structure to be Removed/Activity	Description of Location and Activity
Camas Slough	Access dredging for the removal of the Dock Warehouse Pier	Sediment would be removed at the three piers at the Dock Warehouse to create draft for demolition barges. Several known occurrences of previous dredging immediately adjacent to this area at the PECO dock.
Camas Slough	Structure/pile removal and bank reshaping	Piles and structures to be removed along approximately 1,000 feet of riverbank. Currently, the area supports various docks/piers. Removal of piles and riverbank shaping would occur. Equipment access mainly from land.

Abbreviations:
CRD = Columbia River Datum
RM = river mile

3.0 INFORMATION SUPPORTING TIER 1 EVALUATIONS

The following sections provide a discussion of conceptual dredging plans and the histories of the area to be dredged, along with existing relevant information on sediment characteristics for the Camas Slough locations.

3.1 Recent Surveys and History

Camas Slough is a side-channel of the Columbia River separated from the main channel by Lady Island (see **Figure 1**). The eastern end (upriver) of Camas Slough is formed by the mouth of the Washougal River. Camas Slough is a fairly shallow and relatively still-water reach that receives significant sediment deposition, as demonstrated by the need to conduct periodic maintenance dredging. Previously dredged areas have covered approximately 23 acres of Camas Slough. The most recent maintenance dredging in 2020 was performed only in front of the Fire Water Pumphouse (structure to be retained) (see **Figure 1**).

Exhibit 8 SHOR23-01

A bathymetric/hydrographic survey of the Camas Slough was completed in early 2020 (**Appendix A)**. A diver inspection survey was performed in February 2020, which provided visual information on existing conditions (**Appendix A)**. The most recent sediment sampling to support a suitability determination was performed in 2007 to support a dredged materials disposal determination, although 2017 sampling was done at Outfall 002 (ESA 2018) for National Pollutant Discharge Elimination System (NPDES) compliance (**Appendix B**).

Recent sampling and determinations for Camas Slough Sediments included the following:

- **2007:** A Suitability Determination was made by the DMMP for Dredged Materials Management Units (DMMUs) 1 through 4. Data provided for this analysis included analysis for all freshwater constituents of concern (COCs) along with potential bioaccumulation chemicals and an elution assay. DMMU 1 was located 0.3 mile upriver from any proposed dredging for this project (and was the location of 2020 maintenance dredging). DMMU 2 was in the immediate area of new dredging proposed for this project (Dock Warehouse vicinity). DMMU 4 was located at Lease Area 3, approximately 1.5 miles downriver from any dredging proposed for this project. DMMU 3 was located 1 mile downriver (Lease Area 12), and this area was not approved for dredging based on limited test data; it appeared the new sediment surface would not pass antidegradation standards for cadmium, zinc, PCBs and Dioxins/Furans. All dredged materials were disposed at the Lady Island DMA, including the approximately 3,000 cubic yards dredged from Lease Area 12/DMMU 3.
- **2008:** As stated, dredging at DMMU 3 occurred in 2008 without full agency approvals and was subject of a post-violation determination, which included sampling of the new sediment surface post-dredging. Regulatory determinations resulted in: (1) no conclusive evidence of degradation; (2) implementation of a compensatory wetland restoration site on the Washougal River; and (3) an assumed, but unconfirmed, presence of sediments that may exceed state clean-up levels at the Lady Island DMA.
- **2015:** A Tier 1 evaluation made by the DMMP based on the 2007 data supported maintenance dredging with disposal at Lady Island DMA. This dredging has occurred approximately every other year in Camas Slough.
- **2017:** An antidegradation determination was received based on 2007 data for DMMUs 1 and 2, but the determination did not cover DMMUs 3 and 4 because no continued maintenance dredging would occur in those areas.
- **2017:** Shallow sediment sampling was undertaken near Outfall 002 for compliance with an existing NPDES permit. None of the results from the samples analyzed exceeded any of the DMMP freshwater Screening Level 1 (SL1) criteria, and reporting limits for non-detected analytes were also below the criteria.

Establishment of the wastewater treatment facility on Lady Island in the 1970s enabled wastewaters to be piped from the mill across Camas Slough to treatment facilities. The Lady Island Wastewater Treatment Facility currently operates to receive and treat both Camas Mill wastewater and industrial stormwater from the Camas Mill site. Treated wastewater is discharged to the Columbia River via Outfall 001, as mentioned above. No wastewater is discharged to Camas Slough.

Exhibit 8 SHOR23-01

In the Camas Slough, Outfall 002 currently conveys mainly municipal stormwater from areas originating upgradient of the Camas Mill.

One other outfall in the Camas Slough conveys City of Camas municipal stormwater collected from residential and commercial areas located upgradient of the Camas Mill. This outfall is covered under the City's Municipal Stormwater permit (WAR0405004). The outfall is in the vicinity of the Riverbank Pumphouse. The City is currently implementing a mapping program to identify and map to GIS locations all stormwater outfalls to be completed by 2023 (City of Camas 2022).

As mentioned above, Outfall 002 is regulated under an NPDES industrial discharge permit. Outfall 002 remains operational and would not be altered by this project. A sediment sampling and analysis event was performed by GP in 2017-2018 to comply with NPDES monitoring requirements at operating Outfall 002. Sediment samples to depths of approximately 8 inches below the surface were collected (see **Figure 2** for Outfall 002 historic sampling locations; Data Report for that sampling is included in **Appendix B**).

Sediment characterization included conventional parameters (ammonia, sulfide, total organic carbon, percent total solids, total volatile solids, grain size), metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc), semivolatile organic compounds, organotins, total PAHs, organochloride pesticides, petroleum hydrocarbons, polychlorinated biphenyls (PCBs), and dioxins/furans. No other COCs were identified as requiring analysis for this outfall.

Analysis of sediments for conventional parameters and chemical data showed that no parameter exceeded any of the Sediment Management Standards (SMS)—Freshwater Sediment Cleanup Objectives (Washington Administrative Code [WAC] 173-204-563) [Ecology 2013] and had a total toxic equivalency concentration for Dioxins/Furans between 0.314 and 0.412 ng/kg TEQ. Results of midge (*Chironomus dilutus*) 20-day survival and growth bioassays show that none of the sediment samples exceeded the Sediment Cleanup Objective (SCO) or Cleanup Screening Level (CSL) criteria for mortality or growth. An amphipod (*Hyalella azteca*) 10-day survival bioassay showed that none of the sediment samples resulted in an exceedance for mortality under either the SCO or the CSL of the SMS guidelines.

3.2 Conceptual Dredging Plans

According to the DMMP, current risk ranking for sediment dredging projects in Camas Slough is "Moderate." Based on the Camas Slough management rank, the maximum sediment volume for each DMMU is 40,000 cubic yards. Based on previous sediment sampling data, the Camas Slough sediment is heterogeneous. Because the sediment is presumed to be heterogeneous, a surface unit of 4 feet thickness and a subsurface unit for the remaining dredge prism is indicated for each riverbed area.

Two distinct types of dredge areas exist in the Camas Slough project area:

1. Riverbank dredging/excavation—areas above and below ordinary high water for areas currently covered by structures. Work on the riverbank would be performed by equipment staged on the uplands portion of the riverbank, and all work would be performed "in the dry."

Exhibit 8 SHOR23-01

2. Various dock structures would be removed from approximately 1,000 continuous linear feet of riverbank. Riverbank reshaping following the removal of structures would expose new surfaces to the aquatic system.

Table 2 provides a summary of estimated sediment quantities to be managed by location in Camas Slough.

Table 2. Camas Slough Conceptual Dredge Prisms and Estimated Quantities

Camas Slough Location	Dredged Material Management Unit	Estimated Quantity (Cubic Yards)
Dock Warehouse Piers, Surface Unit	CS1-A	6,900
Dock Warehouse Piers, Subsurface Unit	CS1-B	3,600
Total Camas Slough Riverbed Sediments		**10,500**

Camas Slough Riverbed Design and Disposal

At the Dock Warehouse Piers, an area must be dredged to enable access by demolition crews using barges. **Figures 3A and 3B** provide a plan view and cross-section profiles for this area. This area is separated from the riverbank grading area at the 2-foot elevation contour (Columbia River Datum; CRD). The 2-foot elevation separation was based on assumed ability of operations to complete riverbank excavation/dredging from the upland side and mainly in the dry when river water levels are at this level or lower. Z-Layer testing will be required beneath the newly exposed dredged surface in the Dock Warehouse Piers area to meet antidegradation requirements.

Management of dredged materials will depend on physical and chemical properties, which will determine whether materials are suitable for reuse. Armoring rock, where present on the shoreline, will be removed, placed on the barge segregated from the finer grained sediments, and handled and managed separately from the dredged sediments. Where feasible and appropriate, the armoring rock will be reused in appropriate upland locations. Armoring rock will not be handled as dredged material and will not be disposed of in river, at the Lady Island DMA, or in any other dredged material management area.

GP proposes that dredged sediments from Camas Slough's riverbed be disposed of based on the following protocol[1]:

1. If found suitable for in-water disposal and reuse based on chemical and physical criteria, sediments would be beneficially reused by this project for fill for riverbank and riverbed shaping following the removal of structures in the Camas Slough in accordance with WDNR and any other applicable permits.
2. If found suitable as fill for upland areas, material would be used where needed, including on Camas Mill property and in other locations.

1. Unconfined flow lane disposal in the Columbia River does not appear to be accessible to this project.

Exhibit 8 SHOR23-01

3. If the material is found not to be suitable for in-water disposal and not usable in upland locations, then sediment material would be barged to the upland disposal site at the Lady Island DMA.
4. If materials are found not to be suitable for storage at the DMA or for other upland reuse, then the material would be disposed of at another appropriate approved upland location.

3.3 Camas Slough Riverbank Design and Materials Disposal

A conceptual riverbank grading plan is shown on **Figures 3A and 4**. Work on the riverbank would occur from the landward side and in the dry (estimated to be above approximately 2 feet CRD in the dry season). No in-water disposal is proposed for materials recovered from riverbank areas. Any materials excavated from the riverbank areas would be stockpiled, sampled, and characterized for disposal at a licensed disposal facility.

3.4 New Riverbank Surfaces

Since the riverbank area is currently occupied by structures, and to meet antidegradation requirements following demolition, GP proposes to sample final grades to determine the condition of surface materials after the structures are removed. Owing to some uncertainty in final grades and layout, a sampling and analysis plan for riverbank areas above +2 feet CRD will be developed once the riverbank work is nearing completion. Sampling would likely entail an appropriate number of grab-type samples and chemical analyses to adequately survey the area. Assuming sampled final grade materials are found suitable, a portion of the newly shaped riverbank area would then be planted with native plant species. Final surface materials are designed to be the finest materials coarse enough to remain in place, and similar to native cobbly-mix type riverbank materials.

If final grade materials were found to not be suitable to meet antidegradation requirements, then GP would work with agencies to determine appropriate actions, including the extent of over-excavation that may be needed and appropriate replacement materials to establish suitable final grades.

4.0 LADY ISLAND DREDGED MATERIALS AREA

While in-water reuse and other reuse is preferred by GP for suitable dredged materials, the Lady Island DMA would serve for upland disposal of suitable dredged materials that are not reused (see **Figure 1** for location of the DMA).

GP has a 30-year license with the DNR for the deposit, sale, and use of State-owned dredged material (expires in 2034). DNR has agreed that the proposed dredging activity and dredged materials accessed for this project are covered under this license, and activities will not require an additional license for use authorization (pers. communication, email to J. Dambrun, GP, from R. Schwartz, DNR, August 3, 2020).

The Lady Island DMA is approximately 5 acres and has been in use to successfully store dredged materials for more than 40 years. It is estimated that approximately 110,000 cubic yards of dredged sediments are currently stored in the DMA. The Lady Island DMA was previously regulated under state

Exhibit 8 SHOR23-01

landfill rules and had regulatory requirements for acceptable materials under a landfill operations management plan that required some materials testing. More recently, DMAs have been removed from landfill regulations in Washington, and a landfill management plan for the area is no longer required. Since approximately 2010, GP has routinely assessed all dredged materials entering the DMA using a traditional toxicity characteristic leaching procedure test.

Transportation to the Lady Island DMA would be via barge in Camas Slough to the Lady Island north shore to a landing where materials would be off-loaded and conveyed to the DMA via a short dirt access road. The material would be moved from the barge by a clamshell crane. As dredged materials are placed for storage, the material will be spread and sorted to remove extraneous material that may have been recovered incidental to dredging. The piles will be shaped with 2:1 sloping sides for stability.

Dredged materials will be managed throughout the process in a manner that prevents the return of sediment to the water. Best management practices will be implemented during transportation and placement so that the material does not wash from barges during transfer to the site or from the site after placement.

5.0 REFERENCES

City of Camas. 2022. Stormwater Management Program. City of Camas Public Works, Stormwater Division.https://www.cityofcamas.us/sites/default/files/fileattachments/public_works/page/9162/2022_swmp.pdf.

DMMO (U.S. Army Corps of Engineers, Dredged Material Management Office). 2021. Dredged Material Evaluation and Disposal Procedures, User Manual. Dredged Material Management Program: U.S. Environmental Protection Agency Region 10, Washington State Department of Natural Resources, and Washington Department of Ecology, Seattle, Washington. https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll11/id/5397.

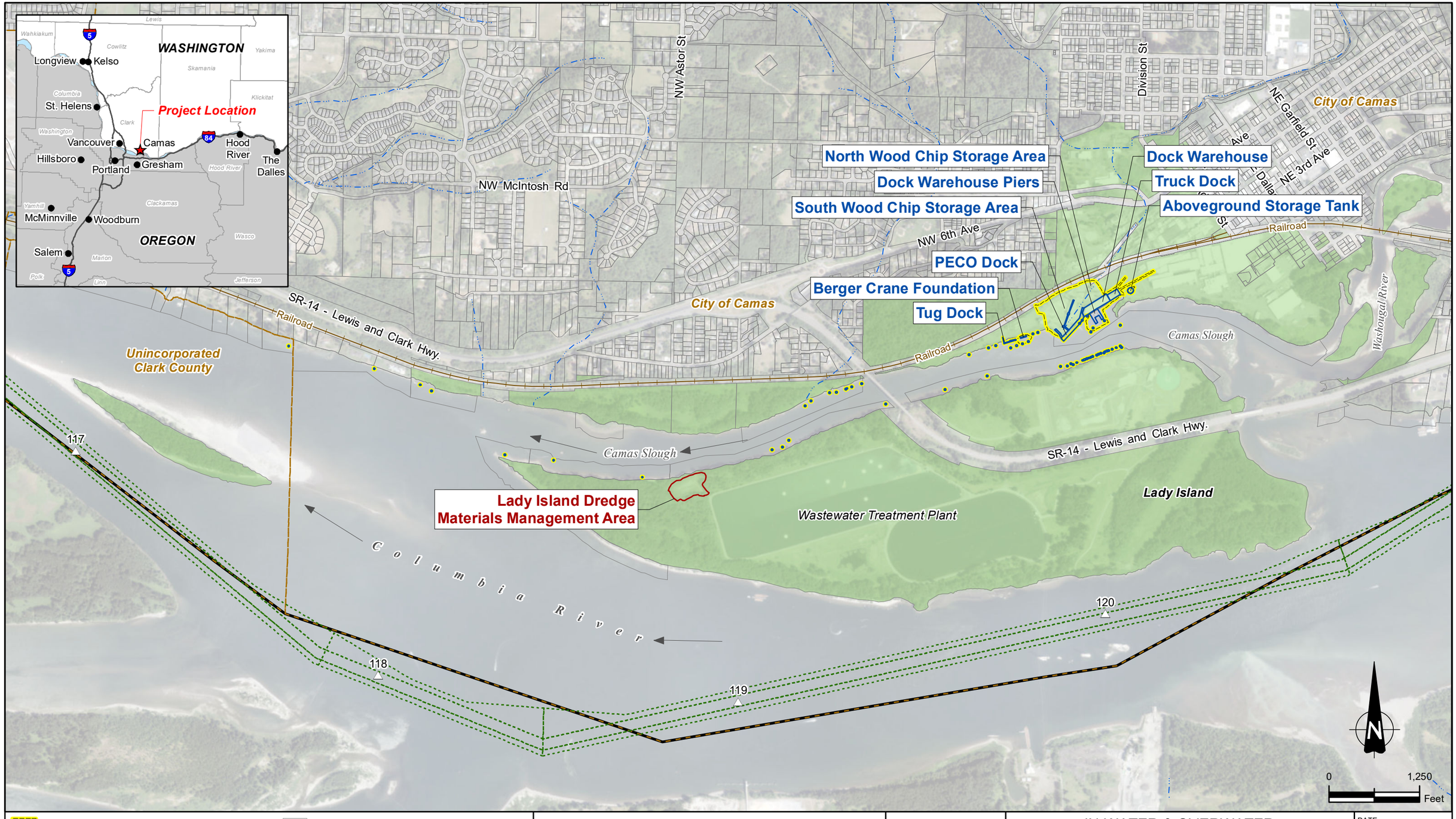
Ecology (Washington State Department of Ecology). 2013. Sediment Management Standards, WAC Chapter 173-204. https://fortress.wa.gov/ecy/publications/publications/1309055.pdf.

———. 2020. Letter to S.T. Wood, Georgia-Pacific Consumer Operations LLC. from J. DeMay, Industrial Section, Regarding Final Determination of Liability for Release of Hazardous Substances. April 8.

ESA . 2018. Sediment Data Report: NPDES Waste Discharge Permit NO. WA0000256. Prepared by Environmental Associates for Georgia-Pacific Consumer Products (Camas) LLC. Camas, Washington. February.

WSDA (Washington State Department of Agriculture. 2022. Washington State Noxious Weed Data Viewer. http://www.arcgis.com/apps/webappviewer/index.html?id=cec83bd1b9fc4d7681afd219a9197654. Accessed December 20, 2022.

FIGURES



- Project Limits
- Columbia River Mile Marker
- Stream/River
- Structure To Be Removed
- Dolphin To Be Removed
- Lady Island Dredge Materials Management Area
- Tax Lot
- Tax Lot Owned by Georgia-Pacific
- City Boundary
- County Boundary
- Federal Navigation Channel

GEORGIA-PACIFIC CONSUMER OPERATIONS LLC

Tetra Tech

TETRA TECH

IN-WATER & OVERWATER STRUCTURES REMOVAL PROJECT
CAMAS MILL, CAMAS, WASHINGTON

PROJECT LOCATION

DATE: OCTOBER 2022
SCALE: 1 " = 1,250 '
PROJECT NO.
FIGURE: 1

R:\PROJECTS\CAMAS_0117-0064\FIGURES_UPDATE\MAPS\Figure 1 - Project Location.mxd - sierra.marrs - 10/19/2022 - 3:37:33 PM

- Outfall 002
- Historical Sample Locations

NOTE: LOCATIONS OF SAMPLES ASSOCIATED WITH OUTFALL 002 COLLECTED IN SEPTEMBER 2017 FOR COMPLIANCE WITH CONDITIONS OF NPDES WASTE DISCHARGE PERMIT NO. WA0000256 (ESA 2018).

GEORGIA-PACIFIC
CONSUMER OPERATIONS LLC

Tetra Tech

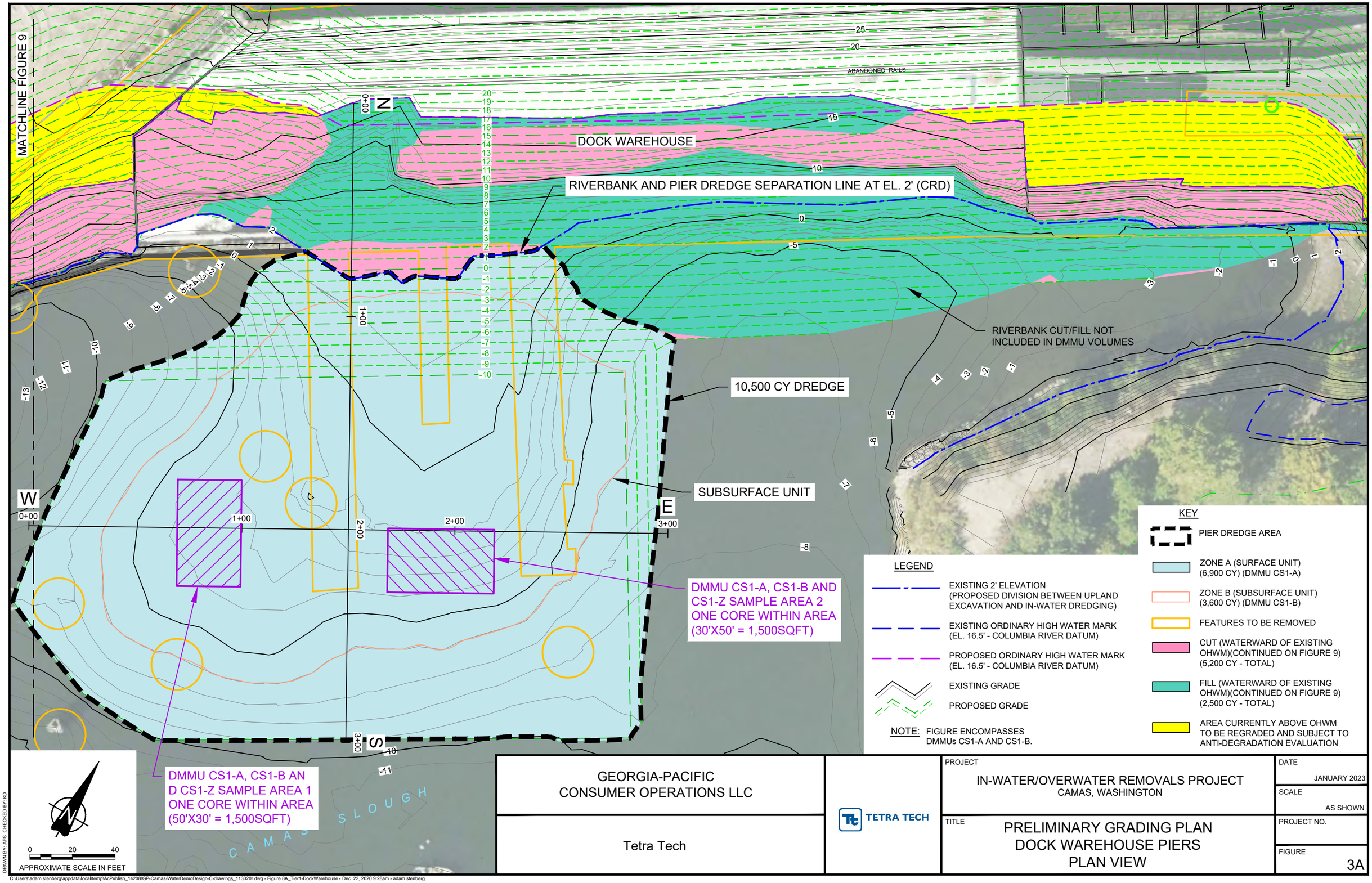
TETRA TECH

IN-WATER & OVERWATER
STRUCTURES REMOVAL PROJECT
CAMAS MILL, CAMAS, WASHINGTON

OUTFALL 002 HISTORICAL
SAMPLE LOCATIONS

DATE: JANUARY 2023
SCALE: 1 " = 35 '
PROJECT NO.:
FIGURE: 2

R:\PROJECTS\CAMAS_0117-0064\TIER_1\MAPS\Tier1_Figure_2.mxd - sierra.marrs - 1/5/2023 - 10:20:29 AM



KEY

- PIER DREDGE AREA

LEGEND

- EXISTING 2' ELEVATION (PROPOSED DIVISION BETWEEN UPLAND EXCAVATION AND IN-WATER DREDGING)
- EXISTING ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)
- PROPOSED ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)
- EXISTING GRADE
- PROPOSED GRADE

NOTE: FIGURE ENCOMPASSES DMMUs CS1-A AND CS1-B.

- ZONE A (SURFACE UNIT) (6,900 CY) (DMMU CS1-A)
- ZONE B (SUBSURFACE UNIT) (3,600 CY) (DMMU CS1-B)
- FEATURES TO BE REMOVED
- CUT (WATERWARD OF EXISTING OHWM)(CONTINUED ON FIGURE 9) (5,200 CY - TOTAL)
- FILL (WATERWARD OF EXISTING OHWM)(CONTINUED ON FIGURE 9) (2,500 CY - TOTAL)
- AREA CURRENTLY ABOVE OHWM TO BE REGRADED AND SUBJECT TO ANTI-DEGRADATION EVALUATION

GEORGIA-PACIFIC
CONSUMER OPERATIONS LLC

Tetra Tech

TETRA TECH

PROJECT
IN-WATER/OVERWATER REMOVALS PROJECT
CAMAS, WASHINGTON

TITLE
PRELIMINARY GRADING PLAN
DOCK WAREHOUSE PIERS
PLAN VIEW

DATE
JANUARY 2023

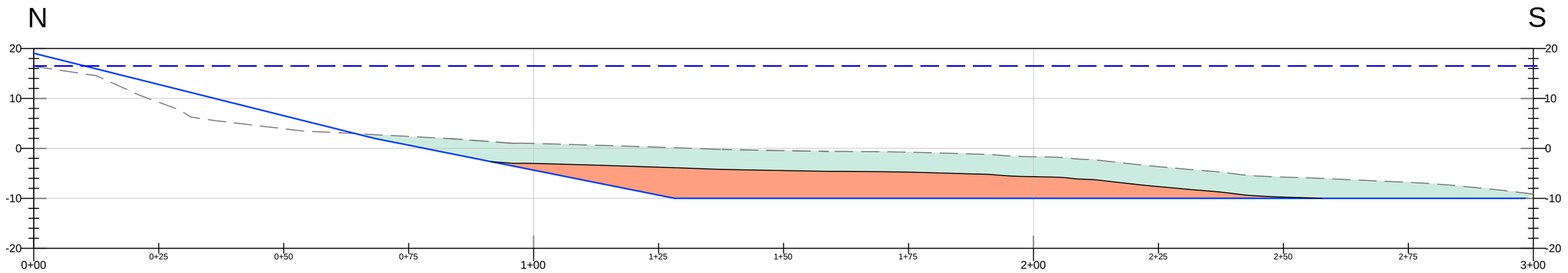
SCALE
AS SHOWN

PROJECT NO.

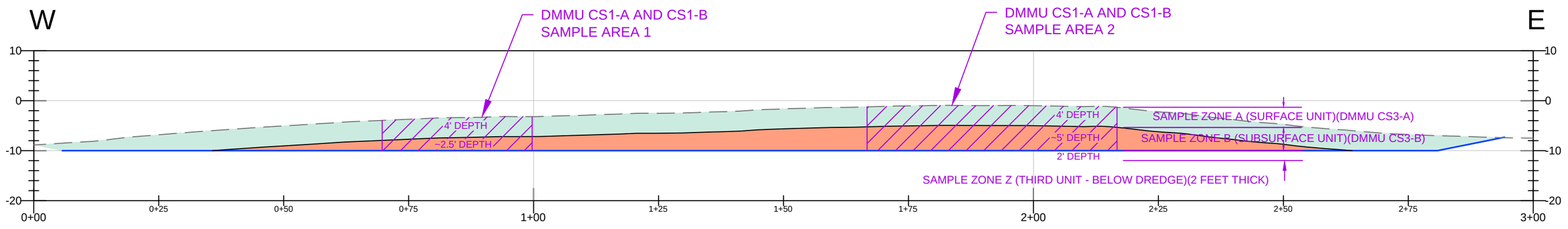
FIGURE
3A

DRAWN BY: APS CHECKED BY: KD

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_14208\GP-Camas-WaterDemoDesign-C-drawings_113020r.dwg - Figure 8A_Tier1-DockWarehouse - Dec. 22, 2020 9:28am - adam.stenberg



CROSS SECTION N-S



CROSS SECTION W-E

CROSS SECTION LEGEND

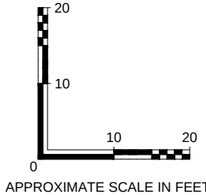
- ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)
- EXISTING GRADE
- DREDGING EXTENT

CAMAS SLOUGH - DMMU CS3 DETAIL

SAMPLED WITH TWO CORES.
SUBSAMPLES TAKEN FROM
ZONES A & B DEPTHS AND
COMPOSITED FOR 3 ANALYSES.

KEY

- ZONE A (SURFACE UNIT) (6,900 CY)
- ZONE B (SUBSURFACE UNIT) (3,600 CY)



APPROXIMATE SCALE IN FEET

CLIENT: GEORGIA-PACIFIC CONSUMER OPERATIONS LLC	TETRA TECH	PROJECT: IN-WATER/OVERWATER REMOVALS PROJECT, CAMAS, WASHINGTON	DATE: JANUARY 2023
			SCALE: AS SHOWN
Tetra Tech		TITLE: DOCK WAREHOUSE PIERS DREDGE PRISM CROSS SECTIONS	PROJECT NO.
			FIGURE: 3B

DRAWN BY: PM CHECKED BY: JKH

C:\Users\adam.stenberg\Documents\PS18200620\DredgePrisms\tier1-Figures\GP Camas-Tier1-DredgePrisms_120920.dwg - Figure 8B_DockDredge (3) - Dec. 20, 2020 1:29pm - adam.stenberg

LEGEND

- EXISTING 2' ELEVATION (PROPOSED DIVISION BETWEEN UPLAND EXCAVATION AND IN-WATER DREDGING)
- EXISTING ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)
- PROPOSED ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)
- EXISTING GRADE
- PROPOSED GRADE

KEY

- CUT (WATERWARD OF EXISTING OHWM)(CONTINUED ON FIGURE 8A) (5,200 CY - TOTAL)
- FILL (WATERWARD OF EXISTING OHWM)(CONTINUED ON FIGURE 8A) (2,500 CY - TOTAL)
- AREA CURRENTLY ABOVE OHWM TO BE REGRADED AND SUBJECT TO ANTI-DEGRADATION EVALUATION
- PIER DREDGE AREA (10,500 CY)
- FEATURES TO BE REMOVED

MATCHLINE FIGURE 8A

PECO DOCK

PECO CRANE

RAILS

RAILS

CAMAS SLOUGH

4:1

5:1

6:1

0 40 80

APPROXIMATE SCALE IN FEET

DRAWN BY: APS CHECKED BY: KD

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_14208\GP-Camas-WaterDemoDesign-C-drawings_113020r.dwg - Figure 9_Tier1-PecoGrading - Dec. 22, 2020 9:34am - adam.stenberg

CLIENT GEORGIA-PACIFIC CONSUMER OPERATIONS LLC		PROJECT IN-WATER/OVERWATER REMOVALS PROJECT CAMAS, WASHINGTON	DATE JANUARY 2023
	TETRA TECH		SCALE AS SHOWN
Tetra Tech		TITLE PRELIMINARY GRADING PLAN PECO DOCK	PROJECT NO.
			FIGURE 4

APPENDIX A: BATHYMETRY AND CONDITIONS SURVEY

CONDITIONS SURVEY

PRE-DEMO OIL STORAGE TANK
EASEMENTS 51-021224 AND 51-026441
IN-WATER PIPE INVESTIGATION

A PORTION OF UNPLATTED FIRST CLASS AND SECOND CLASS TIDELANDS AND BEDLANDS OF CAMAS SLOUGH AND COLUMBIA RIVER SITUATED IN THE SOUTH QUARTERS OF SECTION 11 AND THE NORTH QUARTERS OF SECTIONS 14 AND 15 TOWNSHIP 1 NORTH, RANGE 3 EAST OF THE WILLAMETTE MERIDIAN, CITY OF CAMAS, COUNTY OF CLARK, STATE OF WASHINGTON.

LANDS LYING BETWEEN COLUMBIA RIVER MILES 119–121

Georgia-Pacific

SURVEYED FOR

GEORGIA–PACIFIC CPG ENGINEERING
MAILING ADDRESS: 401 NE ADAMS ST., CAMAS, WA 98607
PROJECT MANAGER: ALDIS RAISTERS
PHONE NUMBER: 360–834–8430
EMAIL ADDRESS: ALDIS.RAISTERS@GAPAC.COM

PROJECT ENGINEER: KOORUS TAGHIGHI, WOOD PLC
PHONE NUMBER: 206–641–6301
EMAIL ADDRESS: KOORUS.TAGHIGHI1@WOODPLC.COM

LEGEND

AAC = ADVANCED AMERICAN CONSTRUCTION
AOI = AREA OF INTEREST
ASB = AERATION STABILIZATION BASIN
BTM EL = BOTTOM ELEVATION
CB = CATCH BASIN
CMP = CORRUGATED METAL PIPE
CRD = COLUMBIA RIVER DATUM
DWG = REFERENCED DRAWING
ESMT = EASEMENT
LA = DEPARTMENT OF NATURAL RESOURCES AQUATIC LEASE AREA NO. 81284S REF. SURVEY RECORDED IN BOOK 64, PAGE 94, RECORDS OF CLARK COUNTY).
SWLS = STATEWIDE LAND SURVEYING

AV — AIR VALVE
ANCHOR
BM — BENCHMARK
BOLLARD
CB — CATCH BASIN
CO — CLEANOUT
DATA POINT FLAG
AAC DIVER TEAM COORDINATE
DOLPHIN
XX — DOLPHIN/PILING DESIGNATION (SWLS SURVEY)
WHP X — DOLPHIN/PILING DESIGNATION W&H PACIFIC SURVEY, BK 49, PG 76, RECORDS OF CLARK COUNTY
DOWNSPOUT
E — ELECTRIC BOX
FINISHED FLOOR ELEVATION
FDC — FIRE ALARM
FIRE DEPARTMENT CONNECTION
FIRE HYDRANT
H COLUMN
MH — MANHOLE
OHW — ORDINARY HIGH WATER DELINEATION FLAG
PILING
PILINGS, JOINED
PILING AT TOP
PILING AT WATER SURFACE

PP — POWER POLE
D — STORM DRAIN MANHOLE
TEST PIT
LP — LIGHT POLE
X.X' — GROUND SPOT ELEVATION
UTIL — UTILITY AS NOTED
WATER SPIGOT
WATER VALVE
WETLAND DELINEATION FLAG

ASHPALT SURFACE
CONCRETE SURFACE
GRAVEL SURFACE
JERSEY BARRIER
OVERHEAD CONVEYOR

BUILDING LINE
CHAIN LINK FENCE
CONTOUR, INDEX (5')
CONTOUR, INTERMEDIATE (1')
GUARD RAIL
ORDINARY HIGH WATER FLAGGING LINE
OVERHEAD POWERLINE
PROPOSED PIPE
WETLAND FLAGGING LINE

CONTOUR ELEVATIONS REFERRED TO NAVD88

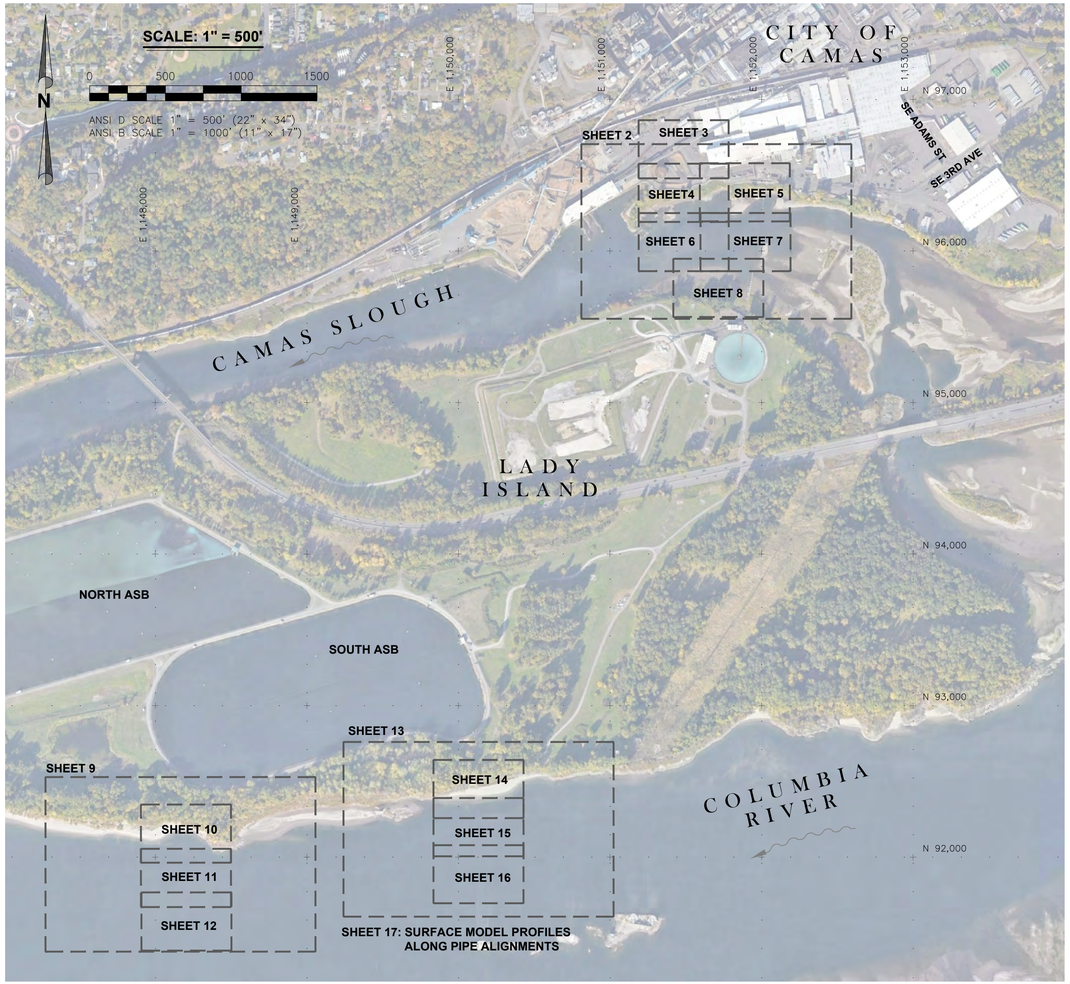
HORIZONTAL DATUM

REFERENCE FRAME: NORTH AMERICAN DATUM (NAD)83/2011 EPOCH 2010.0000
COORDINATE SYSTEM: US STATE PLANE COORDINATE SYSTEM WASHINGTON SOUTH ZONE 4602
FOOT DEFINITION: US SURVEY FOOT

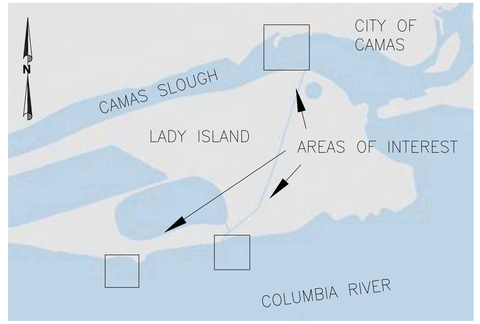
NAVD88 NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B

VERTICAL DATUM

ELEVATION DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) (GEOID12B) AS DERIVED FROM WASHINGTON STATE DEPT. OF TRANSPORTATION CONTROL SURVEY MARK DESIGNATIONS GP06500–44 AND GP06014–87. SEE CONTROL TABLE BELOW.



VICINITY MAP NOT TO SCALE



CONTROL POINTS

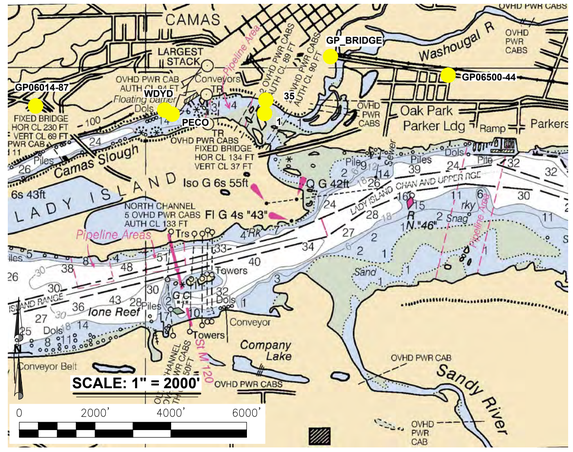


CHART SOURCE: NOAA COAST SURVEY NAVIGATIONAL CHART 18531 (SOUNDINGS IN FEET; CONTOUR ELEVATIONS REFERRED TO MEAN SEA LEVEL).

NOTES

1) CONTROL POINTS SET BY SWLS UTILIZING RTK GNSS RECEIVER AND ANTENNA. SURVEY HELD WASHINGTON STATE DEPT. OF TRANSPORTATION (WSDOT) CONTROL SURVEY MARK DESIGNATIONS GP06500–44 AND GP06014–87 FOR PROJECT CONTROL.
2) WETLAND AND ORDINARY HIGH WATER LOCATIONS FLAGGED IN THE FIELD BY WOOD GROUP PLC 07/16/2019–07/17/2019 AND MEASURED IN THE FIELD BY SWLS 08/20/2019.
3) NO BOUNDARY ANALYSIS PERFORMED FOR THIS SURVEY; NOT A CADASTRAL SURVEY NOR SUITABLE FOR BOUNDARY, LEASE, OR EASEMENT.
4) 1–FT CONTOURS ARE COMPUTER–GENERATED FROM SPOT ELEVATIONS MEASURED IN THE FIELD BY SWLS
5) IN–WATER SURVEY OF SITE–ACCESSIBLE PORTIONS OF EASEMENTS 51–021224 AND 51–026441 UTILIZED A SCANNING NORBIT iWBMHSh STX MULTIBEAM SONAR SYSTEM TO MEET INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO) ACCURACY AND BOTTOM SEARCH SPECIFICATIONS FOR SPECIAL ORDER SURVEYS. SURFACE MODEL GENERATED USING QIMERA, QGIS, AND CARLSON SOFTWARE.
6) SUBMARINE PIPE LOCATIONS DRAFTED WHERE PHYSICAL POSITION POSSIBLE. ALIGNMENTS POSITIONED IN RELATIONSHIP TO EXPOSED PIPES ON LAND, IN–WATER FEATURES, AND IN ACCORDANCE TO HISTORICAL ALIGNMENTS PROVIDED BY GEORGIA–PACIFIC. BURIED PIPE SEGMENTS WITHOUT CONCLUSIVE EVIDENCE OR VERIFICATION ARE BASED ON HISTORICAL ALIGNMENTS ROTATED TO UPLAND FEATURES; ACTUAL LOCATIONS OF PIPE MAY VARY.
7) DIVER COORDINATES SHOWN ARE NORTH AND SOUTH COORDINATES OF PIPE SEARCH AREAS PER ADVANCED AMERICAN CONSTRUCTION (AAC) DIVE INSPECTION REPORT (AAC JOB NUMBER 1120–028 / 01110). AAC FIELD INVESTIGATION PERFORMED 04/20–04/22 2020.
8) SATELLITE AND AERIAL IMAGERY SHOWN FOR GRAPHICAL REFERENCE ONLY. LOCATIONS AND RECTIFICATION ARE APPROXIMATE. 2018 IMAGERY ACQUIRED FROM GOOGLE EARTH PRO.

SWLS SURVEY DATES

SWLS SURVEY DATES:
WETLAND AND ORDINARY HIGH WATER FLAGGING POSITIONS: 08/20/2019
UPLANDS TOPOGRAPHY – OIL STORAGE TANK AREA: 03/02/2020 – 03/05/2020
IN–WATER BATHYMETRY MULTIBEAM – PIPE INVESTIGATION: 04/30/2020
UPLANDS TOPOGRAPHY – PIPE INVESTIGATION: 05/05/2020 – 05/14/2020

CONTROL POINTS

COORDINATES LISTED WITH UNITS IN US SURVEY FEET. ELEVATIONS ON NAVD88 UNLESS OTHERWISE NOTED. SEE DATUM INFORMATION THIS SHEET FOR FURTHER DETAIL.

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION	SOURCE
1	95884.02	1152795.58	9.30	RAILROAD SPIKE	SWLS 08/20/2019
35	96236.36	1152826.57	28.91	NAIL SPIKE	SWLS 11/22/2019
PECO	95905.41	1150353.44	28.19	1/2" REBAR RPC "SWLS CONTROL"	SWLS 09/11/2019
WDYD	96044.23	1150166.03	35.65	MAG NAIL	SWLS 09/11/2019
GP_BRIDGE	97316.07	1154596.58	51.76	1/2" REBAR RPC "SWLS CONTROL"	SWLS 07/29/2019
GP06500–44	96759.862	1157675.503	46.293	WSDOT BRASS DISK	WSDOT PUBLISHED 02/05/2013
GP06014–87	96223.626	1146779.639	173.080	WSDOT BRASS DISK	WSDOT PUBLISHED 02/14/2013
COE CF8516	90440.76	1169179.732	28.35*	USACE BRASS CAP	USACE PUBLISHED 04/27/2010
			21.02 (CRD)	21.02 FEET ABOVE ZERO GARY ISLAND 52 STAFF GAGE.	
CHINOOK	88878.08	1142785.87	24.97	NAIL SPIKE	SWLS 11/22/2019 (NOT SHOWN)

* = COMPUTED USING GEOID09
CRD = COLUMBIA RIVER DATUM

COLUMBIA RIVER DATUM

COLUMBIA RIVER DATUM CONVERSIONS PER USACE APPENDIX E "DATUM EQUATION DOCUMENT" OF UNITED STATES ARMY CORPS OF ENGINEERS (USACE) PORTLAND DISTRICT COMPREHENSIVE EVALUATION OF PROJECT DATUM COMPLIANCE REPORT, DATED 07/28/2014.

RIVER MILE	ORDINARY HIGH WATER (CRD)	NGVD29 TO OBTAIN CRD	NAVD88 (GEOID12A) TO OBTAIN CRD
119	18.0	−3.15	−6.78
120	18.2	−3.22	−6.89
120.1 IONE REEF		−3.45	
121	18.2	−3.56	−7.02

CRD "COLUMBIA RIVER DATUM"

EXAMPLE: ELEVATIONS AT RM 119 — ELEV. CRD 18.0' — ELEV NGVD29 21.15' — ELEV NAVD88 24.78'

DATA CONVERSION EXAMPLE AT RIVER MILE 19 USING USACE TABLE ABOVE

GREGORY D. SPURLOCK — STATE OF WASHINGTON — REGISTERED PROFESSIONAL LAND SURVEYOR
SIGNED: 06/04/2020

REVISION:	
REVISION:	
REVISION:	
REVISION:	
SCALE: 1"=500'	
DRAWN DATE: 05/20/2020	
REVIEW DATE: 06/04/2020	
SURVEY DATE: 03/05/2020	
JOB NUMBER: 2019–355	
DRAWN: T.M.S./A.O.	
REVIEWED: G.D.S.	
SHEET: 1 OF 17	

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503–665–7777 F: 503–665–7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

CLIENT: GEORGIA–PACIFIC

SHEET 1

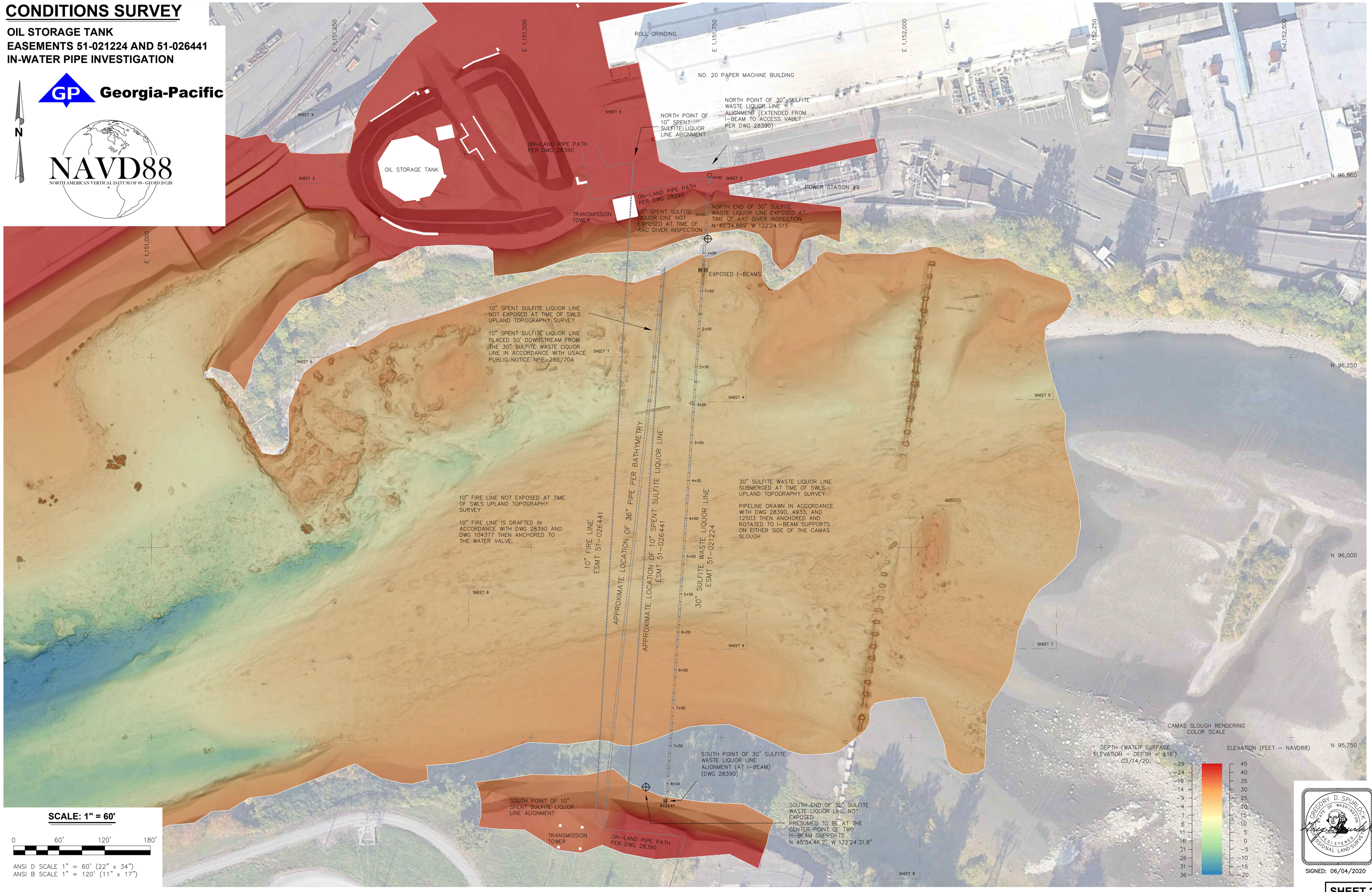
CONDITIONS SURVEY

OIL STORAGE TANK
EASEMENTS 51-021224 AND 51-026441
IN-WATER PIPE INVESTIGATION

Georgia-Pacific

N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B



SCALE: 1" = 60'

0 60' 120' 180'

ANSI D SCALE 1" = 60' (22" x 34")
ANSI B SCALE 1" = 120' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 2

REVISION:
REVISION:
REVISION:
REVISION:

SCALE: 1"=60'
DRAWN DATE: 05/20/2020
REVIEW DATE: 06/04/2020
SURVEY DATE: 03/05/2020

JOB NUMBER: 2019-355
DRAWN: T.M.S./A.O.
REVIEWED: G.D.S.
SHEET: 2 OF 17

CLIENT: GEORGIA-PACIFIC

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

SWLS

CONDITIONS SURVEY

OIL STORAGE TANK

Georgia-Pacific

N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B

CAMAS SLOUGH RENDERING
COLOR SCALE

DEPTH (WATER SURFACE ELEVATION − DEPTH = ±16')
03/14/20

	ELEVATION (FEET − NAVD88)
−29	45
−24	40
−19	35
−14	30
−9	25
−4	20
1	15
6	10
11	5
16	0
21	−5
26	−10
31	−15
36	−20

E 1,151,300 E 1,151,350 E 1,151,400 E 1,151,450 E 1,151,500 E 1,151,550 E 1,151,600 E 1,151,650 E 1,151,700 E 1,151,750

N 96,850 N 96,800 N 96,750 N 96,700 N 96,650 N 96,600

CAR BARN
AWNING
FFE = 38.55'
NO. 3 FINISHING
RIM=37.24'
RIM=37.23'
METAL LID
METAL RISER
FFE = 41.03'
METAL LID
RIM=37.33'
CB
RIM=36.78'
BTM EL
=71.4'
FFE = 39.36'
ROLL GRINDING
RIM=38.40'
PAPER MACHINE BUILDING
CB
RIM=36.78'
BTM EL
=69.8'
OVHD PIPES CONTINUE WEST UNDER CONVEYOR
EXIT
BTM EL
=68.2'
OVHD PIPES
RIM=36.14'
FFE = 36.65'
CB
RIM=37.85'
CB
RIM=35.10'
BTM EL
=66.8'
(31.2' AGL)
PIPE CONTINUES UNDERGROUND UNSURVEYED
OIL STORAGE TANK
CB
RIM=35.02'
FFE = 39.38'
CB
RIM=36.80'
MATCHLINE
SHEETS 3, 4,
AND 5
VAULT
0+00

SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR
SIGNED: 06/04/2020

SHEET 3

REVISION:
REVISION:
REVISION:
REVISION:

SCALE: 1"=20'
DRAWN DATE: 05/20/2020
REVIEW DATE: 06/04/2020
SURVEY DATE: 03/05/2020

JOB NUMBER: 2019-355
DRAWN: T.M.S./A.O.
REVIEWED: G.D.S.
SHEET: 3 OF 17

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

CLIENT: GEORGIA-PACIFIC

CONDITIONS SURVEY

OIL STORAGE TANK
IN-WATER PIPE INVESTIGATION
EASEMENTS 51-021224 AND 51-026441

Georgia-Pacific

N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B

OIL STORAGE TANK
PIPE CONTINUES UNDERGROUND UNSURVEYED
OVHD PIPES
FUEL OIL LINE
RIM=36.14'
FFE = 36.65'
CB RIM=37.85
RIM=35.19'
CB RIM=35.10'
BTM EL =66.8' (31.2' AGL)
CB RIM=35.02'
FFE = 39.38'
CB RIM=36.80'
MATCHLINE SHEETS 3, 4, AND 5
VAULT
0+00
0+50
1+00
1+50
2+00
2+50
RIM=36.19'
TRANSMISSION TOWER
PIPE CROSSING
<4" LARGE ARMOR ROCK
4" AIR VENT
ROCK WALL
W4 F4 12.7'
W4 F3 13.1'
W4 F2 12.6'
W4 F1 11.7'
DP5 12.0'
EL=20.7'
EL=21.0'
EL=27.2'
WETLAND NO. 4
TRANSMISSION TOWER
W5 F1 15.6'
W5 F2 15.7'
W5 F3 11.8'
W5 F4 15.9'
W5 F5 15.7'
W5 F6 14.9'
W5 F7 14.2'
W5 F8 14.0'
W5 F9 13.6'
W5 F10 13.0'
P4
20"
24"
WETLAND NO. 5
EDGE OF WATER ELEVATION 14.7' NAVD88 (03/14/20 3 PM)
MATCHLINE SHEETS 4, 5, 6, 7
N 96,550
N 96,500
N 96,450
N 96,400
N 96,350
N 96,300
E 1,151,200
E 1,151,250
E 1,151,300
E 1,151,350
E 1,151,400
E 1,151,450
E 1,151,500
E 1,151,550
E 1,151,600
E 1,151,650
E 1,151,700
E 1,151,750

CAMAS SLOUGH RENDERING COLOR SCALE

DEPTH (WATER SURFACE ELEVATION – DEPTH = ±16') 03/14/20

	ELEVATION (FEET – NAVD88)
−29	45
−24	40
−19	35
−14	30
−9	25
−4	20
1	15
6	10
11	5
16	0
21	−5
26	−10
31	−15
36	−20

SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 4

REVISION:
REVISION:
REVISION:
REVISION:

SCALE: 1"=20'
DRAWN DATE: 05/20/2020
REVIEW DATE: 06/04/2020
SURVEY DATE: 03/05/2020

JOB NUMBER: 2019-355
DRAWN: T.M.S./A.O.
REVIEWED: G.D.S.
SHEET: 4 OF 17

CLIENT: GEORGIA-PACIFIC

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENTS 51-021224 AND 51-026441

Georgia-Pacific

SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B

N

E 1,151,700 E 1,151,750 E 1,151,800 E 1,151,850 E 1,151,900 E 1,151,950 E 1,152,000 E 1,152,050 E 1,152,100 E 1,152,150

N 96,500 N 96,450 N 96,400 N 96,350 N 96,300

FFE = 39.38'
CB RIM=36.80'
MATCHLINE SHEETS 3, 4, AND 5
VAULT
0+00
0+50
1+00
1+50
2+00
2+50
PIPE CRUSHING
RIM=36.19'
TRANSMISSION TOWER
<4" LARGE ARMOR ROCK
4" AIR VENT
CONTOURS AT GROUND SURFACE BENEATH POWER STATION #9
POWER STATION #9
W5 F11 15.6'
W5 F12 15.7'
W5 F13 11.8'
W6 F9 12.0'
W6 F8 11.1'
W6 F7 11.7'
W6 F6 12.7'
W6 F5 15.7'
W6 F4 16.9'
DP7 12.0'
MH
MATCHLINE SHEETS 4, 5, 6, 7

CAMAS SLOUGH RENDERING
COLOR SCALE

DEPTH (WATER SURFACE ELEVATION – DEPTH = ±16')
03/14/20

−29 −24 −19 −14 −9 −4 1 6 11 16 21 26 31 36

ELEVATION (FEET – NAVD88)

45 40 35 30 25 20 15 10 5 0 −5 −10 −15 −20

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 5

REVISION:
REVISION:
REVISION:
REVISION:

SCALE: 1"=20'
DRAWN DATE: 05/20/2020
REVIEW DATE: 06/04/2020
SURVEY DATE: 03/05/2020

JOB NUMBER: 2019-355
DRAWN: T.M.S./A.O.
REVIEWED: G.D.S.
SHEET: 5 OF 17

CLIENT: GEORGIA-PACIFIC

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

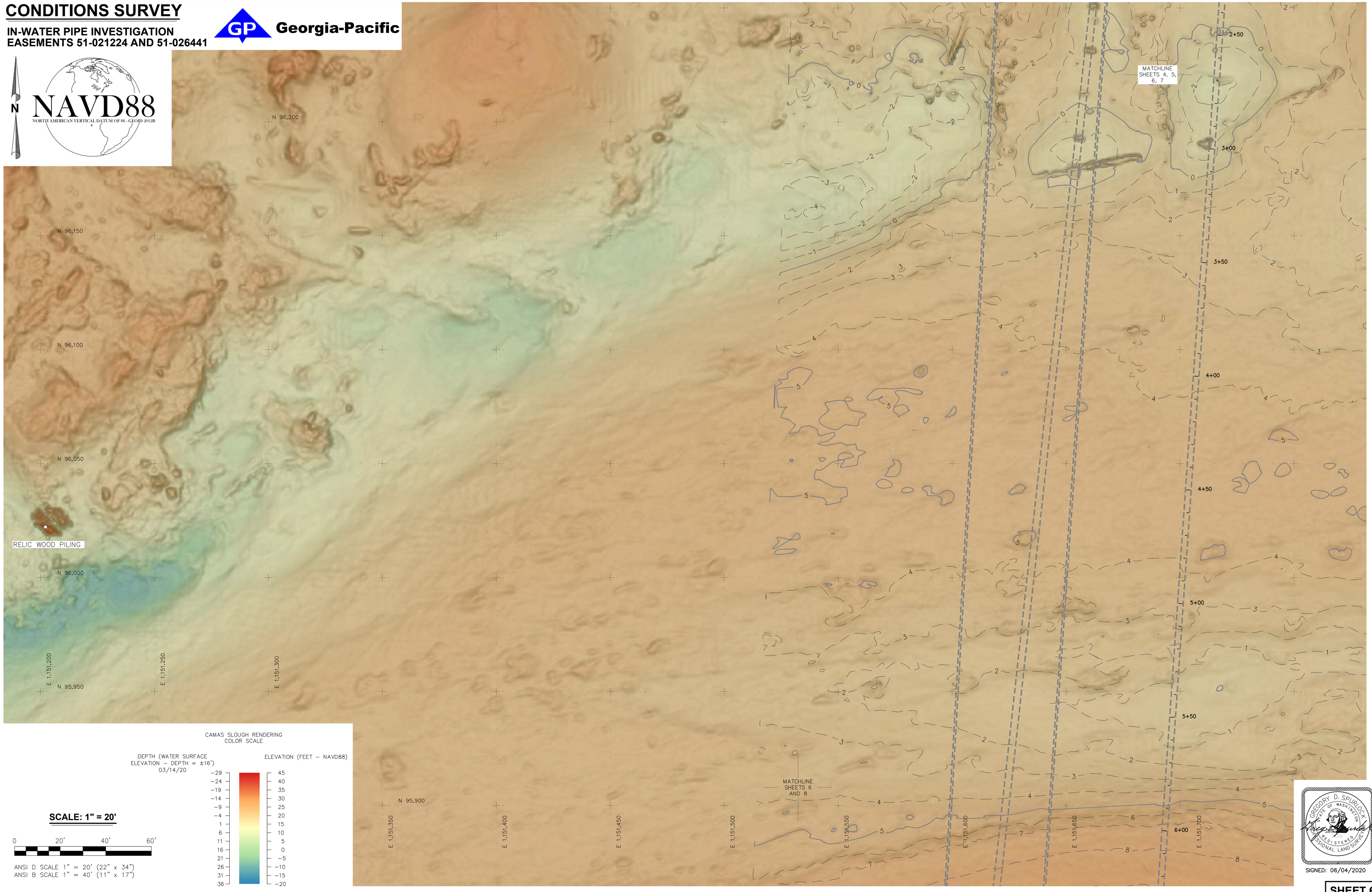
CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENTS 51-021224 AND 51-026441

Georgia-Pacific

N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B



CAMAS SLOUGH RENDERING
COLOR SCALE

DEPTH (WATER SURFACE ELEVATION − DEPTH = ±16')
03/14/20

	ELEVATION (FEET − NAVD88)
−29	45
−24	40
−19	35
−14	30
−9	25
−4	20
1	15
6	10
11	5
16	0
21	−5
26	−10
31	−15
36	−20

SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 6

REVISION:
REVISION:
REVISION:
REVISION:

SCALE: 1"=20'
DRAWN DATE: 05/20/2020
REVIEW DATE: 06/04/2020
SURVEY DATE: 03/05/2020

JOB NUMBER: 2019-355
DRAWN: T.M.S./A.O.
REVIEWED: G.D.S.
SHEET: 6 OF 17

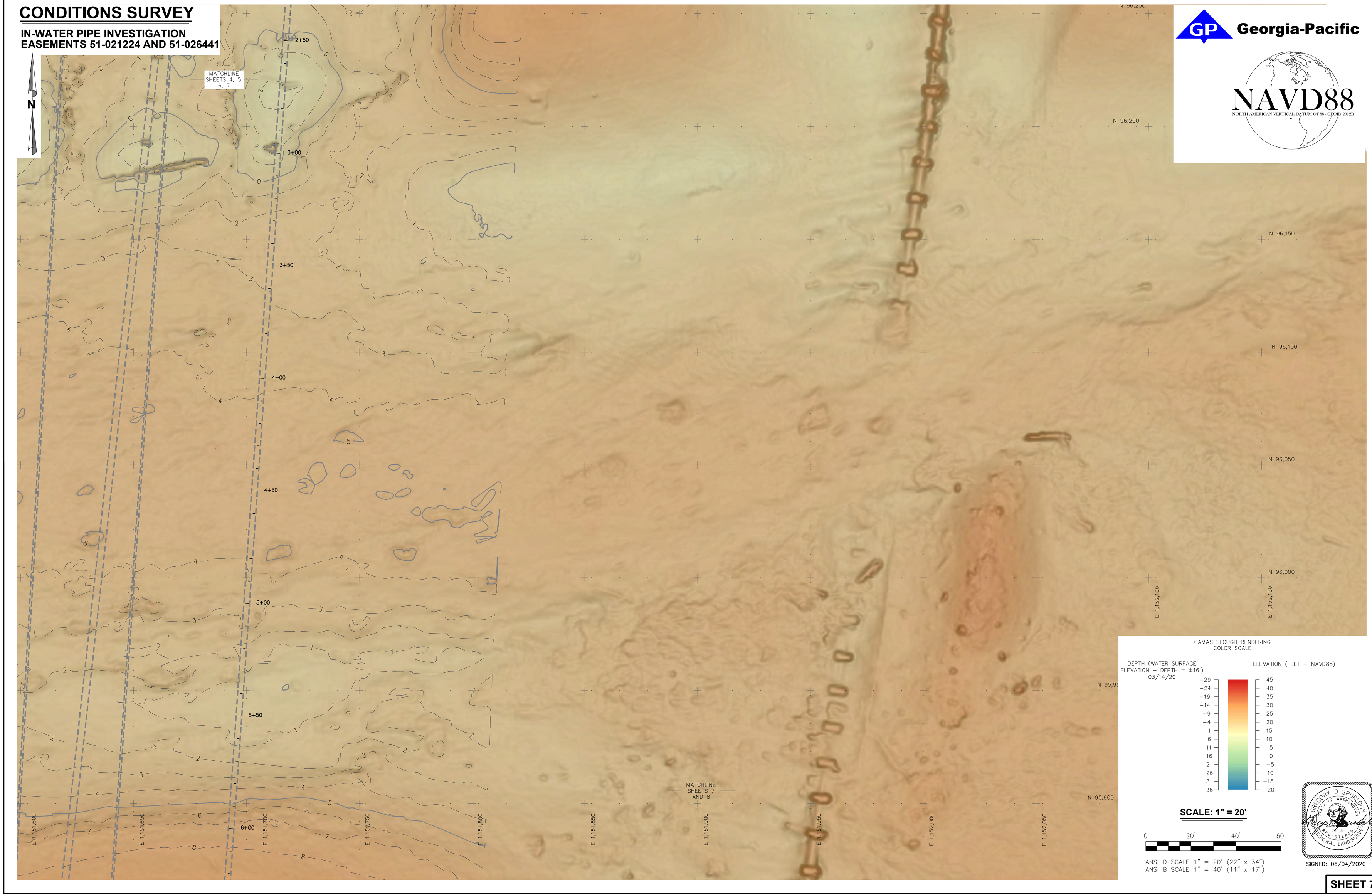
CLIENT: GEORGIA-PACIFIC

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

SWLS

CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENTS 51-021224 AND 51-026441



Georgia-Pacific

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B

CAMAS SLOUGH RENDERING
COLOR SCALE

DEPTH (WATER SURFACE ELEVATION – DEPTH = ±16')
03/14/20

−29 −24 −19 −14 −9 −4 1 6 11 16 21 26 31 36

ELEVATION (FEET – NAVD88)

45 40 35 30 25 20 15 10 5 0 −5 −10 −15 −20

SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 7

JOB NUMBER: 2019-355	SCALE: 1"=20'	REVISION:
DRAWN: T.M.S./A.O.	DRAWN DATE: 05/20/2020	REVISION:
REVIEWED: G.D.S.	REVIEW DATE: 06/04/2020	REVISION:
SHEET: 7 OF 17	SURVEY DATE: 03/05/2020	REVISION:

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

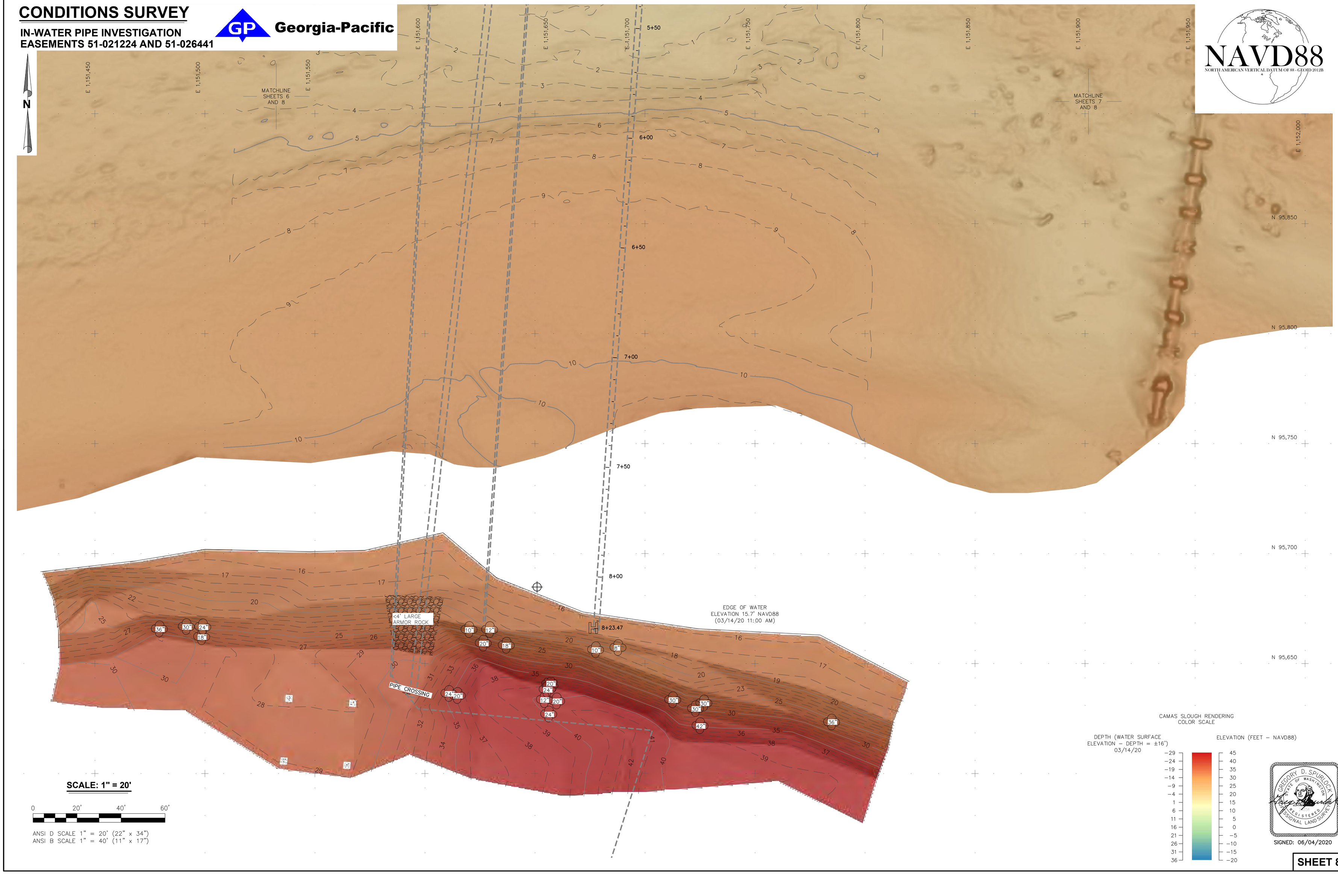
CLIENT: GEORGIA-PACIFIC

SWLS

CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENTS 51-021224 AND 51-026441

Georgia-Pacific



SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 8

REVISION:
REVISION:
REVISION:
REVISION:

SCALE: 1"=20'
DRAWN DATE: 05/20/2020
REVIEW DATE: 06/04/2020
SURVEY DATE: 03/05/2020

JOB NUMBER: 2019-355
DRAWN: T.M.S./A.O.
REVIEWED: G.D.S.
SHEET: 8 OF 17

CLIENT: GEORGIA-PACIFIC

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

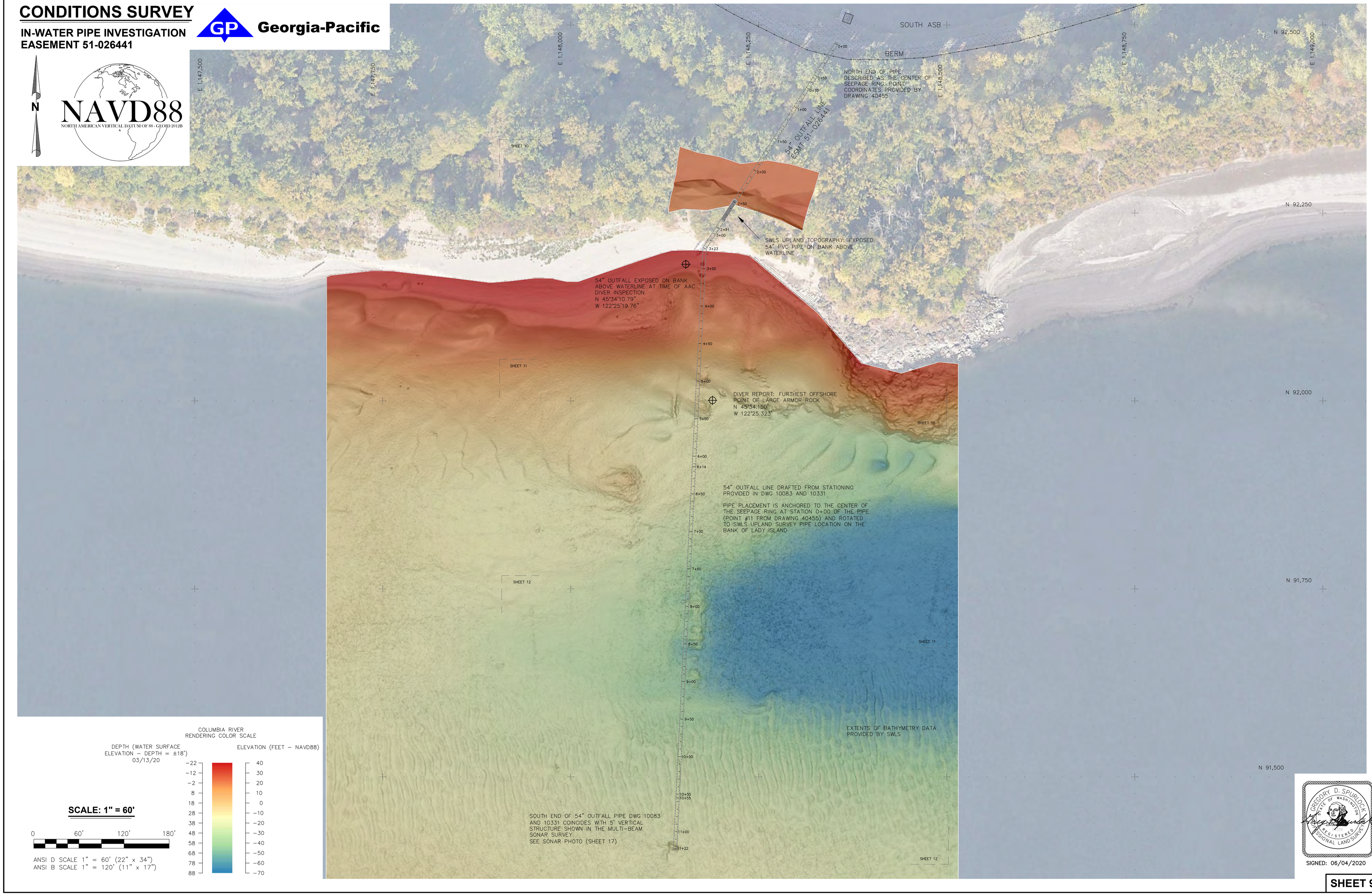
CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENT 51-026441

Georgia-Pacific

N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B



COLUMBIA RIVER
RENDERING COLOR SCALE

DEPTH (WATER SURFACE ELEVATION − DEPTH = ±18')
03/13/20

	ELEVATION (FEET − NAVD88)
−22	40
−12	30
−2	20
8	10
18	0
28	−10
38	−20
48	−30
58	−40
68	−50
78	−60
88	−70

SCALE: 1" = 60'

0 60' 120' 180'

ANSI D SCALE 1" = 60' (22" x 34")
ANSI B SCALE 1" = 120' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 9

JOB NUMBER: 2019-355	SCALE: 1"=20'	REVISION:	
DRAWN: T.M.S./A.O.	DRAWN DATE: 05/20/2020	REVISION:	
REVIEWED: G.D.S.	REVIEW DATE: 06/04/2020	REVISION:	
SHEET: 9 OF 17	SURVEY DATE: 03/05/2020	REVISION:	

CLIENT: GEORGIA-PACIFIC

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENT 51-026441

Georgia-Pacific

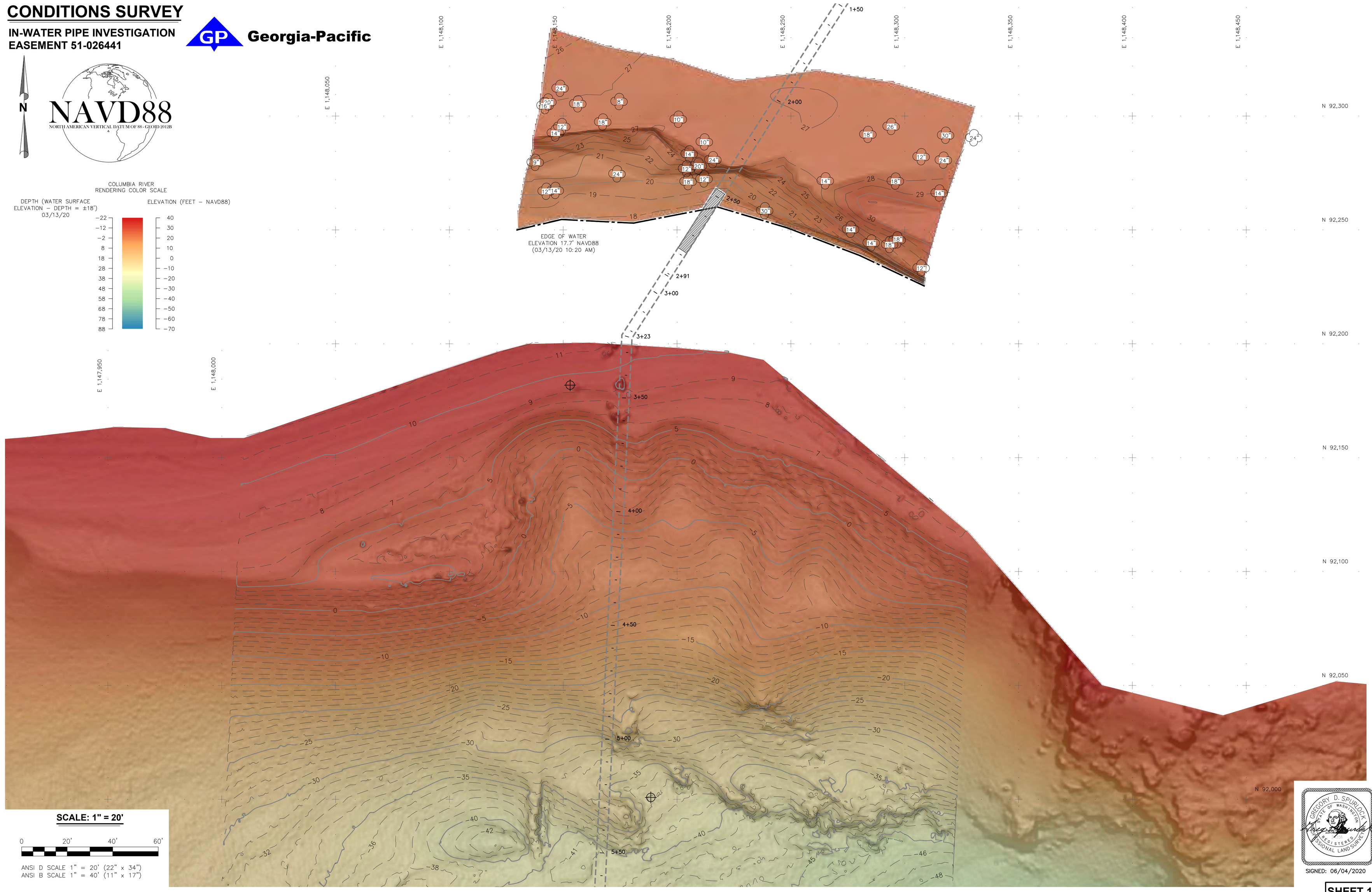
N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B

COLUMBIA RIVER
RENDERING COLOR SCALE

DEPTH (WATER SURFACE ELEVATION − DEPTH = ±18')
03/13/20

DEPTH	ELEVATION (FEET − NAVD88)
−22	40
−12	30
−2	20
8	10
18	0
28	−10
38	−20
48	−30
58	−40
68	−50
78	−60
88	−70



SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 10

REVISION:
REVISION:
REVISION:
REVISION:

SCALE: 1"=20'
DRAWN DATE: 05/20/2020
REVIEW DATE: 06/04/2020
SURVEY DATE: 03/05/2020

JOB NUMBER: 2019-355
DRAWN: T.M.S./A.O.
REVIEWED: G.D.S.
SHEET: 10 OF 17

CLIENT: GEORGIA-PACIFIC

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

SWLS

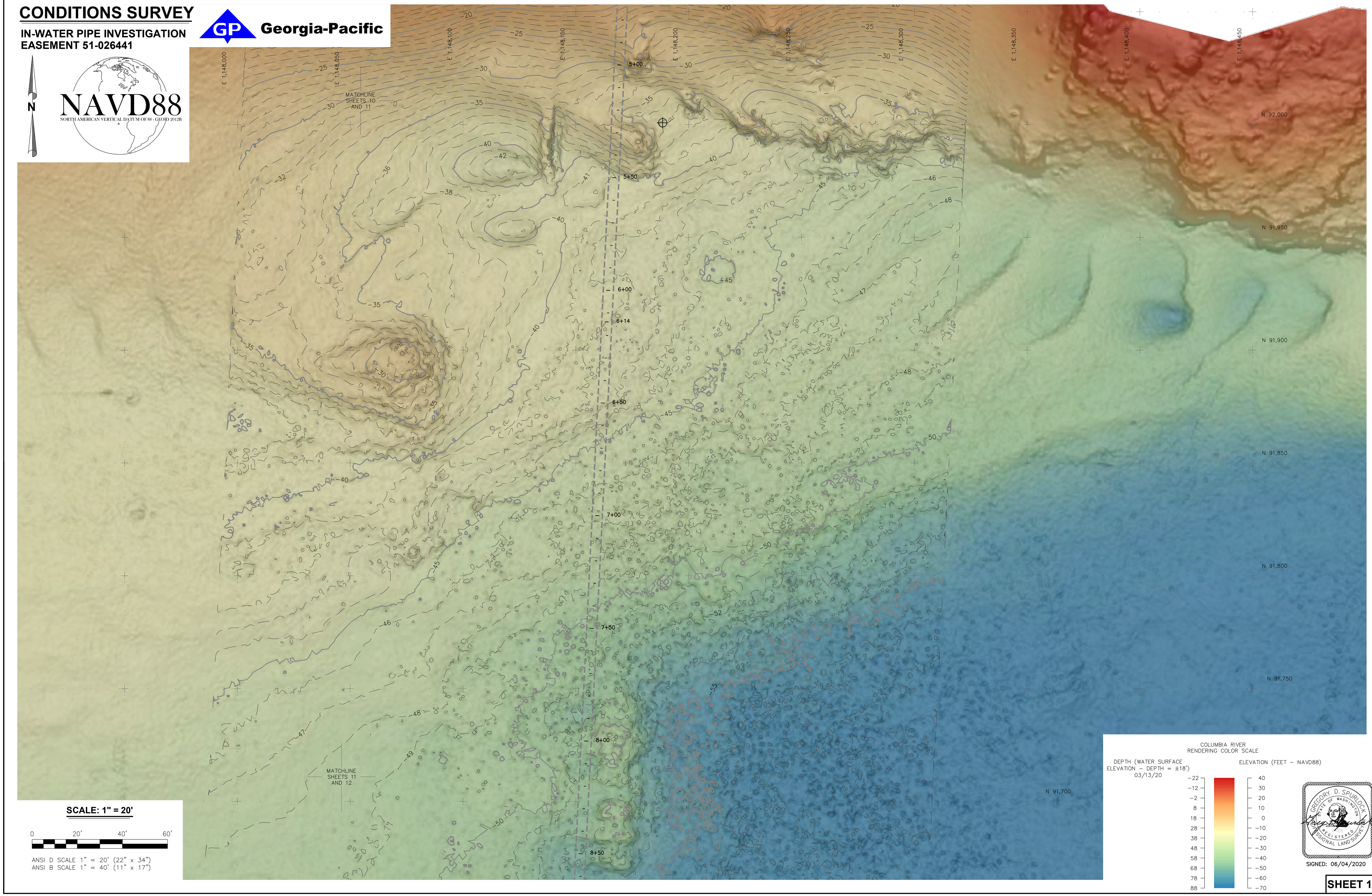
CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENT 51-026441

Georgia-Pacific

N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF '88 - GEOID 2012B



SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

COLUMBIA RIVER
RENDERING COLOR SCALE

DEPTH (WATER SURFACE ELEVATION – DEPTH = ±18')
03/13/20

ELEVATION (FEET – NAVD88)

DEPTH	ELEVATION
−22	40
−12	30
−2	20
8	10
18	0
28	−10
38	−20
48	−30
58	−40
68	−50
78	−60
88	−70

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 11

JOB NUMBER: 2019-355
DRAWN: T.M.S./A.O.
REVIEWED: G.D.S.
SHEET: 11 OF 17

SCALE: 1"=20'
DRAWN DATE: 05/20/2020
REVIEW DATE: 06/04/2020
SURVEY DATE: 03/05/2020

REVISION:
REVISION:
REVISION:
REVISION:

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

SWLS

CLIENT: GEORGIA-PACIFIC

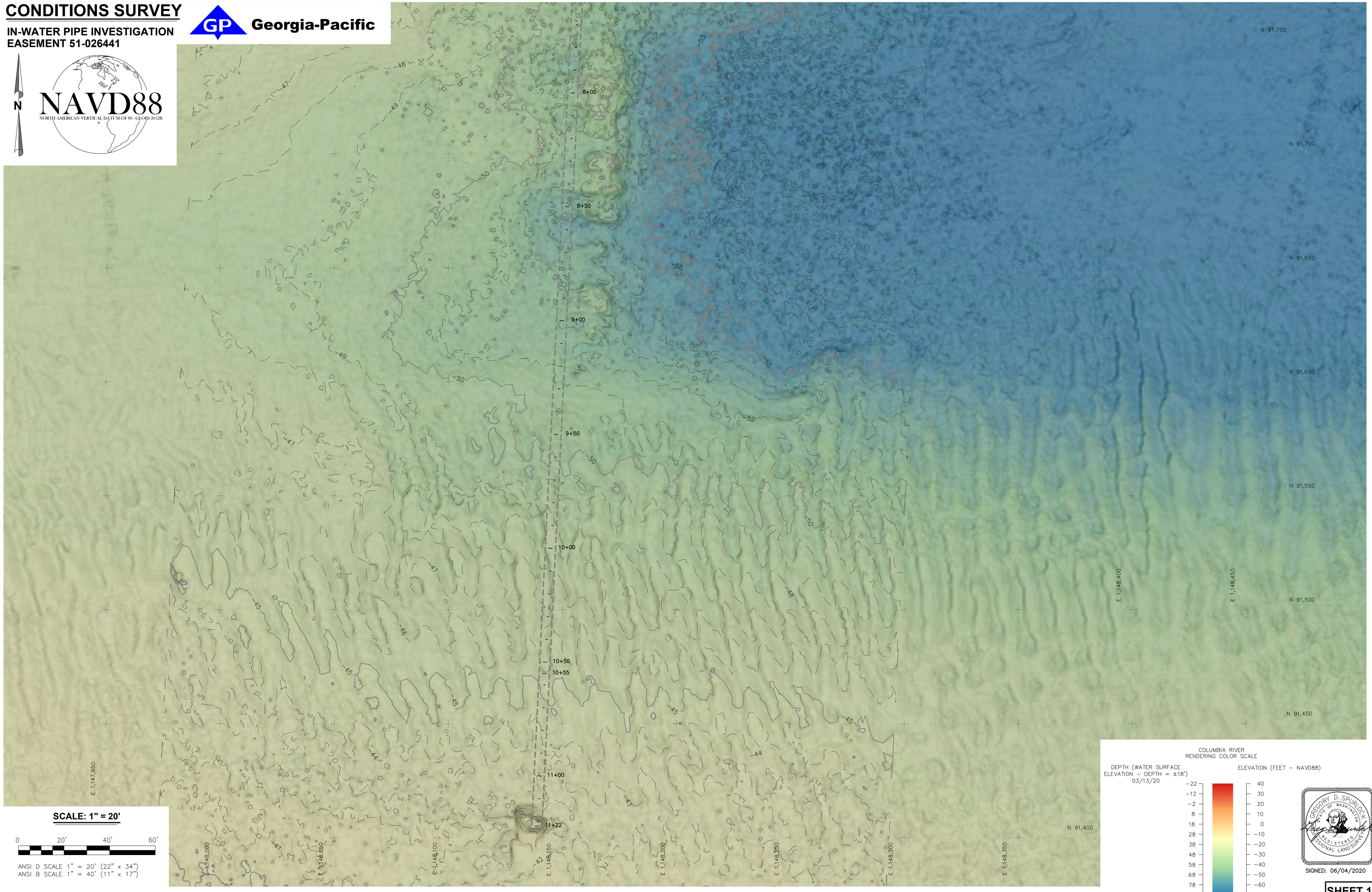
CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENT 51-026441

Georgia-Pacific

N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B



SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

COLUMBIA RIVER
RENDERING COLOR SCALE

DEPTH (WATER SURFACE ELEVATION – DEPTH = ±18')
03/13/20

−22 −12 −2 8 18 28 38 48 58 68 78 88

ELEVATION (FEET – NAVD88)

40 30 20 10 0 −10 −20 −30 −40 −50 −60 −70

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 12

JOB NUMBER: 2019-355	SCALE: 1"=20'	REVISION:	
DRAWN: T.M.S./A.O.	DRAWN DATE: 05/20/2020	REVISION:	
REVIEWED: G.D.S.	REVIEW DATE: 06/04/2020	REVISION:	
SHEET: 12 OF 17	SURVEY DATE: 03/05/2020	REVISION:	

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

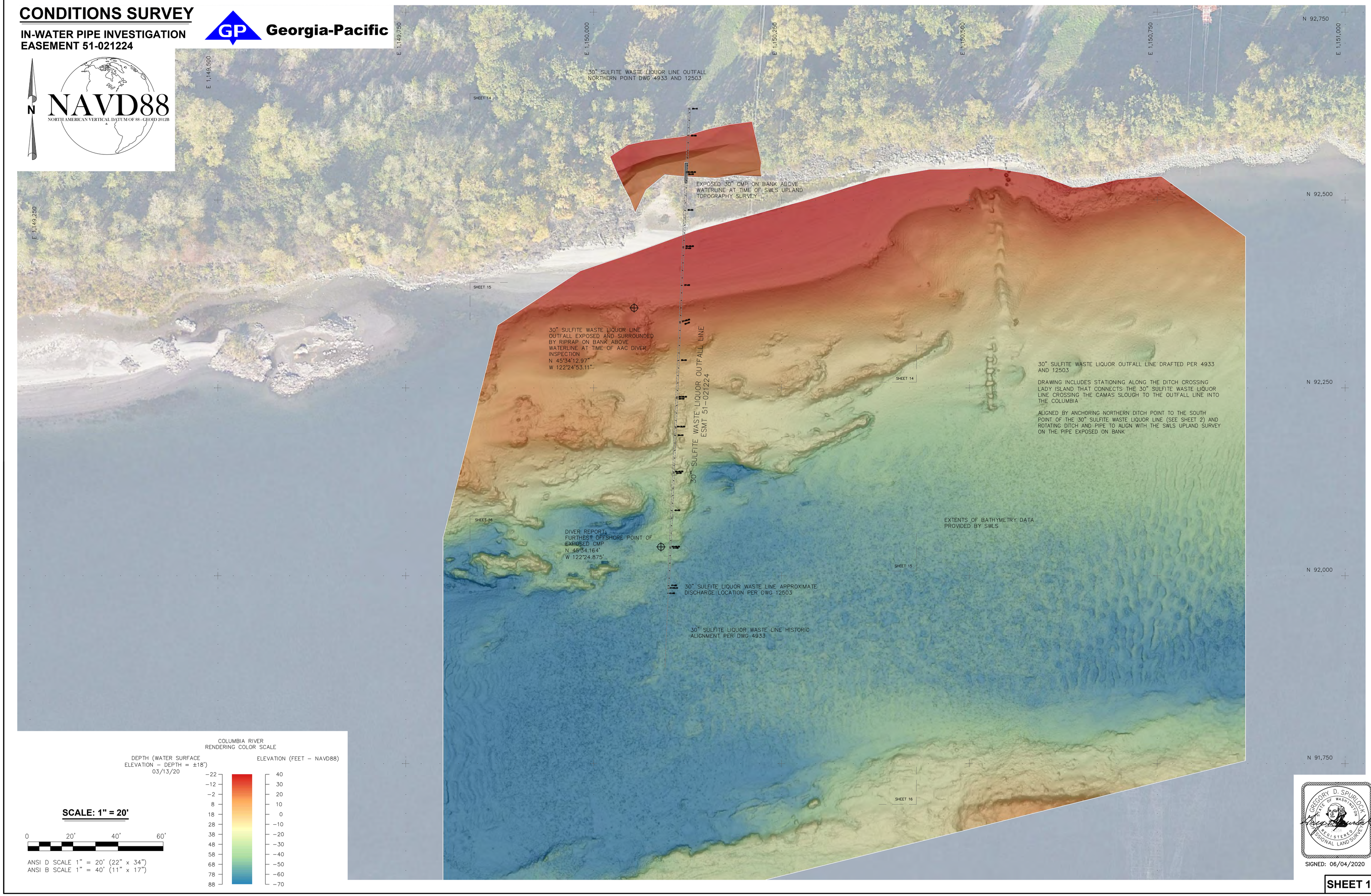
CLIENT: GEORGIA-PACIFIC

CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENT 51-021224

Georgia-Pacific

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B



COLUMBIA RIVER
RENDERING COLOR SCALE

DEPTH (WATER SURFACE ELEVATION – DEPTH = ±18')
03/13/20

ELEVATION (FEET – NAVD88)

DEPTH	ELEVATION
−22	40
−12	30
−2	20
8	10
18	0
28	−10
38	−20
48	−30
58	−40
68	−50
78	−60
88	−70

SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 13

JOB NUMBER: 2019-355	SCALE: 1"=20'	REVISION:	
DRAWN: T.M.S./A.O.	DRAWN DATE: 05/20/2020	REVISION:	
REVIEWED: G.D.S.	REVIEW DATE: 06/04/2020	REVISION:	
SHEET: 13 OF 17	SURVEY DATE: 03/05/2020	REVISION:	

CLIENT: GEORGIA-PACIFIC

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

SWLS

CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENT 51-021224

Georgia-Pacific

N

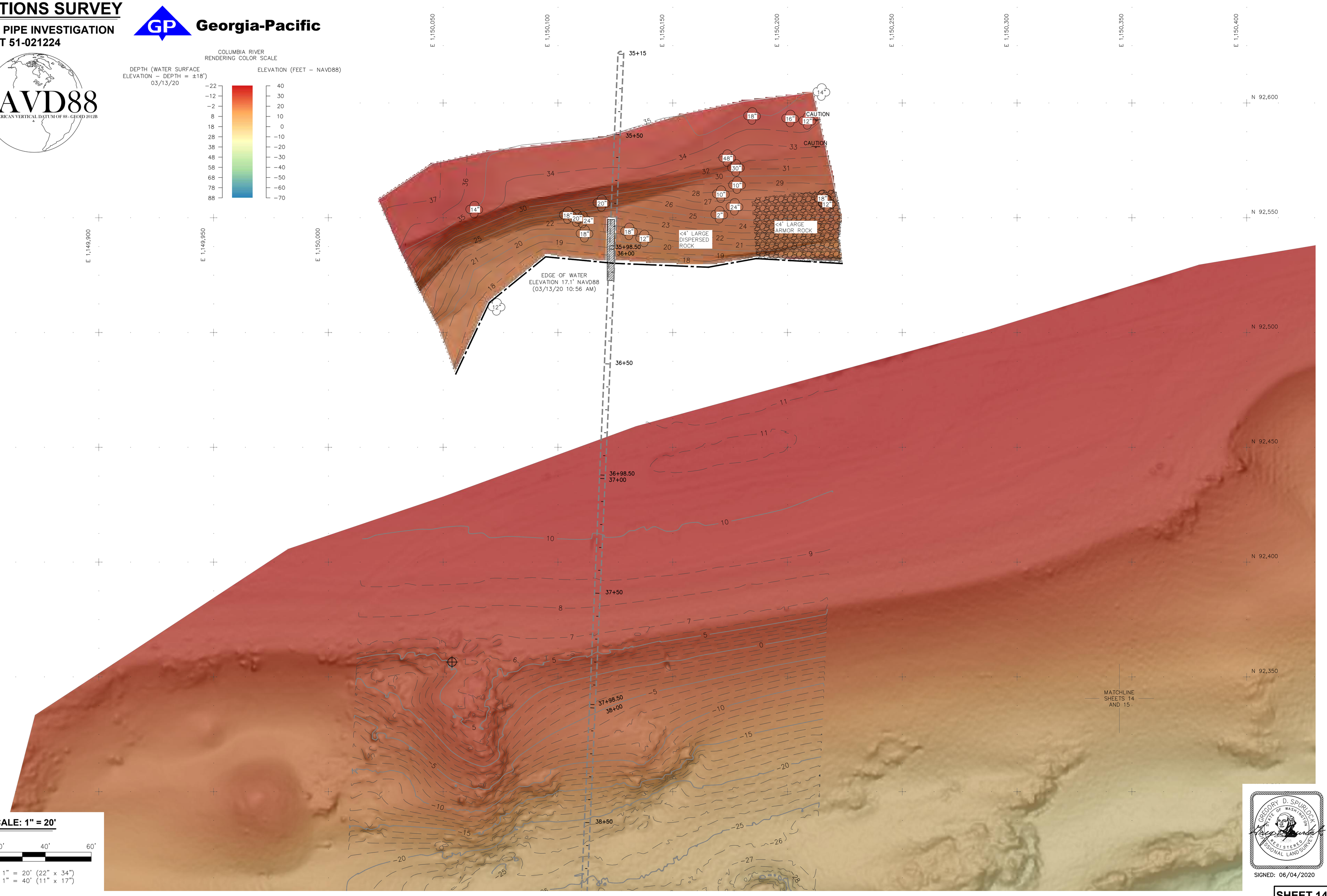
NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B

COLUMBIA RIVER
RENDERING COLOR SCALE

DEPTH (WATER SURFACE ELEVATION − DEPTH = ±18')
03/13/20

ELEVATION (FEET − NAVD88)

−22	40
−12	30
−2	20
8	10
18	0
28	−10
38	−20
48	−30
58	−40
68	−50
78	−60
88	−70



SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 14

REVISION:
REVISION:
REVISION:
REVISION:

SCALE: 1"=20'
DRAWN DATE: 05/20/2020
REVIEW DATE: 06/04/2020
SURVEY DATE: 03/05/2020

JOB NUMBER: 2019-355
DRAWN: T.M.S./A.O.
REVIEWED: G.D.S.
SHEET: 14 OF 17

CLIENT: GEORGIA-PACIFIC

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

SWLS

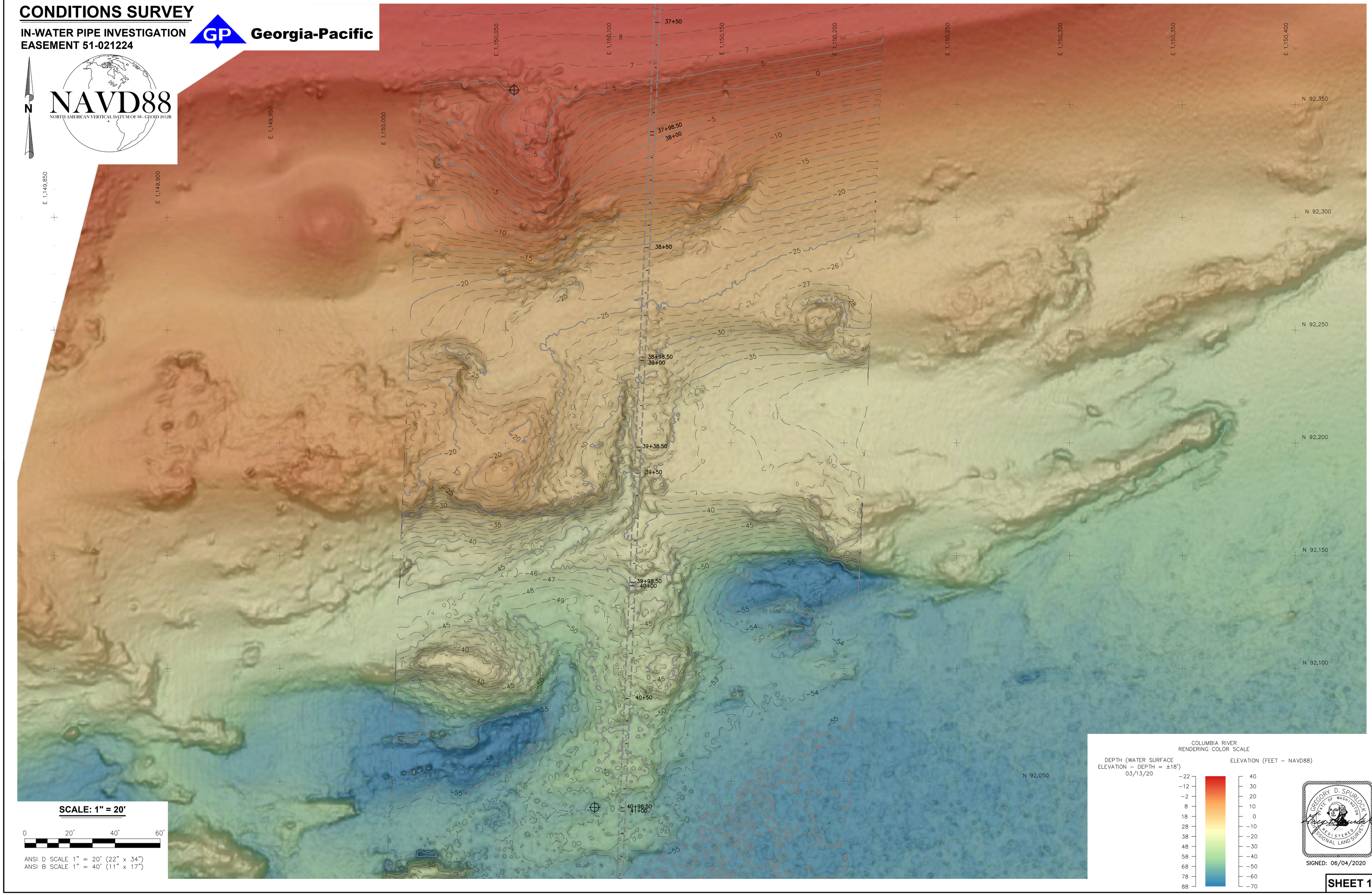
CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENT 51-021224

Georgia-Pacific

N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B



SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

COLUMBIA RIVER
RENDERING COLOR SCALE

DEPTH (WATER SURFACE ELEVATION – DEPTH = ±18')
03/13/20

ELEVATION (FEET – NAVD88)

−22 −12 −2 8 18 28 38 48 58 68 78 88

40 30 20 10 0 −10 −20 −30 −40 −50 −60 −70

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 15

JOB NUMBER: 2019-355	SCALE: 1"=20'	REVISION:	
DRAWN: T.M.S./A.O.	DRAWN DATE: 05/20/2020	REVISION:	
REVIEWED: G.D.S.	REVIEW DATE: 06/04/2020	REVISION:	
SHEET: 15 OF 17	SURVEY DATE: 03/05/2020	REVISION:	

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

CLIENT: GEORGIA-PACIFIC

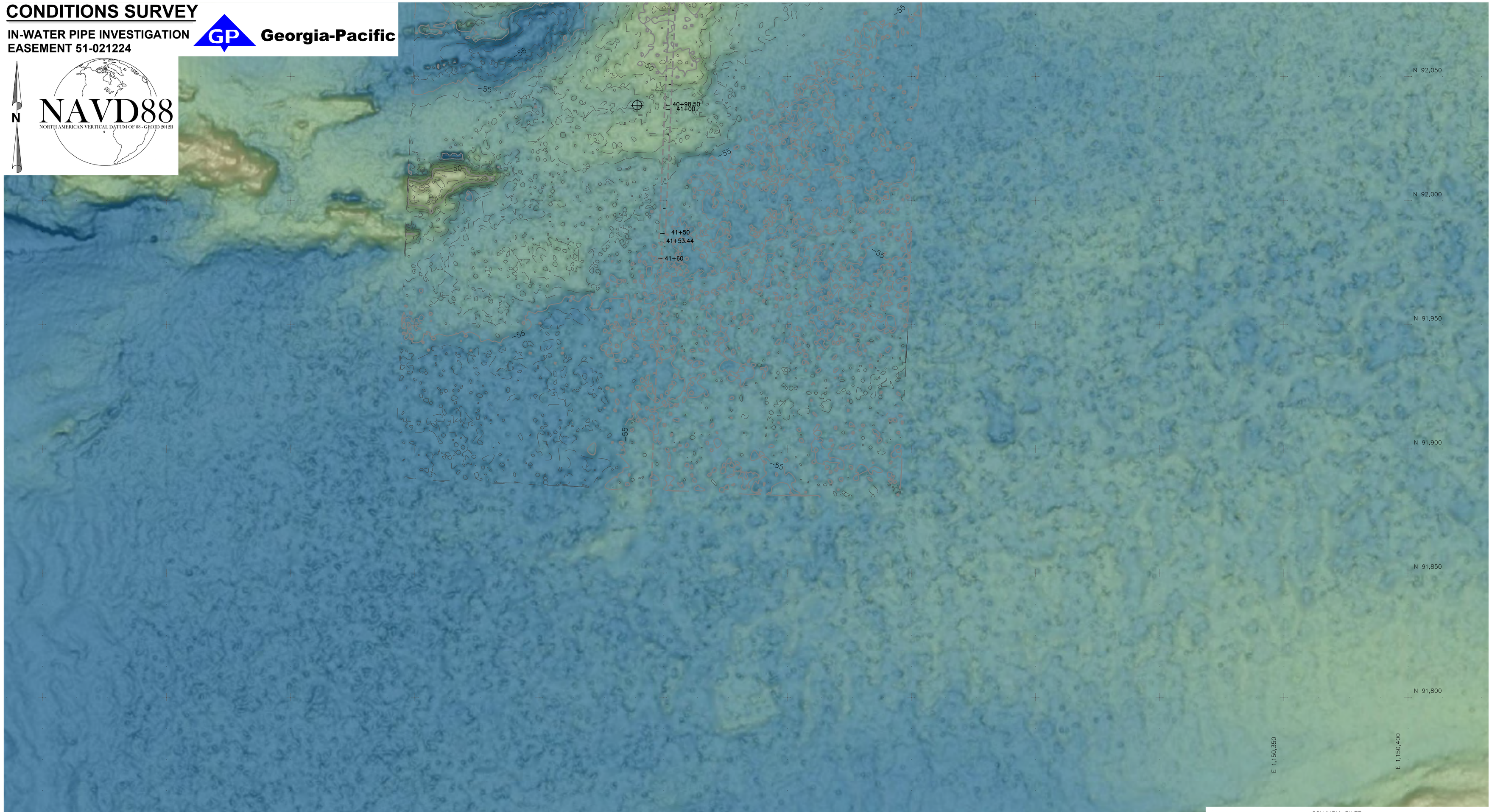
CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
EASEMENT 51-021224

Georgia-Pacific

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B

N



SCALE: 1" = 20'

0 20' 40' 60'

ANSI D SCALE 1" = 20' (22" x 34")
ANSI B SCALE 1" = 40' (11" x 17")

COLUMBIA RIVER
RENDERING COLOR SCALE

DEPTH (WATER SURFACE ELEVATION − DEPTH = ±18')
03/13/20

	ELEVATION (FEET − NAVD88)
−22	40
−12	30
−2	20
8	10
18	0
28	−10
38	−20
48	−30
58	−40
68	−50
78	−60
88	−70

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL LAND SURVEYOR

SIGNED: 06/04/2020

SHEET 16

JOB NUMBER: 2019-355	SCALE: 1"=20'	REVISION:
DRAWN: T.M.S./A.O.	DRAWN DATE: 05/20/2020	REVISION:
REVIEWED: G.D.S.	REVIEW DATE: 06/04/2020	REVISION:
SHEET: 16 OF 17	SURVEY DATE: 03/05/2020	REVISION:

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

CLIENT: GEORGIA-PACIFIC

CONDITIONS SURVEY

IN-WATER PIPE INVESTIGATION
SURFACE PROFILES

Georgia-Pacific

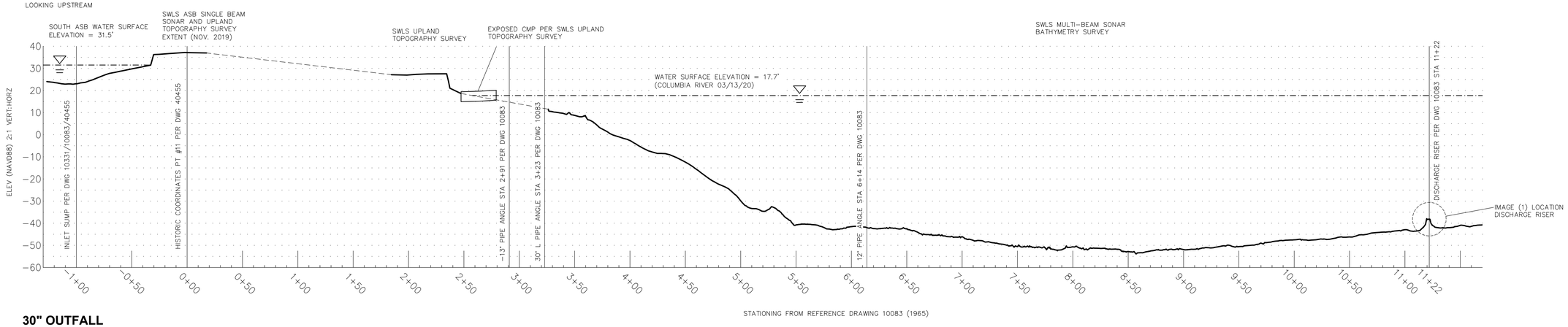
N

NAVD88
NORTH AMERICAN VERTICAL DATUM OF 88 - GEOID 2012B

LEGEND

- SURVEYED SURFACE
- INTERPOLATED SURFACE
- WATER SURFACE
- EXPOSED PIPE

54" OUTFALL



30" OUTFALL

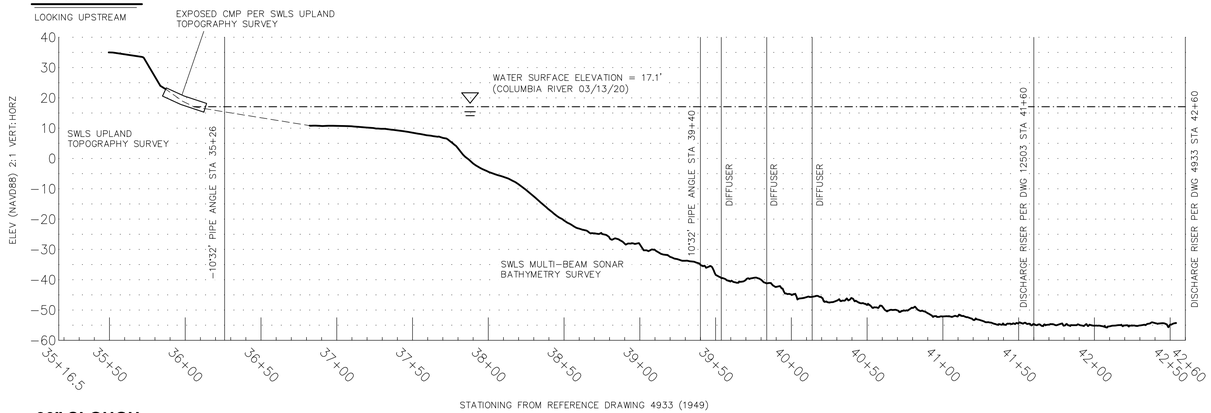


IMAGE (1): SIDE SCAN SONAR IMAGE OF 54" OUTFALL DISCHARGE RISER, COLUMBIA RIVER APPROX. DEPTH TO TOP OF RISER ±55'

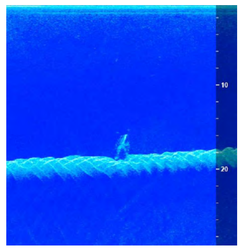
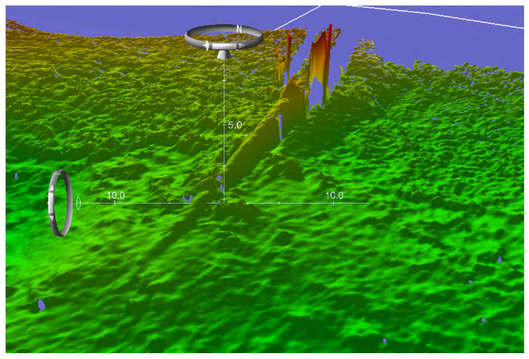
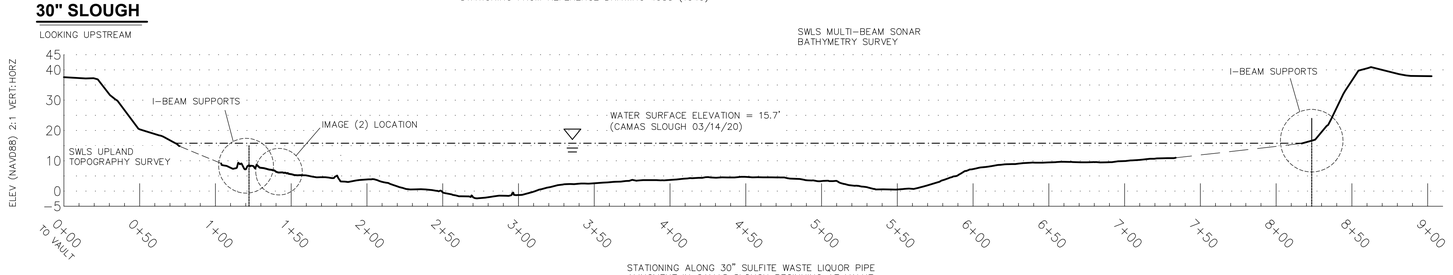


IMAGE (2): 30" STEEL PIPE AND GIRDERS, NORTH SIDE OF CAMAS SLOUGH 3D MODEL IMAGE (QIMERA SOFTWARE)



30" SLOUGH



VERTICAL SCALE: 1" = 25'

0 50' 100' 150'

ANSI D SCALE 1" = 25' (22" x 34")
ANSI B SCALE 1" = 50' (11" x 17")

HORIZONTAL SCALE: 1" = 50'

0 50' 100' 150'

ANSI D SCALE 1" = 50' (22" x 34")
ANSI B SCALE 1" = 100' (11" x 17")

GREGORY D. SPURLOCK
STATE OF WASHINGTON
REGISTERED PROFESSIONAL LAND SURVEYOR

SIGNED: 06/4/2020

SHEET 17

JOB NUMBER: 2019-355	SCALE: 1"=20'	REVISION:
DRAWN: T.M.S./A.O.	DRAWN DATE: 05/20/2020	REVISION:
REVIEWED: G.D.S.	REVIEW DATE: 06/04/2020	REVISION:
SHEET: 17 OF 17	SURVEY DATE: 03/05/2020	REVISION:

STATEWIDE LAND SURVEYING INC.
43 NW AVA AVE. GRESHAM, OR 97030
O: 503-665-7777 F: 503-665-7988
EMAIL: SURVEY@STATEWIDESURVEYING.COM
WEB: WWW.STATEWIDESURVEYING.COM

CLIENT: GEORGIA-PACIFIC

APPENDIX B: SEDIMENT QUALITY RESULTS FOR NDPES COMPLIANCE AT OUTFALLS 001 AND 002

SEDIMENT DATA REPORT

NPDES Waste Discharge Permit No. WA0000256

Prepared for
Georgia-Pacific Consumer Operations LLC

February 2018

OUR COMMITMENT TO SUSTAINABILITY | ESA helps a variety of public and private sector clients plan and prepare for climate change and emerging regulations that limit GHG emissions. ESA is a registered assessor with the California Climate Action Registry, a Climate Leader, and founding reporter for the Climate Registry. ESA is also a corporate member of the U.S. Green Building Council and the Business Council on Climate Change (BC3). Internally, ESA has adopted a Sustainability Vision and Policy Statement and a plan to reduce waste and energy within our operations. This document was produced using recycled paper.

TABLE OF CONTENTS

Page

CHAPTER 1. Introduction 1-1

CHAPTER 2. Field Sampling and Laboratory Analytical Procedures: Deviations from the Sediment Sampling and Analysis Plan 2-1

CHAPTER 3. Sampling Station Locations.....3-1
3.1 Outfall 001 Area 3-1
3.2 Outfall 002 Area 3-6

CHAPTER 4. Sample Results 4-1
4.1 Sediment Chemistry and Conventional Analyses.....4-1
4.2 Sediment Biological Tests.....4-8

CHAPTER 5. References 5-1

Appendices

Appendix A Field Notes and Sample Forms A-1
Appendix B Lab Results B-1
Appendix C Quality Assurance 1 Memorandum C-1

List of Figures

Figure 1 G-P Camas Mill Vicinity and Outfall Locations 1-2
Figure 2a G-P Camas Mill Outfall 001 Sediment Sampling Locations 3-4
Figure 2b G-P Camas Mill Outfall 002 Sediment Sampling Locations 3-5

List of Tables

Table 1 Surficial Sediment Grab Sampling Locations and Depths 3-2
Table 2 Columbia River Freshwater Sediment Results of Chemistry and Conventional Analyses 4-2
Table 3 Camas Slough Freshwater Sediment Results of Chemistry and Conventional Analyses.....4-5
Table 4 Columbia River Freshwater Sediment Biological Test Results.....4-9

CHAPTER 1.
Introduction

This Sediment Data Report was prepared to meet National Pollution Discharge Elimination System (NPDES) sediment monitoring requirements for the Georgia-Pacific Consumer Operations LLC NPDES Waste Discharge Permit No. WA0000256. Requirements for a Sediment Sampling and Analysis Plan (SSAP) and Sediment Data Report are specified in Special Condition S12 of the NPDES permit (Ecology 2016). Sediment baseline monitoring is required to characterize sediment quality in the vicinity of two facility discharge locations, Outfalls 001 and 002 (Figure 1), including comparisons to the Sediment Quality Standards (SQS) in Washington's Sediment Management Standards (SMS, Chapter 173-204 WAC). The purpose of baseline monitoring is to determine whether there are current SQS exceedances in depositional areas near the discharge locations.

Sediment sampling was performed between September 12 and 14, 2017, according to the August 18, 2017 SSAP approved by Ecology on August 22, 2017 (ESA 2017), with final adjustments to the target sampling locations near Outfall 002 approved on August 30, 2017. Delivery of samples to the laboratories was completed on September 15, 2017, and sample analyses were completed on December 21, 2017.

This document is organized to include the data report requirements identified in Appendix A of the *Final Sediment Cleanup User's Manual II: Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards*, Chapter 173-204 WAC (SCUM II, Ecology 2015). The report includes a description of deviations from the approved SSAP, a general vicinity map and sampling station maps, coordinates for all sampling locations, sediment data tables summarizing the chemical and conventional variables in the same units as the SQS, a sediment data table summarizing all biological results and statistical analyses, and an interpretation of the results compared to the Sediment Quality Standards. Appendices include copies of the field notebook and sample log forms, complete laboratory data packages that include chain-of-custody forms, and a quality assurance (QA1) memorandum. In addition to the written report, data have been submitted to Ecology's Environmental Information Management (EIM) database according to the instructions on the EIM website, and Ecology's MyEIM tools were used to confirm the accuracy of the submitted data.

SOURCE: NAIP, 2013; OSM, 2016

Camas Mill . 160430

Figure 1

Georgia-Pacific Camas Mill Vicinity and Outfall Locations

CHAPTER 2.

Field Sampling and Laboratory Analytical Procedures: Deviations from the Sediment Sampling and Analysis Plan

Detailed methods and procedures were presented in the SSAP for field sampling, sample handling, laboratory analyses, quality assurance reviews, data analyses, recordkeeping, and reporting. These methods and procedures are not repeated in this Sediment Data Report. However, deviations from the SSAP are described below.

The primary deviations from the SSAP were in the number and location of sediment samples, because it was not physically possible to collect surface sediment grabs at all six target locations near each outfall (see field notebook copies in Appendix A). Due to extensive rock outcroppings between Lady Island and Ione Reef, samples could not be collected in the high-current environment at the two downstream-most stations near Outfall 001 (Figure 2). Shallow water and gravel and cobble substrate prevented access to and sampling of sediment at all of the target stations near Outfall 002. Sampling was attempted moving farther offshore until sand deposits were encountered 140 to 190 feet from the target locations, and samples were successfully obtained at five Camas Slough sites (Figure 3). Chapter 3 and the Quality Assurance Memorandum (Appendix C) provide further documentation of the sediment sampling efforts and station locations.

Although not required in the SSAP, the field crew collected a set of duplicate samples for chemistry analyses and conventional parameters at station OF2-5, labeled OF2-5D. Duplicates were not collected for analysis of sulfides, and dioxins and furans.

Samples shipped from TestAmerica to Maxxam for analysis of dioxins and furans were received at temperatures ranging from 3.8 to 4.8 °C. No action was taken to qualify dioxin and furan results that were received slightly above the recommended maximum 4.0 °C holding temperature.

There were four deviations from compliance with recommended maximum holding times, as summarized below. Additional documentation of laboratory analytical procedures is found in the data packages from TestAmerica and Northwestern Aquatic Sciences (Appendix B).

(1) Samples were analyzed for total organic carbon (TOC) 23 to 25 days after sample collection due to a laboratory instrument breakdown; therefore, those sample results were outside the Puget Sound Estuary Program (PSEP)-specified holding time (14 days).

(2) Semi-volatile organic compounds (SVOCs) were re-extracted for low-level analysis of five compounds that were not detected in the original analysis at concentrations higher than Sediment Cleanup Objectives (SCOs). TestAmerica had not frozen any archived

Exhibit 8 SHOR23-01

sample material. The re-extractions were performed 57 to 84 days after sample collection with unfrozen sample material; therefore, those sample results were outside of the specified holding time (14 days). For one of the three sample batches (i.e., samples OF1-1, OF1-2 and OF1-3), TestAmerica did not have any remaining sediment and they obtained archived sample material for SVOC re-extraction from the bioassay laboratory.

(3) Organotins were re-extracted and re-analyzed after the initial analysis found laboratory control sample results to be outside control limits for monobutyltin and tetra-n-butyltin. Re-extraction of organotins occurred 22 to 24 days after sample collection; therefore, those sample results were also outside the specified holding time (14 days).

(4) Dioxins and furans from two of the three sample batches (samples OF1-1 through OF1-4, OF2-4, and OF2-5) were analyzed by Maxxam on October 8, ten to 11 days past the recommended maximum holding time of 14 days.

Exhibit 8 SHOR23-01

CHAPTER 3.
Sampling Station Locations

Table 1 provides latitude and longitude coordinates, with a datum of NAD 83 HARN, for sampling station locations near each outfall, including locations where sampling was attempted but unsuccessful. Figures 2a and 2b show the locations of the original target sampling stations, actual stations sampled with each grab location, and the locations of grab samples that were unsuccessful due to rock outcroppings or cobble and coarse gravel substrate. Below are notes describing what was encountered in the field at the SSAP-target sampling stations near Outfalls 001 and 002, and at adjusted sampling locations near Outfall 002. Copies of the field notebook and sample log forms are included in Appendix A.

3.1 Outfall 001 Area

Sampling Outfall 001 stations began on the second sampling day, starting at the upstream end (OF-1). The field team was able to access and collect sediment (sand) from the target stations OF1-1, OF1-2, and OF1-3, as identified in the SSAP.

The third sampling day was started by attempting to collect sediment from OF1-6 station, but no sample material was retrieved in the Ponar grab sampler. The current was strong on the ebb tide in the morning, so the crew moved to Camas Slough and collected the OF2-4 and OF2-5 samples (as described in Section 3.2) while waiting for high tide and better river sampling conditions near Outfall 001.

The crew returned to the Outfall 001 area in the afternoon of the third day near high tide, and started sampling at OF1-4. They collected enough sediment (sand) for analysis, but had a number of unsuccessful grabs (Ponar retrieved with no sample material inside), possibly due to rocky substrate.

The field team attempted multiple grabs at OF1-5 and could not obtain a sample. The bottom in this area appeared rocky on the sonar imagery, and they noted more rock along the adjacent Lady Island shoreline in this area.

A second attempt was made to sample OF1-6 again and no sample material was retrieved. The river bottom appeared to be rocky in this area in the sonar imagery. The Ponar got hung up in current on something on the bottom (likely rock) after only a couple of attempts, and the crew could not immediately retrieve it (i.e., the winch could not pull it up). It finally popped loose and they were able to haul it in. They did not attempt further sampling at the OF1-6 station due to the rocky substrate, strong currents, and safety concerns.

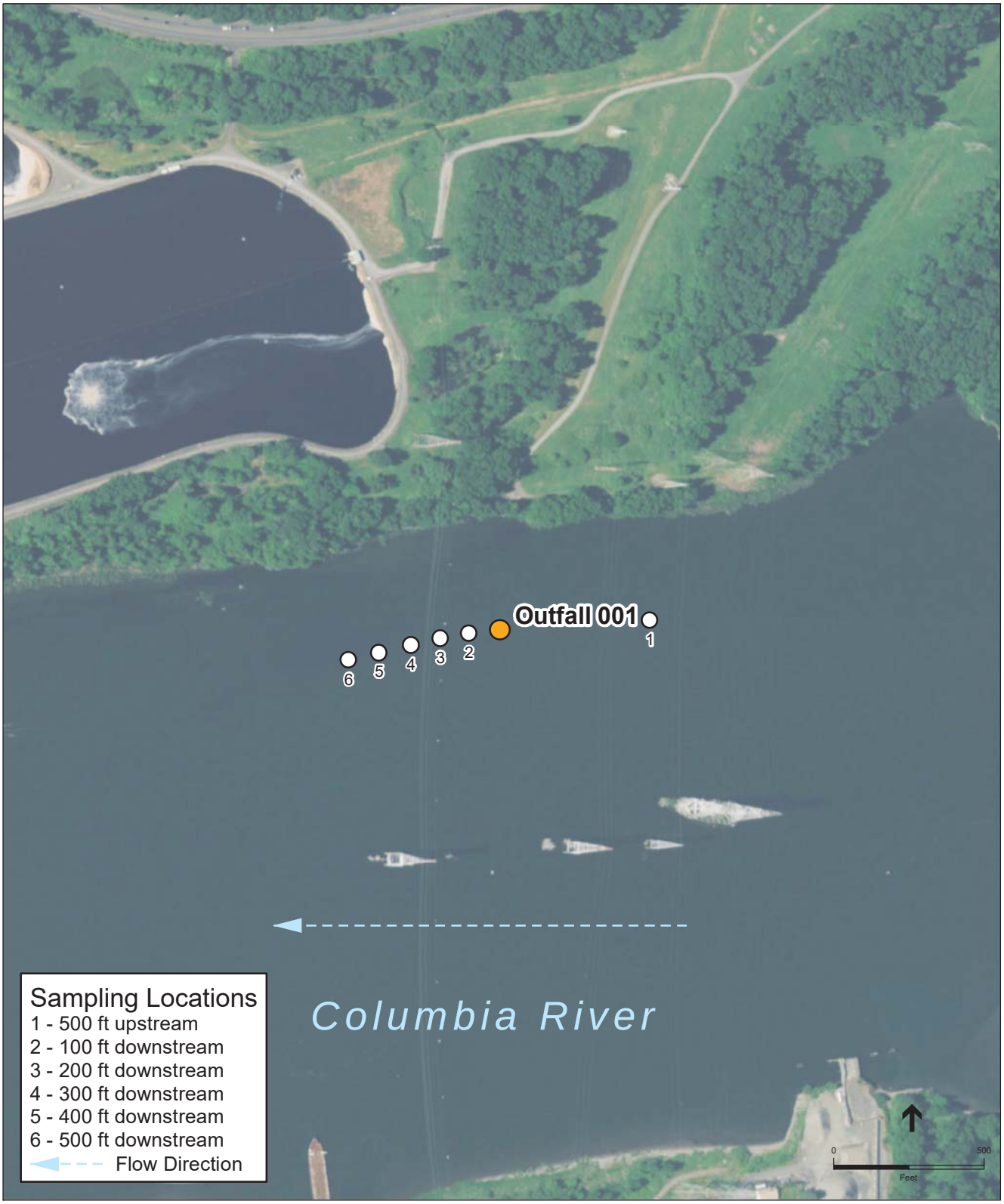
TABLE 1
SURFICIAL SEDIMENT GRAB SAMPLING LOCATIONS AND DEPTHS

Outfall	Sampling Station and Sample Number	Grab	Sample Collection Date	Latitude	Longitude	Sediment Depth Below Water Surface (ft)	Sediment Sample Depth (cm)
001	Outfall	none	none	45°34'11.41"	-122°24'46.64"	NR	NR
001	OF1-1	A	9-13-2107	45°34'11.94"	-122°24'39.49"	53.7	0 to 8.5
		B	9-13-2107	45°34'11.98"	-122°24'39.63"	54.5	0 to 8.0
		C	9-13-2107	45°34'11.79"	-122°24'39.69"	54.2	0 to 8.0
001	OF1-2	A	9-13-2107	45°34'11.22"	-122°24'48.08"	59.0	0 to 6.0
		B	9-13-2107	45°34'11.33"	-122°24'48.28"	59.0	0 to 7.0
		C	9-13-2107	45°34'11.24"	-122°24'48.07"	59.5	0 to 6.0
001	OF1-3	A	9-13-2107	45°34'11.06"	-122°24'49.43"	59.5	0 to 5.5
		B	9-13-2107	45°34'11.08"	-122°24'49.34"	59.2	0 to 3.0
		C	9-13-2107	45°34'11.00"	-122°24'49.42"	59.0	0 to 7.0
		D	9-13-2107	45°34'11.15"	-122°24'49.33"	59.2	0 to 3.0
001	OF1-4	A	9-14-2017	45°34'10.78"	-122°24'50.79"	62.0	0 to 5.5
		B	9-14-2017	45°34'10.83"	-122°24'50.63"	56.0	0 to 4.0
		C	9-14-2017	45°34'10.93"	-122°24'50.77"	62.0	0 to 5.0
001	OF1-5	none	none	45°34'10.48"	-122°24'52.09"	58.0	0 to 5.0
		none	none	45°34'10.43"	-122°24'52.20"	NR	NR
		none	none	45°34'10.69"	-122°24'52.30"	NR	NR
		none	none	45°34'10.69"	-122°24'52.38"	NR	NR
		none	none	45°34'10.56"	-122°24'52.40"	NR	NR
001	OF1-6	none	none	45°34'10.13"	-122°24'53.74"	NR	NR
		none	none	45°34'10.24"	-122°24'53.94"	NR	NR
002	Outfall	none	none	45°34'53.19"	-122°24'29.22"	0.0	NR
002	OF2-1	A	9-12-2017	45° 34' 50.55"	-122° 24' 26.07"	6.0	0 to 7.0
		B	9-12-2017	45° 34' 50.52"	-122° 24' 26.13"	5.5	0 to 4.5
		C	9-12-2017	45° 34' 50.48"	-122° 24' 26.31"	6.0	0 to 6.5
002	OF2-2	A	9-12-2017	45° 34' 50.58"	-122° 24' 28.20"	5.0	0 to 5.0
		B	9-12-2017	45° 34' 50.57"	-122° 24' 28.07"	5.0	0 to 8.5
		C	9-12-2017	45° 34' 50.52"	-122° 24' 28.18"	4.5	0 to 8.5
002	OF2-3	A	9-12-2017	45° 34' 50.33"	-122° 24' 30.11"	4.7	0 to 8.5
		B	9-12-2017	45° 34' 50.48"	-122° 24' 30.21"	4.8	0 to 8.5
		C	9-12-2017	45° 34' 50.33"	-122° 24' 30.22"	4.8	0 to 8.5
002	OF2-4	A	9-14-2017	45° 34' 50.64"	-122° 24' 29.19"	6.0	0 to 6.0
		B	9-14-2017	45° 34' 50.64"	-122° 24' 29.22"	6.0	0 to 5.5
		C	9-14-2017	45° 34' 50.65"	-122° 24' 29.23"	6.7	0 to 5.0
		D	9-14-2017	45° 34' 50.66"	-122° 24' 29.23"	6.3	0 to 4.5
		E	9-14-2017	45° 34' 50.75"	-122° 24' 29.20"	7.2	0 to 5.0

Exhibit 8 SHOR23-01

Outfall	Sampling Station and Sample Number	Grab	Sample Collection Date	Latitude	Longitude	Sediment Depth Below Water Surface (ft)	Sediment Sample Depth (cm)
002	OF2-5	A	9-14-2017	45° 34' 50.16"	-122° 24' 29.37"	3.7	0 to 8.0
		B	9-14-2017	45° 34' 50.12"	-122° 24' 29.37"	4.0	0 to 7.0
		C	9-14-2017	45° 34' 50.81"	-122° 24' 29.36"	4.1	0 to 8.0

NR = not recorded



SOURCE: NAIP, 2013; OSM, 2016

Camas Mill . 160430

Figure 2a

Outfall 001 Sampling Locations

SOURCE: NAIP, 2013; OSM, 2016

Camas Mill . 160430

Figure 2b

Outfall 002 Sampling Locations

Exhibit 8 SHOR23-01

3.2 Outfall 002 Area

Attempts were made to access all SSAP target locations on the first day of sampling. The boat was able to reach the targets for OF2-1, OF2-3, and OF2-6. However, the other three target stations (OF2-2, OF2-4, and OF2-5) were not accessible due to their locations in extremely shallow water associated with a gravel/cobble bar. From the points where the boat grounded on the bar, attempting to access OF2-2, OF2-4, and OF2-5, cobble bed material was visible underwater extending north to the shoreline. Sampling attempts at the reachable OF2-1, OF2-3, and OF2-6 stations encountered cobble/gravel-dominated bed material in the Ponar. No sand or finer sediments could be retrieved at these locations for sample collection and analysis.

After attempting to access/sample all SSAP target stations, attempts were continued farther from shore in the same general area as the target stations. Following several failed grabs due to continued cobble bed material extending offshore, sand deposits were located approximately 140 to 190 feet generally south from the target locations. During the first day, samples were collected at adjusted stations OF2-1, OF2-2, and OF2-3, marking the approximate upstream, downstream, and mid-point of the east-west extent of the target coordinates. Additional samples from adjusted stations 2-4 and 2-5 were collected on the third day of sampling. Sampling stations were numbered in the order of sample collection.

Enough sample material was obtained with 3 successful grabs at OF2-1, OF2-2, OF2-3, and OF2-5. Five successful grabs were necessary at OF2-4, which seemed to mark the northern extent of sand deposition and the transition to coarse gravel and cobble substrate. The northernmost grab of the OF2-4 composite sample contained some gravel.

CHAPTER 4.
Sample Results

Complete TestAmerica laboratory data packages for chemical and conventional sediment analyses are provided in Appendix B, as well as a complete laboratory data package from Northwestern Aquatic Sciences for freshwater sediment toxicity bioassays.

4.1 Sediment Chemistry and Conventional Analyses

Tables 2 and 3 summarize the chemical and conventional sediment analysis results for samples from the Columbia River (near Outfall 001) and Camas Slough (near Outfall 002), respectively. Sediment Cleanup Objectives (SCOs) and Cleanup Screening Levels (CSLs), chemical criteria from the SMS, are also presented in Tables 2 and 3. Where sample results were assigned data qualifiers by the laboratory or during the quality assurance review, as explained in the laboratory data packages (Appendix B) and the quality assurance memorandum (Appendix C), these qualifiers are shown in Tables 2 and 3. Where re-extraction and re-analyses were necessary to achieve reporting limits sufficiently low for comparison to SCOs, the re-analysis results are reported in Tables 2 and 3.

None of the results from any of the Columbia River or Camas Slough sample analyses exceeded any of the SMS chemical criteria (Tables 2 and 3), and reporting limits for non-detected samples were also below the criteria. Ammonia and sulfide were not detected in any sample. Mercury and silver were not detected or below reporting limits in each sample, and most other metals were detected at concentrations one to two orders of magnitude below SMS criteria. Most organic compounds analyzed were not detected in samples, and a few were detected at trace concentrations below reporting limits. Total petroleum hydrocarbons (TPH) in the diesel range were not detected in any samples, and TPH in the residual range was either not detected in samples or detected at trace concentrations below the reporting limits. Total toxic equivalency values for dioxins and furans were calculated to range from 0.314 to 0.412 in sediment samples indicating that the combination of dioxins and dioxin-like compounds in the sediments may have a toxicity that is approximately 31 to 41% that of the most toxic dioxin compounds. In Camas Slough samples, all but the least toxic dioxin compounds were either not detected or detected at trace concentrations between the estimated detection limit and reportable detection limit. No dioxin or dioxin-like compounds were detected above the reportable detection limits in Columbia River samples.

Exhibit 8 SHOR23-01

TABLE 2
COLUMBIA RIVER FRESHWATER SEDIMENT RESULTS OF CHEMISTRY AND CONVENTIONAL ANALYSES

Chemical Parameter	OF1-1	OF1-2	OF1-3	OF1-4	Sediment Management Standards	
					Sediment Cleanup Objective	Cleanup Screening Level
Conventional Chemicals (mg/Kg)						
Ammonia	<63	<47	<62	<61	230	300
Sulfide	<13	<13	<13	<13	39	61
Total Organic Carbon	310 J H	280 J H	320 J H	250 J H	N/A	N/A
Conventional Chemicals (%)						
Total Solids	71	71	69	73	N/A	N/A
Metals (mg/Kg)						
Arsenic	1.7	1.8	1.8	2.1	14	120
Cadmium	0.096	0.095	0.11	0.12	2.1	5.4
Chromium	8.6	8.5	9.7	12 B	72	88
Copper	5.4	5.5	6.0	6.6	400	1200
Lead	2.8	3.1	3.6	3.6	360	>1300
Mercury	<0.030 F1	<0.032	<0.036	<0.040	0.66	0.8
Nickel	9.5	11	11	13	26	110
Selenium	0.57	1.48	0.54	0.49	11	>20
Silver	0.010 J	<0.059	0.011 J	0.015 J	0.57	1.7
Zinc	39	41	48	49	3200	>4200
Organics (µg/Kg)						
4-Methylphenol[1]	<52	<52	<50	<26 H	260	2000
Benzoic Acid	<650	<650	<630	<330 H	2900	3800
Beta-Hexachlorocyclohexane	<0.13 F1	<0.12	0.070 J	<0.13	7.2	11
Bis (2-ethylhexyl) phthalate	<160	<160	<150	<79 H	500	22000

Chemical Parameter	OF1-1	OF1-2	OF1-3	OF1-4	Sediment Management Standards	
					Sediment Cleanup Objective	Cleanup Screening Level
Carbazole	<39	<39	<38	<200	900	1100
Dibenzofuran	<39	<39	<38	<200	200	680
Dibutyltin	<16 H	<16 H	<16 H	<17 H	910	130000
Dieldrin	<0.26 F1	<0.25	<0.25 p	<0.26	4.9	9.3
Di-n-butyl phthalate	<130	<130	<130	<66 H	380	1000
Di-n-octyl phthalate	<26 H F2	<26 H	<25 H	<26 H	39	>1100
Endrin Ketone	0.019 J p	<0.25	<0.25	<0.26	8.5	>8.5
Monobutyltin	<9.9 H	<9.7 H	<9.6 H	<11 H	540	>4800
Pentachlorophenol	<100	<100	<100	<530	1200	>1200
Phenol	<39	<39	<38	<20 H	120	210
Tetrabutyltin	<49 H	<49 H	<48 H	<54 H	97	>97
Total PCB Aroclors	<1.4	<1.4	<1.4	<1.5	110	2500
Total DDDs	<0.26 p	<0.25	<0.25	<0.26	310	860
Total DDEs	0.021 J p	0.022 J p	0.019 J p	<0.26	21	33
Total DDTs	<0.26	<0.25	<0.25	<0.26	100	8100
Total PAHs	<200.5	<200.5	<193.1 F1 F2	<1016	17000	30000
Tributyltin	<8.6 H	<8.5 H	<8.4 H	<9.4 H	47	320
Bulk Petroleum Hydrocarbons (mg/Kg)						
Total Petroleum Hydrocarbon (TPH) – Diesel (C10-C24)	<63	<61	<63	<65	340	510
Total Petroleum Hydrocarbon (TPH) – Residual (>C24-C36)	16 J	17 J	12 J	<65	3600	4400

Chemical Parameter	OF1-1	OF1-2	OF1-3	OF1-4	Sediment Management Standards	
					Sediment Cleanup Objective	Cleanup Screening Level
Dioxins and Furans						
Total Toxic Equivalency CDD, CDF	0.325	0.332	0.344	0.351	N/A	N/A
Grain Size (%)						
Clay	0.10	0.10	0.20	0.10	N/A	N/A
Sand	100	99	99	99	N/A	N/A
Silt	0.30	0.70	0.50	0.40	N/A	N/A
Gravel	0.10	0.10	0.00	0.10	N/A	N/A
Cobble	0.00	0.00	0.00	0.00	N/A	N/A

QUALIFIERS:
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
F2 = MS/MSD RPD exceeds control limits
H = Sample was prepped or analyzed beyond specific holding time.
J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
p = The %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported
* = LCS or LCSD is outside acceptance limits.
NOTE:
1 = The results for 4-Methylphenol are combined results for 3-Methylphenol and 4-Methylphenol because the analytical laboratory process was not able to provide separate quantitation of the compounds.
N/A = not applicable
CDD = Chloro Dibenzo-p-Dioxin
CDF = Chloro Dibenzo-p-Furan

Exhibit 8 SHOR23-01

TABLE 3
CAMAS SLOUGH FRESHWATER SEDIMENT RESULTS OF CHEMISTRY AND CONVENTIONAL ANALYSES

Chemical Parameter	OF2-1	OF2-2	OF2-3	OF2-4	OF2-5	OF2-5D	Sediment Management Standards	
							Sediment Cleanup Objective	Cleanup Screening Level
Conventional Chemicals (mg/Kg)								
Ammonia	<72	<46	<51	<63	<60	<72	230	300
Sulfide	<15	<14	<13	<13	<15	--	39	61
TOC	3500 H	2100 H	1500 J H	1200 J H	1600 J H	1700 J H	N/A	N/A
Conventional Chemicals (%)								
Total Solids	64	68	65	73	67	67	N/A	N/A
Metals (mg/Kg)								
Arsenic	7.7	7.2	6.5	7.7	8.9	7.9	14	120
Cadmium	0.26	0.16	0.16	0.12	0.20	0.17	2.1	5.4
Chromium	16	17	16	17 B F1	19 B	18 B	72	88
Copper	29	39	37	40 F1	47	43	400	1200
Lead	9.8	9.0	7.7	5.7	12	9.1	360	>1300
Mercury	0.026 J	0.021 J	0.042	0.011 J	0.024 J	0.026 J	0.66	0.8
Nickel	0.15	16	16	16	17	15	26	110
Selenium	0.66	0.62	0.52	0.86	0.97	0.95	11	>20
Silver	0.035 J	0.024 J	0.021 J	0.015 J	0.024 J	0.031 J	0.57	1.7
Zinc	85	75	65	73	94	88	3200	>4200
Organics (µg/Kg)								
4-Methylphenol[1]	<150	<130	<120	<250	<29 H	<29 H	260	2000
Benzoic Acid	<1900	<1600	<1500	<320 H	<360 H	<360 H	2900	3800
Beta-Hexachlorocyclohexane	<0.72	<0.69	<0.65	<0.64	<0.74	<0.71	7.2	11

Chemical Parameter	OF2-1	OF2-2	OF2-3	OF2-4	OF2-5	OF2-5D	Sediment Management Standards	
							Sediment Cleanup Objective	Cleanup Screening Level
Bis(2-ethylhexyl) phthalate	<450	<380	<360	20 J H F2	<86 H	<86 H	500	22000
Carbazole	<110	<95	<91	<190	<220	<210	900	1100
Dibenzofuran	<110	<95	<91	<190	<22 H	<22 H	200	680
Dibutyltin	<19 H	<17 H	<17 H	<16 H	<19 H	<18 H	910	130000
Dieldrin	<1.4	<1.4	<1.3	<1.3	<1.5	<1.4	4.9	9.3
Di-n-butyl phthalate	<370	<320	<300	<65 H	<72 H	<72 H	380	1000
Di-n-octyl phthalate	<30 H	<25 H	<24 H	<26 H	<29 H	<29 H	39	>1100
Endrin Ketone	<1.4	<1.4	<1.3	<1.3	<1.5	<1.4	8.5	>8.5
Monobutyltin	<12 H	<11 H	<10 H	<10 H F2	<11 H	<11 H	540	>4800
Pentachlorophenol	<300	<250	<240	<500	<590	<560	1200	>1200
Phenol	<110	<95	<91	<19 H	<22 H	<22 H	120	210
Tetrabutyltin	<59 H	<53 H	<51 H	<50 H F2	<57 H	<56 H	97	>97
Total PCB Aroclors	<1.6	<1.5	<1.3	<1.4	<1.7	<1.6	110	2500
Total DDDs	<1.4	<1.4	<1.3	<1.3	<1.5	<1.4	310	860
Total DDEs	<1.4	<1.4	<1.3	<1.3	<1.5	<1.4	21	33
Total DDTs	<1.4	<1.4	<1.3	<1.3	<1.5	<1.4	100	8100
Total PAHs	<572	45.4 J *	<460	<958 F2	<1124	<1076	17000	30000
Tributyltin	<10 H	<9.2 H	<9.0 H	<8.8 H	<10 H	<9.7 H	47	320
Bulk Petroleum Hydrocarbons (mg/Kg)								
Total Petroleum Hydrocarbon (TPH) – Diesel (C10-C24)	<71	<66	<62	<64	<69	<70	340	510
Total Petroleum Hydrocarbon (TPH) – Residual (>C24-C36)	70 J	60 J	30 J	23 J	23 J	38 J	3600	4400

Exhibit 8 SHOR23-01

Chemical Parameter	OF2-1	OF2-2	OF2-3	OF2-4	OF2-5	OF2-5D	Sediment Management Standards	
							Sediment Cleanup Objective	Cleanup Screening Level
Dioxins and Furans								
Total Toxic Equivalency CDD, CDF	0.350	0.347	0.314	0.376	0.412	--	N/A	N/A
Grain Size (%)								
Clay	1.0	0.50	0.50	0.20	0.50	0.50	N/A	N/A
Sand	87	91	91	70	95	95	N/A	N/A
Silt	9.5	4.6	4.6	1.3	3.4	3.4	N/A	N/A
Gravel	2.6	4.1	4.1	29	0.80	0.90	N/A	N/A
Cobble	0.00	0.00	0.00	0.00	0.00	0.00	N/A	N/A

QUALIFIERS:
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
F2 = MS/MSD RPD exceeds control limits
H = Sample was prepped or analyzed beyond specific holding time.
J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
p = The %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported
* = LCS or LCSD is outside acceptance limits.
NOTE:
1 = The results for 4-Methylphenol are combined results for 3-Methylphenol and 4-Methylphenol because the analytical laboratory process was not able to provide separate quantitation of the compounds.
N/A = not applicable
CDD = Chloro Dibenzo-p-Dioxin
CDF = Cloro Dibenzo-p-Furan

Exhibit 8 SHOR23-01

4.2 Sediment Biological Tests

The SMS includes SCO and CSL biological criteria to identify sediments that may have adverse effects on biological resources. The SCO establishes a no-adverse-effects level, including on acute or chronic adverse effects, to the benthic community. The CSL establishes a minor adverse effects level, including acute or chronic effects, to the benthic community. Table 4 presents the results of biological tests together with SCO and CSL criteria for each bioassay endpoint. No sediment sample mortality results from the *Hyalella* 10-day toxicity test were significantly higher than mortality in the control sediment. A few sediment sample mortality results from the *Chironomus* 20-day toxicity test were significantly higher than the control sediment toxicity; however, the percent mortality for all samples was 2.5 to 12.5% higher than control sediment mortality and thus did not exceed the SCO criterion of >25%. All but one sediment sample produced results from the *Chironomus* 20-day growth test that were significantly lower than growth in the control sediment, and growth in the OF1-3 sediment sample was 28.9% lower than growth in the control sediment. Because the difference in growth exceeded the 25% SCO criterion, this one result indicated a potential for chronic adverse effects to benthic organisms at the OF1-3 location could not be ruled out; however, the difference was well below the CSL level of 40% that would indicate a minor adverse chronic effect.

TABLE 4
COLUMBIA RIVER FRESHWATER SEDIMENT BIOLOGICAL TEST RESULTS

	Hyallela 10-day Toxicity Test			*Chironomus* 20-day Toxicity Test			*Chironomus* 20-day Toxicity Test		
Sample	**Percent Mortality (Mean ± SD)**	**Significantly Higher Than Control?**	**Percent Higher Than Control**	**Percent Mortality (Mean ± SD)**	**Significantly Higher Than Control?**	**Percent Higher Than Control**	**Avg. Ash-free Dry Wt/Midge (mg) (Mean ±SD)**	**Significantly Lower Than Control?**	**Percent Lower Than Control**
Control	1.3 ± 3.5	--	--	2.5 ± 4.6	--	--	1.63 ± 0.16	--	--
OF1-1	1.3 ± 3.5	No	0.0	15.0 ± 14.1	Yes	12.5	1.35 ± 0.14	Yes	17.5
OF1-2	0.0 ± 0.0	No	-1.3	11.3 ± 14.6	No	8.8	1.24 ± 0.16	Yes	23.9
OF1-3	2.5 ± 7.1	No	1.2	5.0 ± 7.6	No	2.5	1.17 ± 0.12	Yes	**28.9**
OF1-4	3.8 ± 7.4	No	2.5	12.5 ± 11.6	Yes	10.0	1.32 ± 0.20	Yes	19.1
OF2-1	3.8 ± 7.4	No	2.5	13.8 ± 13.0	Yes	11.3	1.51 ± 0.28	No	7.5
OF2-2	0.0 ± 0.0	No	-1.3	8.8 ± 8.3	No	6.3	1.35 ± 0.16	Yes	17.5
OF2-3	1.3 ± 3.5	No	0.0	7.1 ± 7.6	No	4.6	1.32 ± 0.11	Yes	19.3
OF2-4	0.0 ± 0.0	No	-1.3	8.8 ± 6.4	Yes	6.3	1.49 ± 0.14	Yes	9.0
OF2-5	1.3 ± 3.5	No	0.0	12.56 ± 12.8	Yes	10.0	1.43 ± 0.20	Yes	12.4
SCO	--	--	>15	--	--	>15	--	--	>25
CSL	--	--	>25	--	--	>25	--	--	>40

SD = Standard Deviation
SCO = Sediment Cleanup Objective (exceedance level shown)
CSL = Cleanup Screening Level (exceedance level shown)
Bold = Exceedance of the SCO criterion

CHAPTER 5.
References

Ecology. 2015. Sediment cleanup users manual II: Guidance for implementing the cleanup provisions of the Sediment Management Standards, Chapter 173-204 WAC. Publication No. 12-09-057. Washington State Department of Ecology. March 2015. https://fortress.wa.gov/ecy/publications/documents/1209057.pdf

Ecology. 2016. National Pollution Discharge Elimination System waste discharge permit No. WA0000256. Washington State Department of Ecology. Modified March 25, 2016. https://fortress.wa.gov/ecy/wqreports/public/f?p=110:1000:2156606099633169::NO:RP:P1000_FACILITY_ID,P1000_FACILITY_NAME:66765272,GEORGIA%20PACIFIC%20CONSUMER%20PRODUCTS%20(Camas)%20LLC

ESA. 2017. Sediment sampling and analysis plan: NPDES waste discharge permit number WA0000256. Prepared by Environmental Science Associates for Georgia-Pacific Consumer Products (Camas) LLC. Camas, Washington. August 2017.

Appendix A
Field Notes and Sample Forms

1

Field Notes
- Supplement to Sample Forms
G-P Camas Mill Sediment Sampling

9-12-17 to 9-14-17

ESA

2

G-P Camas Mill Sediment Sampling - Day 1

Field Log 9/12/17

Crew: JV, CF

0940 - on station at OFZ-6; Shallow but accessible

Wx = Sunny, warm

Water - Calm (Camas Slough)

0945 - Equipment Decon. w/ Alconox / Distilled

Followed by DI Rinse

Rite in the Rain

1040 - Attempt to Sample OF2-6

- Pulled up Cobbles/gravel multiple Grabs (~6)
- No Fine sediment Retained
- Worked outward (Southward) from Station
- First sediment Retained ~150' South of OF2-6 Target

1120 - Call Jim G. to discuss Alternate Plan

- Clearly Rocky Along N. Shoreline @ Low tide
Photos Taken

- Attempt to sample @ All Target Stations, then adjust as needed to find depositional areas

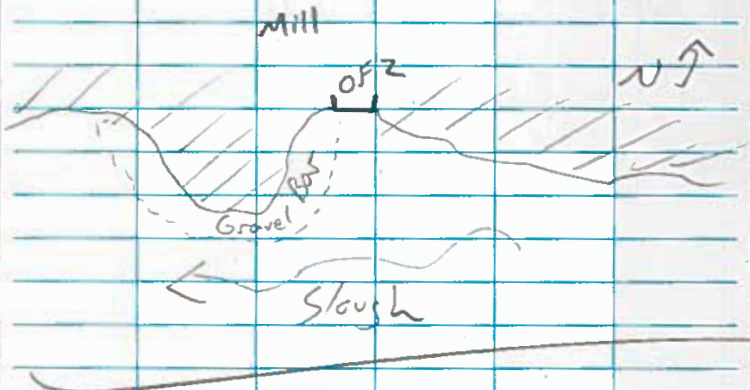
OF2-5 - 1130

Too Shallow to Access Target Coord.
- 2.5' water Depth Due South of Target by 95' - Cobble bed visible
- Attempt to Sample ~4.5' W/ S. South of Target (OF2-5A) + Cobble

Rite in the Rain

OF2-4 - Can't Access -
Grounded short
of Target Coord.,
1145 on Cobble bed.

~20-25 South & East
of Target Coord.



OF2-3 - on station
~3 Water
1155 for Grab Attempts
- Cobbles & Twigs
-

OF2-2
1205 - Can't Access
Target, which
is on gravel bar;
Stopped 30' south by
Depth (Aground)
E/W Right on
Cobble bed visible
no Sample Attempted

OF-2-1
1215 Accessed Target
Coords; ~7.5' wtr
Depth;

Rite in the Rain

7

OF2-1 Grab Attempt

1218 - 1228

-3 Grab Attempts

- 1st two Retrieved cobble - incomplete jaw closure

- 3rd Attempt - jaws closed small amount of Gravel, cobble, sand, & Corbicula clams

~ Target Location is upstream of Large pipe crossing

8

- 1230 - 1300 - Lunch

1300 - Attempt to sample farther from shore, starting upstream of Outfall 2, on upstream side of pipeline crossing

OF2-1 - Successfully retrieved sand sample South of Target 2-1 ~190' S.
OF2-1-1
-2
-3
Time: 1345

OF2-2 - Sample Retrieved on Downstream side of pipeline crossing, directly South of OF2
Time: 1530
~190'

Rite in the Rain

9

OF2-3 Sample obtained
@ 140-200' Due
South of Target OF2-6

2-3-1
-2 Time: 1700
-3

Decontamination w/ Alconox/
Distilled Solution
performed prior to Sampling
each new station

The 3-station Sampling Covered
Same overall N/S extents
of Target Coords; w/ middle
of 3 at ~ same E/W
as Outfall 2

10

- Leaving Site @ 1750
to Camas Marina

Rite in the Rain

GP Sediment Sampling
Day 12 9/13/17
crew: JV/CF WX= Mostly Sunny Light w. wind

- Obtained new Safe Work Permit at Camas Mill to start
- Loaded Boat & Departed Marina ~ 1015 AM
- on-site in Col. River near OF1 ~ 1030 AM
- Prepped Gear
- Calibration Verification of Rugked 45 & 56 pH/Temp. Meter at 1115 AM

Rite in the Rain

12

YSI pH Cal. Verification

Buffer	pH Read	Temp.
7	6.98	22.82°C
10	10.06	22.86°C

Good ✓

1200 – Sample Attempts @ outfall 2

OF1-1 – US of outfall

Grab A Collected at 1230

B Sand

C

13

1350 pH/Temp Readings @ OF1-1

YSI 556

@ wtr. surface (2' depth)

pH = 7.29

temp = 21.18°C

Wtr. Depth = ~~50~~ 53.0'

Sensor @ near bottom

- Lowered w/ Razor until bottom reached, then up ~ 3'

pH = 5.59

Temp = 21.22°C

Rite in the Rain

14

15/5 OF 1-2 pH

Wtr Depth = 59.0'

Sensor Depth = ~56'

pH = 5.84

Temp = 21.44°C

OF 1-2 – Grabs Collected A, B, C

Time 1435-1505 Sand

15

OF 1-3 + 1620

First → Attempt & retrieved gravel incomplete jaw closure

↓ Successful Grabs A-D 1650-1825 Sand

1830 pH / Temp at OF 1-3

Wtr Depth = 59.5

Sensor Depth ~ 58.5

pH = 7.00 SU

Temp = 21.42° C

Rite in the Rain

16

1910 - Leaving Site for Marina

GP Sediment Sampling 17

Day 3

Wx: Partly Sunny Light E. wind

Crew: JV/CF

0715 - Arrive at Marina to begin boat prep.

0735 - To Camas Mill to meet Phil for Safe Work Permit

0845 - Boat loaded & leaving marina

0900 - On Site @ OF1 to prep. - Decon. Ponar & bowls & utensils

0940 - Anchored on OF1-6 to Attempt Sampling

3 Grabs attempted - NOT SUCCESSFUL - too much current

Rite in the Rain

0945 Pull Anchor to Attempt while drifting w/ current

Three Attempts Made while Drifting - Too much current; of Rock

Will Return to on incoming tide

1015 Leaving for slough sites

- Established OF 2-4 Between & slightly inshore of OUT OF 2-2 & OF 2-3

- Transition Point between

inshore gravels & offshore sands;

- Many Failed grabs due to incomplete jaw closure due to large sticks,
- Completed sample w/ 5 successful grabs A-E @ 1200

Rite in the Rain

OF2-4 cont'd 20

- Many Clams Removed by hand from sample
- pH/Temp
  Water Depth = 7.0'
  Sensor Depth = 6.0'
  pH = 8.32
  Temp = 21.0°C

OF2-5 offshore & slightly DS of OF2-4
Shallower Water
Enough Sample w/ 3 Grabs -
Duplicates for Chemistry

21

- pH/Temp @ OF2-5
  Water Depth = 3.8'
  Sensor Depth = 3.0'
  pH = 8.50
  Temp = 21.4°C
  Time = 1345

Leaving Camas Slough @ 1410 to try sampling around high tide (less current) at OF1

Rite in the Rain

1430 - on-site @ OF1

~~Bot~~ Starting w/ OF1-4

- Sample obtained w/ 3 successful grabs A-C ; Sand 1502-1655
- Several empty grabs returned as well
- Difficult sampling in deep water

1745 pH/Temp @ OF1-4

Wtr Dpth = 62'

Sensor Dpth = 18 m

pH = 6.46

Temp = 21.05°C

1800-1840

Attempted to sample OF1-5 ; Not successful multiple Grabs ; very small amount of Sand 1st Grab ; Appears rocky on sonar imagery

OF1-6

1845-1900 Attempt Grabs, no sediment returned in ponar ; Bottom looks rocky in sonar ; Ponar stuck/caught in something on bottom while attempting grab, - can't pull in.

Rite in the Rain.

OF 1-6 cont'd

- Ponar finally popped loose
- No further attempts made
  - hazardous in current

1900 - Leave site for marina

Rite in the Rain

ESA Field Sample Form

Project Name: G-P Camas Mill NPDES Permit Sediment Monitoring

ESA Project Number: D160430

Date: 9/12/17

Crew: JV/CF

Page 1 of 1

Site: Camas Slough; outfall 2

Station #	Grab ID	Time	Water Depth (FT)	Sediment Depth ~~(FT)~~ CM	Sediment Type	Color	Layering	% Wood waste	pH* (S.U.)	Temp.*	Notes (debris, odor, sheen, etc.)
OF2-1	1	1315	6.0	7	fine sand	brown	none	~~<1%~~ 5%	~~8.~~		no sheen; no odor
OF2-1	2	1333	5.5	4.5	fine sand	brown	none	5%			- corbicula clams
OF-2-1	3	1345	6.0	6.5	fine sand	brown	none	5%			removed; some twigs,
OF 2-1		1434	5.5						8.35	22.2°C	smaller nat. wood debris
OF 2-~~1~~2	1	1510	5.0	5	sand	brown	none	5%			no sheen; no odor
OF2-2	2	1520	5.0	8.5	sand	brown	none	5%			some clams; pine cone;
OF2-2	3	1530	~~5.0~~ 4.5	8.5	sand	brown	none	5%	8.30		small wood fragments;
		1550	5.0						~~8.29~~	22.2°C	sand is coarser than
											OF2-1
OF2-3	1	1635	4.7	8.5	sand	greyish brown	none	<5%			smaller nat. wood
OF2-3	2	1650	4.8	8.5	sand	greyish brown	none	<5%			debris; no sheen; no
OF2-3	3	1700	4.8	8.5	sand	greyish brown	none	<5%			odor; clams
		1715	4.7						8.39	22.2C	

*pH/Temp readings taken ~ 1' off bottom w/ YSI pH 100 w/ 4m cable

ESA Field Sample Form

Project Name: G-P Camas Mill NPDES Permit Sediment Monitoring

ESA Project Number: D160430

Date: 8/13/17 (9)

Crew: CF/JV

Page 1 of 1

Site: Columbia River; Outfall 1

Station #	Grab ID	Time	Water Depth (ft)	Sediment Depth (cm)	Sediment Type	Color	Layering	% Wood Waste	pH* (S.U.)	Temp.*	Notes (debris, odor, sheen, etc.)
OF1-1	A	1230	53.7	8.5	sand	grey	none	NONE OBSERVED			no odor; no sheen;
OF1-1	B	1245	54.5	8.0	sand	grey	none	↓			small twigs, wood frag-
OF1-1	C	1300	54.2	8.0	sand	grey	none	↓			ments; no wood waste
~~OF1-2~~	~~A~~	1350	53.0			grey			5.59	21.22°C	
OF1-2	A	1435	59.0	6.0	sand	grey	none	NONE OBSERVED			no odor; No sheen
OF1-2	B	1445	59.0	7.0	sand	grey	none	↓			Few corbicula clams;
OF1-2	C	1505	59.5	6.0	sand	grey	none	↓			small wood fragments;
		1515	59.0			grey			5.84	21.44°C	Fir needles
OF1-3	A	1650	59.5	5.5	sand	grey	none	NONE OBSERVED			No wood waste; no
OF1-3	B	1715	59.2	3.0	sand	grey	none	↓			odor; no sheen
OF1-3	C	1800	59.0	7.0	sand	grey	none	↓			
OF1-3	D	1825	59.2	3.0	sand	grey	none	↓			
		1930	59.5			grey			7.00	21.42°C	

* pH/temp readings taken ~3' off bottom; sensor lowered w/ Ponar until bottom reached, then pulled up ~3'; YSI 556 w/ 20m' cable

ESA Field Sample Form

Project Name: G-P Camas Mill NPDES Permit Sediment Monitoring

ESA Project Number: D160430

Date: 9/14/17

Crew: CF/JV

Site: Camas Slough & Col. River; outfalls 1 & 2

Station #	Grab ID	Time	Water Depth (Ft)	Sediment Depth (Cm)	Sediment Type	Color	Layering	% Wood waste	pH* (S.U.)	Temp.*	Notes (debris, odor, sheen, etc.)
OF2-4	A	1055	6.0	6.0	sand	brown	none	~5%			clams, no odor, no sheen
OF2-4	B	1103	6.0	5.5	sand	brown	none	↑			
OF2-4	C	1115	6.7	5.0	sand	brown	none				CLAMS
OF2-4	D	1124	6.3	4.5	sand	brown	none				
OF2-4	E	1129	7.2	5.0	Coarse sand + small gravel	brown	none	↓			several clams
OF-2-4		1200	7.2	—	—	—	—		8.32	21.0°C	
OF2-5	A	1300	3.7	8.0	sand	brown	none	<1%			no odor; no sheen;
OF2-5	B	1315	4.0	7.0	sand	brown	none	↓			a few clams
OF2-5	C	1330	4.1	8.0	sand	brown	none				stick; wood fragments;
OF2-5		1345	3.8	—	—	—	—		8.50	21.4°C	black clams
OF1-4	A	1502	62.0	5.5	sand	grey	none	<1%			
OF1-4	B	1625	56.0	4.0	sand	grey	none	↓			
OF1-4	C	1655	62.0	5.0	sand	grey	none				
OF1-4		1745	62.0	—	—	—	—	—	6.46	21.05°C	
OF1-5	A	1820	56.0	5.0	sand	grey	none				Very small amount of sand in 1st grab - unable to obtain more in subseq. grabs

*pH/temp. @ OF2-4 & 2-5 taken w/ YSI pH100 ~1' off bottom
pH/temp @ OF1-4 taken 3' off bottom w/ YSI 556

Appendix B
Lab Results

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-71236-1
Client Project/Site: G-P Camas Freshwater Sediments
Revision: 2

For:
Environmental Science Associates (ESA)
5309 Shilshole Avenue NW, Suite 200
Seattle, Washington 98107

Attn: Jim Good

M. Elaine Walker

Authorized for release by:
12/29/2017 2:06:10 PM

Elaine Walker, Project Manager II
(253)248-4972
elaine.walker@testamericainc.com

LINKS
Review your project results through TotalAccess
Have a Question? Ask The Expert
Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page 1
Table of Contents 2
Case Narrative 3
Definitions 5
Client Sample Results 6
QC Sample Results 18
Chronicle 29
Certification Summary 32
Sample Summary 33
Subcontract Data 34
Chain of Custody 58
Receipt Checklists 61

Case Narrative

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Job ID: 580-71236-1

Laboratory: TestAmerica Seattle

Narrative

Job Narrative
580-71236-1

Revision 2: 12/29/2017
Per client request, the 8270D SVOCs were reanalyzed outside hold time undiluted. The samples were initially run at a 5x dilution, but the sample results exceeded tghe client action limits. The original and this reanalysis are reported here. The first reanalysis data have been turned off as they were also run at a 5x dilution and wer outside the required action level. Please note additional narrative comments below in **BOLD** type, added to the GC/MS Semi VOA section asssociated to the re-extraction / reanalysis

Revision 1: 12/19/2017
The client noted that the 8270D SVOC analysis did not follow the proper prep of 20g to 2ml to achieve low limits. The client requested that the sampled be re-extracted and reanalyted. Because the samples were not placed in the freezer after the initial analysis, the preparation and analysis was performed outisde hold time. .

Receipt
Three samples were received on 9/13/2017 12:50 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.3º C.

GC/MS Semi VOA
Method(s) 8270D: The laboratory control sample (LCS) for preparation batch 580-256990 and analytical batch 580-257097 recovered outside control limits for Di-n-octyl phthalate. This target was biased high in the LCS and not detected in the associated samples; therefore, the data have been reported.

Method(s) 8270D: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 580-256990 and analytical batch 580-257097 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected.

Method(s) 8270D: The following samples were diluted due to the nature of the sample matrix: OF2-1 (580-71236-1), OF2-2 (580-71236-2), OF2-3 (580-71236-3), (580-71266-F-3-D), (580-71266-F-3-E MS) and (580-71266-F-3-F MSD). Elevated reporting limits (RLs) are provided.

Method(s) 8270D: Pentachlorophenol recovered below control limits for the LCS associated with preparation batch 580-264022 and analytical batch 580-263999. This is not indicative of a systematic control problem because these were random marginal exceedances. Qualified results have been reported.

Method(s) Organotins: Monobutyltin and Tetra-n-butyltin recovered outside control limits for LCS associated with preparation batch 580-257308 and 580-257308 and analytical batch 580-257811. These analytes were outside the Marginal Exceedance Limits and were indicative of a systematic problem; therefore, re-extraction was performed. Out-of-hold re-extraction yielded acceptable LCS recovery and results for affected samples were corroborated; both sets of data are reported.

Method(s) Organotins: The matrix spike / matrix spike duplicate (MS/MSD) precision for preparation batch 580-257308 and 580-257308 and analytical batch 580-257811 was outside control limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC Semi VOA
Method(s) 8081B: In analytical batch 580-257614, the %RPD between the primary and confirmation column exceeded 40% for some analytes for the following sample(s): (580-71266-C-1-C). The lower value(s) has been reported in accordance with the laboratory's SOP.

Method(s) 8081B: The matrix spike duplicate (MSD) recoveries for preparation batch 580-256979 and analytical batch 580-257614 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the MS and associated laboratory control sample (LCS) recovery was within acceptance limits.

Method(s) 8081B: In analytical batch 580-257614, the following sample(s) required a copper clean-up to reduce matrix interferences caused by sulfur. The copper lot number is 615040-BB. The following samples are impacted: OF2-1 (580-71236-1), OF2-2 (580-71236-2), OF2-3 (580-71236-3), (LCS 580-256979/2-A), (MB 580-256979/1-A), (580-71266-C-1-C), (580-71266-C-1-D MS) and

Case Narrative

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Job ID: 580-71236-1 (Continued)

Laboratory: TestAmerica Seattle (Continued)

(580-71266-C-1-E MSD).

Method(s) 8081B: The following samples was diluted due to extract color: OF2-1 (580-71236-1), OF2-2 (580-71236-2) and OF2-3 (580-71236-3). Elevated reporting limits (RL) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
Method(s) 7471A: The matrix spike (MS) recoveriyfor preparation batch 580-257821 and analytical batch 580-257853 were outside control limits for Mercury. Sample matrix interference and/or non-homogeneity are suspected because the MSD and associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
Method(s) 9060_PSEP: The following sample(s) were prepared outside of preparation holding time due to an instrument failure: OF2-1 (580-71236-1) and OF2-3 (580-71236-3). The soil TOC instrument broke down before the samples could be run. Client requested that the sample be run out of hold. The hold time for PSEP TOC is 14 days. The hold time for regular TOC analysis is 28 days.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Geotechnical
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Definitions/Glossary

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
X	Surrogate is outside control limits
H	Sample was prepped or analyzed beyond the specified holding time
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

GC Semi VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
B	Compound was found in the blank and sample.
H	Sample was prepped or analyzed beyond the specified holding time
F3	Duplicate RPD exceeds the control limit
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-1

Date Collected: 09/12/17 13:45
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-1

Matrix: Solid
Percent Solids: 67.0

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	ND		22	3.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
2-Methylnaphthalene	ND		37	6.6	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
3 & 4 Methylphenol	ND		150	11	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Acenaphthene	ND		19	3.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Acenaphthylene	ND		19	3.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Anthracene	ND		19	3.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Benzo[a]anthracene	ND		19	3.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Benzo[a]pyrene	ND		45	9.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Benzo[g,h,i]perylene	ND		45	11	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Benzofluoranthene	ND		110	26	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Benzoic acid	ND		1900	790	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Bis(2-ethylhexyl) phthalate	ND		450	100	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Carbazole	ND		110	23	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Chrysene	ND		45	9.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Dibenz(a,h)anthracene	ND		37	8.9	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Dibenzofuran	ND		110	27	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Di-n-butyl phthalate	ND		370	42	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Di-n-octyl phthalate	ND	*	150	170	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Fluoranthene	ND		19	3.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Fluorene	ND		19	3.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Indeno[1,2,3-cd]pyrene	ND		30	3.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Naphthalene	ND		19	3.7	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Pentachlorophenol	ND		300	68	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Phenanthrene	ND		45	8.9	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Phenol	ND		110	28	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5
Pyrene	ND		45	11	ug/Kg	☼	09/22/17 09:53	09/23/17 17:34	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*90*		*10 - 126*	*09/22/17 09:53*	*09/23/17 17:34*	*5*
2-Fluorobiphenyl	*73*		*57 - 110*	*09/22/17 09:53*	*09/23/17 17:34*	*5*
2-Fluorophenol	*73*		*36 - 125*	*09/22/17 09:53*	*09/23/17 17:34*	*5*
Nitrobenzene-d5	*80*		*54 - 113*	*09/22/17 09:53*	*09/23/17 17:34*	*5*
Phenol-d5	*83*		*59 - 113*	*09/22/17 09:53*	*09/23/17 17:34*	*5*
Terphenyl-d14	*81*		*68 - 120*	*09/22/17 09:53*	*09/23/17 17:34*	*5*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	ND	H	4.5	0.74	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
2-Methylnaphthalene	ND	H	7.4	1.3	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
3 & 4 Methylphenol	**5.8**	**J H**	30	2.2	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Acenaphthene	ND	H	3.7	0.74	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Acenaphthylene	ND	H	3.7	0.74	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Anthracene	ND	H	3.7	0.74	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Benzo[a]anthracene	ND	H	3.7	0.74	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Benzo[a]pyrene	ND	H	8.9	1.9	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Benzo[g,h,i]perylene	ND	H	8.9	2.2	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Benzofluoranthene	ND	H	22	5.2	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Benzoic acid	ND	H	370	160	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Bis(2-ethylhexyl) phthalate	ND	H	89	20	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Carbazole	ND	H	22	4.6	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-1
Date Collected: 09/12/17 13:45
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-1
Matrix: Solid
Percent Solids: 67.0

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chrysene	ND	H	8.9	1.9	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Dibenz(a,h)anthracene	ND	H	7.4	1.8	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Dibenzofuran	ND	H	22	5.4	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Di-n-butyl phthalate	ND	H	74	8.5	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Di-n-octyl phthalate	ND	H	30	33	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Fluoranthene	**2.4**	**J H**	3.7	0.74	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Fluorene	ND	H	3.7	0.74	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Indeno[1,2,3-cd]pyrene	ND	H	6.0	0.74	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Naphthalene	**0.94**	**J H**	3.7	0.74	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Pentachlorophenol	ND	H *	60	14	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Phenanthrene	ND	H	8.9	1.8	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Phenol	ND	H	22	5.7	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1
Pyrene	ND	H	8.9	2.2	ug/Kg	☼	09/22/17 09:53	12/21/17 19:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*85*		*10 - 126*	*09/22/17 09:53*	*12/21/17 19:08*	*1*
2-Fluorobiphenyl	*90*		*57 - 110*	*09/22/17 09:53*	*12/21/17 19:08*	*1*
2-Fluorophenol	*104*		*36 - 125*	*09/22/17 09:53*	*12/21/17 19:08*	*1*
Nitrobenzene-d5	*93*		*54 - 113*	*09/22/17 09:53*	*12/21/17 19:08*	*1*
Phenol-d5	*103*		*59 - 113*	*09/22/17 09:53*	*12/21/17 19:08*	*1*
Terphenyl-d14	*90*		*68 - 120*	*09/22/17 09:53*	*12/21/17 19:08*	*1*

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibutyltin	ND		19	4.4	ug/Kg	☼	09/26/17 13:24	10/02/17 14:49	1
Monobutyltin	ND	*	12	2.9	ug/Kg	☼	09/26/17 13:24	10/02/17 14:49	1
Tetra-n-butyltin	ND	*	58	17	ug/Kg	☼	09/26/17 13:24	10/02/17 14:49	1
Tributyltin	ND		10	2.2	ug/Kg	☼	09/26/17 13:24	10/02/17 14:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*9*	*X*	*10 - 113*	*09/26/17 13:24*	*10/02/17 14:49*	*1*

Method: Organotins - Organotins, PSEP (GC/MS) - RE

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibutyltin	ND	H	19	4.5	ug/Kg	☼	10/04/17 16:32	10/05/17 19:31	1
Monobutyltin	ND	H	12	2.9	ug/Kg	☼	10/04/17 16:32	10/05/17 19:31	1
Tetra-n-butyltin	ND	H	59	17	ug/Kg	☼	10/04/17 16:32	10/05/17 19:31	1
Tributyltin	ND	H	10	2.3	ug/Kg	☼	10/04/17 16:32	10/05/17 19:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*34*		*10 - 113*	*10/04/17 16:32*	*10/05/17 19:31*	*1*

Method: 8081B - Organochlorine Pesticides (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4'-DDD	ND		1.4	0.22	ug/Kg	☼	09/22/17 08:46	09/29/17 13:03	5
2,4'-DDE	ND		1.4	0.22	ug/Kg	☼	09/22/17 08:46	09/29/17 13:03	5
2,4'-DDT	ND		1.4	0.12	ug/Kg	☼	09/22/17 08:46	09/29/17 13:03	5
4,4'-DDD	ND		1.4	0.053	ug/Kg	☼	09/22/17 08:46	09/29/17 13:03	5
4,4'-DDE	ND		1.4	0.10	ug/Kg	☼	09/22/17 08:46	09/29/17 13:03	5
4,4'-DDT	ND		1.4	0.11	ug/Kg	☼	09/22/17 08:46	09/29/17 13:03	5
beta-Hexachlorocyclohexane	ND		0.72	0.082	ug/Kg	☼	09/22/17 08:46	09/29/17 13:03	5

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-1

Date Collected: 09/12/17 13:45
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-1

Matrix: Solid
Percent Solids: 67.0

Method: 8081B - Organochlorine Pesticides (GC) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dieldrin	ND		1.4	0.085	ug/Kg	☼	09/22/17 08:46	09/29/17 13:03	5
Endrin ketone	ND		1.4	0.087	ug/Kg	☼	09/22/17 08:46	09/29/17 13:03	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*56*		*16 - 123*	*09/22/17 08:46*	*09/29/17 13:03*	*5*
Tetrachloro-m-xylene	*80*		*38 - 121*	*09/22/17 08:46*	*09/29/17 13:03*	*5*

Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0014	0.000071	mg/Kg	☼	09/22/17 08:49	09/26/17 03:47	1
PCB-1221	ND		0.0016	0.00048	mg/Kg	☼	09/22/17 08:49	09/26/17 03:47	1
PCB-1232	ND		0.0016	0.00031	mg/Kg	☼	09/22/17 08:49	09/26/17 03:47	1
PCB-1242	ND		0.0014	0.00030	mg/Kg	☼	09/22/17 08:49	09/26/17 03:47	1
PCB-1248	ND		0.0016	0.00023	mg/Kg	☼	09/22/17 08:49	09/26/17 03:47	1
PCB-1254	ND		0.0014	0.00013	mg/Kg	☼	09/22/17 08:49	09/26/17 03:47	1
PCB-1260	ND		0.0014	0.00018	mg/Kg	☼	09/22/17 08:49	09/26/17 03:47	1
Polychlorinated biphenyls, Total	ND		0.0016	0.00048	mg/Kg	☼	09/22/17 08:49	09/26/17 03:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*56*		*25 - 149*	*09/22/17 08:49*	*09/26/17 03:47*	*1*
Tetrachloro-m-xylene	*60*		*35 - 130*	*09/22/17 08:49*	*09/26/17 03:47*	*1*

Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
#2 Diesel (C10-C24)	ND		71	17	mg/Kg	☼	09/20/17 11:56	09/22/17 16:00	1
Motor Oil (>C24-C36)	**70**	**J**	71	13	mg/Kg	☼	09/20/17 11:56	09/22/17 16:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*95*		*54 - 118*	*09/20/17 11:56*	*09/22/17 16:00*	*1*

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**7.7**		0.15	0.058	mg/Kg	☼	09/27/17 17:02	09/28/17 10:54	5
Cadmium	**0.26**		0.058	0.045	mg/Kg	☼	09/27/17 17:02	09/28/17 10:54	5
Chromium	**16**		0.15	0.037	mg/Kg	☼	09/27/17 17:02	09/28/17 10:54	5
Copper	**29**		0.29	0.13	mg/Kg	☼	09/27/17 17:02	09/28/17 10:54	5
Lead	**9.8**		0.15	0.028	mg/Kg	☼	09/27/17 17:02	09/28/17 10:54	5
Nickel	**15**		0.15	0.11	mg/Kg	☼	09/27/17 17:02	09/28/17 10:54	5
Selenium	**0.66**		0.29	0.13	mg/Kg	☼	09/27/17 17:02	09/28/17 10:54	5
Silver	**0.035**	**J**	0.058	0.012	mg/Kg	☼	09/27/17 17:02	09/28/17 10:54	5
Zinc	**85**		1.5	0.93	mg/Kg	☼	09/27/17 17:02	09/28/17 10:54	5

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.026**	**J**	0.038	0.012	mg/Kg	☼	10/02/17 12:02	10/02/17 14:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Volatile Solids	**1.9**		0.097	0.097	%			09/18/17 20:50	1
Sulfide	ND		15	3.6	mg/Kg	☼	09/17/17 19:15	09/18/17 00:05	1
Total Organic Carbon - Duplicates	**3500**	**H B**	2000	44	mg/Kg			10/05/17 09:47	1

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-1
Date Collected: 09/12/17 13:45
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-1
Matrix: Solid
Percent Solids: 67.0

General Chemistry (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
TOC Result 2	3500	H	2000	44	mg/Kg			10/05/17 09:47	1
TOC Result 1	3400	H B	2000	44	mg/Kg			10/05/17 09:47	1
Percent Solids	67.0		0.1	0.1	%			09/25/17 11:09	1
Percent Moisture	33.0		0.1	0.1	%			09/25/17 11:09	1
Total Solids	67.0		0.1	0.1	%			09/25/17 11:09	1
Total Solids	64		0.097	0.097	%			09/18/17 20:48	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia	ND	F1	72	72	mg/Kg	☼		09/19/17 12:43	1

Method: PSEP Plumb 1981 - Grain Size (PSEP Plumb 1981)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Clay	1.0				%			09/20/17 09:05	1
Sand	87				%			09/20/17 09:05	1
Silt	9.5				%			09/20/17 09:05	1
Gravel	2.6				%			09/20/17 09:05	1
Cobbles	0.00				%			09/20/17 09:05	1

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-2

Date Collected: 09/12/17 15:30
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-2

Matrix: Solid
Percent Solids: 71.4

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	ND		19	3.2	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
2-Methylnaphthalene	ND		32	5.6	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
3 & 4 Methylphenol	ND		130	9.5	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Acenaphthene	ND		16	3.2	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Acenaphthylene	ND		16	3.2	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Anthracene	ND		16	3.2	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Benzo[a]anthracene	**7.7**	**J**	16	3.2	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Benzo[a]pyrene	ND		38	8.3	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Benzo[g,h,i]perylene	ND		38	9.5	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Benzofluoranthene	ND		95	22	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Benzoic acid	ND		1600	670	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Bis(2-ethylhexyl) phthalate	ND		380	86	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Carbazole	ND		95	20	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Chrysene	ND		38	8.3	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Dibenz(a,h)anthracene	ND		32	7.6	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Dibenzofuran	ND		95	23	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Di-n-butyl phthalate	ND		320	36	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Di-n-octyl phthalate	ND	*	130	140	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Fluoranthene	**16**		16	3.2	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Fluorene	ND		16	3.2	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Indeno[1,2,3-cd]pyrene	**6.7**	**J**	25	3.2	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Naphthalene	ND		16	3.2	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Pentachlorophenol	ND		250	58	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Phenanthrene	ND		38	7.6	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Phenol	ND		95	24	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5
Pyrene	**15**	**J**	38	9.5	ug/Kg	☼	09/22/17 09:53	09/23/17 18:00	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*89*		*10 - 126*	*09/22/17 09:53*	*09/23/17 18:00*	*5*
2-Fluorobiphenyl	*75*		*57 - 110*	*09/22/17 09:53*	*09/23/17 18:00*	*5*
2-Fluorophenol	*79*		*36 - 125*	*09/22/17 09:53*	*09/23/17 18:00*	*5*
Nitrobenzene-d5	*76*		*54 - 113*	*09/22/17 09:53*	*09/23/17 18:00*	*5*
Phenol-d5	*80*		*59 - 113*	*09/22/17 09:53*	*09/23/17 18:00*	*5*
Terphenyl-d14	*77*		*68 - 120*	*09/22/17 09:53*	*09/23/17 18:00*	*5*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	ND	H	3.8	0.64	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
2-Methylnaphthalene	ND	H	6.4	1.1	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
3 & 4 Methylphenol	**4.6**	**J H**	25	1.9	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Acenaphthene	ND	H	3.2	0.64	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Acenaphthylene	ND	H	3.2	0.64	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Anthracene	ND	H	3.2	0.64	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Benzo[a]anthracene	**10**	**H**	3.2	0.64	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Benzo[a]pyrene	**8.9**	**H**	7.6	1.7	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Benzofluoranthene	**14**	**J H**	19	4.5	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Benzoic acid	ND	H	320	130	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Bis(2-ethylhexyl) phthalate	ND	H	76	17	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Carbazole	ND	H	19	3.9	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Chrysene	**8.1**	**H**	7.6	1.7	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-2
Date Collected: 09/12/17 15:30
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-2
Matrix: Solid
Percent Solids: 71.4

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibenz(a,h)anthracene	ND	H	6.4	1.5	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Dibenzofuran	ND	H	19	4.6	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Di-n-butyl phthalate	ND	H	64	7.2	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Di-n-octyl phthalate	ND	H	25	28	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Fluoranthene	**16**	**H**	3.2	0.64	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Fluorene	ND	H	3.2	0.64	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Naphthalene	**1.3**	**J H**	3.2	0.64	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Pentachlorophenol	ND	H *	51	12	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Phenanthrene	**3.1**	**J H**	7.6	1.5	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Phenol	ND	H	19	4.8	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1
Pyrene	**14**	**H**	7.6	1.9	ug/Kg	☼	09/22/17 09:53	12/21/17 19:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*83*		*10 - 126*	*09/22/17 09:53*	*12/21/17 19:33*	*1*
2-Fluorobiphenyl	*74*		*57 - 110*	*09/22/17 09:53*	*12/21/17 19:33*	*1*
2-Fluorophenol	*87*		*36 - 125*	*09/22/17 09:53*	*12/21/17 19:33*	*1*
Nitrobenzene-d5	*89*		*54 - 113*	*09/22/17 09:53*	*12/21/17 19:33*	*1*
Phenol-d5	*85*		*59 - 113*	*09/22/17 09:53*	*12/21/17 19:33*	*1*
Terphenyl-d14	*87*		*68 - 120*	*09/22/17 09:53*	*12/21/17 19:33*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzo[g,h,i]perylene	**5.8**	**J H**	7.6	1.9	ug/Kg	☼	09/22/17 09:53	12/22/17 16:17	1
Indeno[1,2,3-cd]pyrene	**8.8**	**H**	5.1	0.64	ug/Kg	☼	09/22/17 09:53	12/22/17 16:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*79*		*10 - 126*	*09/22/17 09:53*	*12/22/17 16:17*	*1*
2-Fluorobiphenyl	*72*		*57 - 110*	*09/22/17 09:53*	*12/22/17 16:17*	*1*
2-Fluorophenol	*81*		*36 - 125*	*09/22/17 09:53*	*12/22/17 16:17*	*1*
Nitrobenzene-d5	*80*		*54 - 113*	*09/22/17 09:53*	*12/22/17 16:17*	*1*
Phenol-d5	*75*		*59 - 113*	*09/22/17 09:53*	*12/22/17 16:17*	*1*
Terphenyl-d14	*94*		*68 - 120*	*09/22/17 09:53*	*12/22/17 16:17*	*1*

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibutyltin	ND		18	4.1	ug/Kg	☼	09/26/17 13:24	10/02/17 15:15	1
Monobutyltin	ND	*	11	2.7	ug/Kg	☼	09/26/17 13:24	10/02/17 15:15	1
Tetra-n-butyltin	ND	*	55	16	ug/Kg	☼	09/26/17 13:24	10/02/17 15:15	1
Tributyltin	ND		9.6	2.1	ug/Kg	☼	09/26/17 13:24	10/02/17 15:15	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*30*		*10 - 113*	*09/26/17 13:24*	*10/02/17 15:15*	*1*

Method: Organotins - Organotins, PSEP (GC/MS) - RE

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibutyltin	ND	H	17	4.0	ug/Kg	☼	10/04/17 16:32	10/05/17 19:57	1
Monobutyltin	ND	H	11	2.6	ug/Kg	☼	10/04/17 16:32	10/05/17 19:57	1
Tetra-n-butyltin	ND	H	53	15	ug/Kg	☼	10/04/17 16:32	10/05/17 19:57	1
Tributyltin	ND	H	9.2	2.0	ug/Kg	☼	10/04/17 16:32	10/05/17 19:57	1

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-2
Date Collected: 09/12/17 15:30
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-2
Matrix: Solid
Percent Solids: 71.4

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tripentyltin	*34*		*10 - 113*	*10/04/17 16:32*	*10/05/17 19:57*	*1*

Method: 8081B - Organochlorine Pesticides (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4'-DDD	ND		1.4	0.21	ug/Kg	☼	09/22/17 08:46	09/29/17 13:21	5
2,4'-DDE	ND		1.4	0.21	ug/Kg	☼	09/22/17 08:46	09/29/17 13:21	5
2,4'-DDT	ND		1.4	0.11	ug/Kg	☼	09/22/17 08:46	09/29/17 13:21	5
4,4'-DDD	ND		1.4	0.051	ug/Kg	☼	09/22/17 08:46	09/29/17 13:21	5
4,4'-DDE	ND		1.4	0.098	ug/Kg	☼	09/22/17 08:46	09/29/17 13:21	5
4,4'-DDT	ND		1.4	0.11	ug/Kg	☼	09/22/17 08:46	09/29/17 13:21	5
beta-Hexachlorocyclohexane	ND		0.69	0.079	ug/Kg	☼	09/22/17 08:46	09/29/17 13:21	5
Dieldrin	ND		1.4	0.082	ug/Kg	☼	09/22/17 08:46	09/29/17 13:21	5
Endrin ketone	ND		1.4	0.084	ug/Kg	☼	09/22/17 08:46	09/29/17 13:21	5

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl	*52*		*16 - 123*	*09/22/17 08:46*	*09/29/17 13:21*	*5*
Tetrachloro-m-xylene	*66*		*38 - 121*	*09/22/17 08:46*	*09/29/17 13:21*	*5*

Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0013	0.000067	mg/Kg	☼	09/22/17 08:49	09/26/17 04:05	1
PCB-1221	ND		0.0015	0.00046	mg/Kg	☼	09/22/17 08:49	09/26/17 04:05	1
PCB-1232	ND		0.0015	0.00030	mg/Kg	☼	09/22/17 08:49	09/26/17 04:05	1
PCB-1242	ND		0.0013	0.00028	mg/Kg	☼	09/22/17 08:49	09/26/17 04:05	1
PCB-1248	ND		0.0015	0.00021	mg/Kg	☼	09/22/17 08:49	09/26/17 04:05	1
PCB-1254	ND		0.0013	0.00012	mg/Kg	☼	09/22/17 08:49	09/26/17 04:05	1
PCB-1260	ND		0.0013	0.00017	mg/Kg	☼	09/22/17 08:49	09/26/17 04:05	1
Polychlorinated biphenyls, Total	ND		0.0015	0.00046	mg/Kg	☼	09/22/17 08:49	09/26/17 04:05	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl	*61*		*25 - 149*	*09/22/17 08:49*	*09/26/17 04:05*	*1*
Tetrachloro-m-xylene	*61*		*35 - 130*	*09/22/17 08:49*	*09/26/17 04:05*	*1*

Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
#2 Diesel (C10-C24)	ND		66	16	mg/Kg	☼	09/20/17 11:56	09/22/17 16:20	1
Motor Oil (>C24-C36)	**60**	**J**	66	12	mg/Kg	☼	09/20/17 11:56	09/22/17 16:20	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	*100*		*54 - 118*	*09/20/17 11:56*	*09/22/17 16:20*	*1*

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**7.2**		0.12	0.048	mg/Kg	☼	09/27/17 17:02	09/28/17 10:58	5
Cadmium	**0.16**		0.048	0.037	mg/Kg	☼	09/27/17 17:02	09/28/17 10:58	5
Chromium	**17**		0.12	0.030	mg/Kg	☼	09/27/17 17:02	09/28/17 10:58	5
Copper	**39**		0.24	0.11	mg/Kg	☼	09/27/17 17:02	09/28/17 10:58	5
Lead	**9.0**		0.12	0.023	mg/Kg	☼	09/27/17 17:02	09/28/17 10:58	5
Nickel	**16**		0.12	0.092	mg/Kg	☼	09/27/17 17:02	09/28/17 10:58	5
Selenium	**0.62**		0.24	0.10	mg/Kg	☼	09/27/17 17:02	09/28/17 10:58	5
Silver	**0.024**	**J**	0.048	0.0096	mg/Kg	☼	09/27/17 17:02	09/28/17 10:58	5
Zinc	**75**		1.2	0.77	mg/Kg	☼	09/27/17 17:02	09/28/17 10:58	5

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.021	J	0.038	0.011	mg/Kg	☼	10/02/17 12:02	10/02/17 14:41	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Volatile Solids	1.9		0.099	0.099	%			09/18/17 20:50	1
Sulfide	ND		14	3.4	mg/Kg	☼	09/17/17 19:15	09/18/17 00:05	1
Total Organic Carbon - Duplicates	2100	H B	2000	44	mg/Kg			10/05/17 11:17	1
TOC Result 2	2100	H	2000	44	mg/Kg			10/05/17 11:17	1
TOC Result 1	2100	H B	2000	44	mg/Kg			10/05/17 11:17	1
Percent Solids	71.4		0.1	0.1	%			09/25/17 11:09	1
Percent Moisture	28.6		0.1	0.1	%			09/25/17 11:09	1
Total Solids	71.4		0.1	0.1	%			09/25/17 11:09	1
Total Solids	68		0.099	0.099	%			09/18/17 20:48	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia	ND		46	46	mg/Kg	☼		09/19/17 12:43	1

Method: PSEP Plumb 1981 - Grain Size (PSEP Plumb 1981)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Clay	0.50				%			09/20/17 09:05	1
Sand	91				%			09/20/17 09:05	1
Silt	4.6				%			09/20/17 09:05	1
Gravel	4.1				%			09/20/17 09:05	1
Cobbles	0.00				%			09/20/17 09:05	1

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-3
Date Collected: 09/12/17 17:00
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-3
Matrix: Solid
Percent Solids: 76.5

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	ND		18	3.0	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
2-Methylnaphthalene	ND		30	5.4	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
3 & 4 Methylphenol	ND		120	9.1	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Acenaphthene	ND		15	3.0	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Acenaphthylene	ND		15	3.0	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Anthracene	ND		15	3.0	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Benzo[a]anthracene	ND		15	3.0	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Benzo[a]pyrene	ND		36	7.9	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Benzo[g,h,i]perylene	ND		36	9.1	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Benzofluoranthene	ND		91	21	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Benzoic acid	ND		1500	640	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Bis(2-ethylhexyl) phthalate	ND		360	83	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Carbazole	ND		91	19	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Chrysene	ND		36	7.9	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Dibenz(a,h)anthracene	ND		30	7.3	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Dibenzofuran	ND		91	22	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Di-n-butyl phthalate	ND		300	35	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Di-n-octyl phthalate	ND	*	120	140	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Fluoranthene	ND		15	3.0	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Fluorene	ND		15	3.0	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Indeno[1,2,3-cd]pyrene	ND		24	3.0	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Naphthalene	ND		15	3.0	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Pentachlorophenol	ND		240	55	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Phenanthrene	ND		36	7.3	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Phenol	ND		91	23	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5
Pyrene	ND		36	9.1	ug/Kg	☼	09/22/17 09:53	09/23/17 18:25	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*81*		*10 - 126*	*09/22/17 09:53*	*09/23/17 18:25*	*5*
2-Fluorobiphenyl	*70*		*57 - 110*	*09/22/17 09:53*	*09/23/17 18:25*	*5*
2-Fluorophenol	*75*		*36 - 125*	*09/22/17 09:53*	*09/23/17 18:25*	*5*
Nitrobenzene-d5	*75*		*54 - 113*	*09/22/17 09:53*	*09/23/17 18:25*	*5*
Phenol-d5	*81*		*59 - 113*	*09/22/17 09:53*	*09/23/17 18:25*	*5*
Terphenyl-d14	*76*		*68 - 120*	*09/22/17 09:53*	*09/23/17 18:25*	*5*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	ND	H	3.6	0.61	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
2-Methylnaphthalene	ND	H	6.1	1.1	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
3 & 4 Methylphenol	**2.8**	**J H**	24	1.8	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Acenaphthene	ND	H	3.0	0.61	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Acenaphthylene	ND	H	3.0	0.61	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Anthracene	ND	H	3.0	0.61	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Benzo[a]anthracene	ND	H	3.0	0.61	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Benzo[a]pyrene	ND	H	7.3	1.6	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Benzo[g,h,i]perylene	ND	H	7.3	1.8	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Benzofluoranthene	ND	H	18	4.3	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Benzoic acid	ND	H	300	130	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Bis(2-ethylhexyl) phthalate	ND	H	73	17	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Carbazole	ND	H	18	3.8	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-3
Date Collected: 09/12/17 17:00
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-3
Matrix: Solid
Percent Solids: 76.5

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chrysene	ND	H	7.3	1.6	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Dibenz(a,h)anthracene	ND	H	6.1	1.5	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Dibenzofuran	ND	H	18	4.4	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Di-n-butyl phthalate	**8.0**	**J H**	61	6.9	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Di-n-octyl phthalate	ND	H	24	27	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Fluoranthene	ND	H	3.0	0.61	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Fluorene	ND	H	3.0	0.61	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Indeno[1,2,3-cd]pyrene	ND	H	4.9	0.61	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Naphthalene	**0.65**	**J H**	3.0	0.61	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Pentachlorophenol	ND	H *	49	11	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Phenanthrene	ND	H	7.3	1.5	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Phenol	ND	H	18	4.6	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1
Pyrene	ND	H	7.3	1.8	ug/Kg	☼	09/22/17 09:53	12/21/17 19:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*88*		*10 - 126*	*09/22/17 09:53*	*12/21/17 19:58*	*1*
2-Fluorobiphenyl	*80*		*57 - 110*	*09/22/17 09:53*	*12/21/17 19:58*	*1*
2-Fluorophenol	*89*		*36 - 125*	*09/22/17 09:53*	*12/21/17 19:58*	*1*
Nitrobenzene-d5	*84*		*54 - 113*	*09/22/17 09:53*	*12/21/17 19:58*	*1*
Phenol-d5	*91*		*59 - 113*	*09/22/17 09:53*	*12/21/17 19:58*	*1*
Terphenyl-d14	*96*		*68 - 120*	*09/22/17 09:53*	*12/21/17 19:58*	*1*

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibutyltin	ND		16	3.7	ug/Kg	☼	09/26/17 13:24	10/02/17 15:41	1
Monobutyltin	ND	*	9.8	2.4	ug/Kg	☼	09/26/17 13:24	10/02/17 15:41	1
Tetra-n-butyltin	ND	*	49	14	ug/Kg	☼	09/26/17 13:24	10/02/17 15:41	1
Tributyltin	ND		8.6	1.9	ug/Kg	☼	09/26/17 13:24	10/02/17 15:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*37*		*10 - 113*	*09/26/17 13:24*	*10/02/17 15:41*	*1*

Method: Organotins - Organotins, PSEP (GC/MS) - RE

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibutyltin	ND	H	17	3.9	ug/Kg	☼	10/04/17 16:32	10/05/17 20:23	1
Monobutyltin	ND	H	10	2.6	ug/Kg	☼	10/04/17 16:32	10/05/17 20:23	1
Tetra-n-butyltin	ND	H	51	15	ug/Kg	☼	10/04/17 16:32	10/05/17 20:23	1
Tributyltin	ND	H	9.0	2.0	ug/Kg	☼	10/04/17 16:32	10/05/17 20:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*25*		*10 - 113*	*10/04/17 16:32*	*10/05/17 20:23*	*1*

Method: 8081B - Organochlorine Pesticides (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4'-DDD	ND		1.3	0.19	ug/Kg	☼	09/22/17 08:46	09/29/17 13:40	5
2,4'-DDE	ND		1.3	0.19	ug/Kg	☼	09/22/17 08:46	09/29/17 13:40	5
2,4'-DDT	ND		1.3	0.10	ug/Kg	☼	09/22/17 08:46	09/29/17 13:40	5
4,4'-DDD	ND		1.3	0.048	ug/Kg	☼	09/22/17 08:46	09/29/17 13:40	5
4,4'-DDE	ND		1.3	0.091	ug/Kg	☼	09/22/17 08:46	09/29/17 13:40	5
4,4'-DDT	ND		1.3	0.098	ug/Kg	☼	09/22/17 08:46	09/29/17 13:40	5
beta-Hexachlorocyclohexane	ND		0.65	0.074	ug/Kg	☼	09/22/17 08:46	09/29/17 13:40	5

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-3

Date Collected: 09/12/17 17:00
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-3

Matrix: Solid
Percent Solids: 76.5

Method: 8081B - Organochlorine Pesticides (GC) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dieldrin	ND		1.3	0.076	ug/Kg	☼	09/22/17 08:46	09/29/17 13:40	5
Endrin ketone	ND		1.3	0.078	ug/Kg	☼	09/22/17 08:46	09/29/17 13:40	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*62*		*16 - 123*	*09/22/17 08:46*	*09/29/17 13:40*	*5*
Tetrachloro-m-xylene	*84*		*38 - 121*	*09/22/17 08:46*	*09/29/17 13:40*	*5*

Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0012	0.000060	mg/Kg	☼	09/22/17 08:49	09/26/17 04:22	1
PCB-1221	ND		0.0013	0.00041	mg/Kg	☼	09/22/17 08:49	09/26/17 04:22	1
PCB-1232	ND		0.0013	0.00026	mg/Kg	☼	09/22/17 08:49	09/26/17 04:22	1
PCB-1242	ND		0.0012	0.00025	mg/Kg	☼	09/22/17 08:49	09/26/17 04:22	1
PCB-1248	ND		0.0013	0.00019	mg/Kg	☼	09/22/17 08:49	09/26/17 04:22	1
PCB-1254	ND		0.0012	0.00011	mg/Kg	☼	09/22/17 08:49	09/26/17 04:22	1
PCB-1260	ND		0.0012	0.00016	mg/Kg	☼	09/22/17 08:49	09/26/17 04:22	1
Polychlorinated biphenyls, Total	ND		0.0013	0.00041	mg/Kg	☼	09/22/17 08:49	09/26/17 04:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*55*		*25 - 149*	*09/22/17 08:49*	*09/26/17 04:22*	*1*
Tetrachloro-m-xylene	*56*		*35 - 130*	*09/22/17 08:49*	*09/26/17 04:22*	*1*

Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
#2 Diesel (C10-C24)	ND		62	15	mg/Kg	☼	09/20/17 11:56	09/22/17 16:40	1
Motor Oil (>C24-C36)	**30**	**J**	62	11	mg/Kg	☼	09/20/17 11:56	09/22/17 16:40	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*97*		*54 - 118*	*09/20/17 11:56*	*09/22/17 16:40*	*1*

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**6.5**		0.16	0.063	mg/Kg	☼	09/27/17 17:02	09/28/17 11:02	5
Cadmium	**0.16**		0.063	0.049	mg/Kg	☼	09/27/17 17:02	09/28/17 11:02	5
Chromium	**16**		0.16	0.040	mg/Kg	☼	09/27/17 17:02	09/28/17 11:02	5
Copper	**37**		0.32	0.14	mg/Kg	☼	09/27/17 17:02	09/28/17 11:02	5
Lead	**7.7**		0.16	0.030	mg/Kg	☼	09/27/17 17:02	09/28/17 11:02	5
Nickel	**16**		0.16	0.12	mg/Kg	☼	09/27/17 17:02	09/28/17 11:02	5
Selenium	**0.52**		0.32	0.14	mg/Kg	☼	09/27/17 17:02	09/28/17 11:02	5
Silver	**0.021**	**J**	0.063	0.013	mg/Kg	☼	09/27/17 17:02	09/28/17 11:02	5
Zinc	**65**		1.6	1.0	mg/Kg	☼	09/27/17 17:02	09/28/17 11:02	5

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.042**		0.026	0.0078	mg/Kg	☼	10/02/17 12:02	10/02/17 14:43	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Volatile Solids	**2.4**		0.10	0.10	%			09/18/17 20:50	1
Sulfide	ND		13	3.1	mg/Kg	☼	09/17/17 19:15	09/18/17 00:05	1
Total Organic Carbon - Duplicates	**1600**	**J H B**	2000	44	mg/Kg			10/05/17 11:31	1

Client Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-3
Date Collected: 09/12/17 17:00
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-3
Matrix: Solid
Percent Solids: 76.5

General Chemistry (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
TOC Result 2	1500	J H	2000	44	mg/Kg			10/05/17 11:31	1
TOC Result 1	1600	J H B	2000	44	mg/Kg			10/05/17 11:31	1
Percent Solids	76.5		0.1	0.1	%			09/25/17 11:09	1
Percent Moisture	23.5		0.1	0.1	%			09/25/17 11:09	1
Total Solids	76.5		0.1	0.1	%			09/25/17 11:09	1
Total Solids	65		0.10	0.10	%			09/18/17 20:48	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia	ND		51	51	mg/Kg	☼		09/19/17 12:43	1

Method: PSEP Plumb 1981 - Grain Size (PSEP Plumb 1981)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Clay	0.40				%			09/20/17 09:05	1
Sand	83				%			09/20/17 09:05	1
Silt	2.8				%			09/20/17 09:05	1
Gravel	14				%			09/20/17 09:05	1
Cobbles	0.00				%			09/20/17 09:05	1

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 580-256990/1-A
Matrix: Solid
Analysis Batch: 257097

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 256990

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	ND		3.0	0.50	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
2-Methylnaphthalene	ND		5.0	0.88	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
3 & 4 Methylphenol	ND		20	1.5	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Acenaphthene	ND		2.5	0.50	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Acenaphthylene	ND		2.5	0.50	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Anthracene	ND		2.5	0.50	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Benzo[a]anthracene	ND		2.5	0.50	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Benzo[a]pyrene	ND		6.0	1.3	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Benzo[g,h,i]perylene	ND		6.0	1.5	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Benzofluoranthene	ND		15	3.5	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Benzoic acid	ND		250	110	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Bis(2-ethylhexyl) phthalate	ND		60	14	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Carbazole	ND		15	3.1	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Chrysene	ND		6.0	1.3	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Dibenz(a,h)anthracene	ND		5.0	1.2	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Dibenzofuran	ND		15	3.6	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Di-n-butyl phthalate	ND		50	5.7	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Di-n-octyl phthalate	ND		20	22	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Fluoranthene	ND		2.5	0.50	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Fluorene	ND		2.5	0.50	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Indeno[1,2,3-cd]pyrene	ND		4.0	0.50	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Naphthalene	ND		2.5	0.50	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Pentachlorophenol	ND		40	9.1	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Phenanthrene	ND		6.0	1.2	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Phenol	ND		15	3.8	ug/Kg		09/22/17 09:53	09/23/17 12:53	1
Pyrene	ND		6.0	1.5	ug/Kg		09/22/17 09:53	09/23/17 12:53	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*62*		*10 - 126*	*09/22/17 09:53*	*09/23/17 12:53*	*1*
2-Fluorobiphenyl	*72*		*57 - 110*	*09/22/17 09:53*	*09/23/17 12:53*	*1*
2-Fluorophenol	*77*		*36 - 125*	*09/22/17 09:53*	*09/23/17 12:53*	*1*
Nitrobenzene-d5	*80*		*54 - 113*	*09/22/17 09:53*	*09/23/17 12:53*	*1*
Phenol-d5	*83*		*59 - 113*	*09/22/17 09:53*	*09/23/17 12:53*	*1*
Terphenyl-d14	*78*		*68 - 120*	*09/22/17 09:53*	*09/23/17 12:53*	*1*

Lab Sample ID: LCS 580-256990/2-A
Matrix: Solid
Analysis Batch: 257097

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 256990

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1-Methylnaphthalene	100	99.8		ug/Kg		100	76 - 120
2-Methylnaphthalene	100	97.4		ug/Kg		97	71 - 120
3 & 4 Methylphenol	100	104		ug/Kg		104	70 - 120
Acenaphthene	100	91.1		ug/Kg		91	71 - 120
Acenaphthylene	100	92.3		ug/Kg		92	73 - 128
Anthracene	100	102		ug/Kg		102	74 - 120
Benzo[a]anthracene	100	106		ug/Kg		106	73 - 120
Benzo[a]pyrene	100	101		ug/Kg		101	72 - 121

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 580-256990/2-A
Matrix: Solid
Analysis Batch: 257097

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 256990

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzo[g,h,i]perylene	100	103		ug/Kg		103	75 - 122
Benzofluoranthene	200	199		ug/Kg		99	71 - 120
Benzoic acid	200	ND		ug/Kg		13	10 - 141
Bis(2-ethylhexyl) phthalate	100	123		ug/Kg		123	66 - 130
Carbazole	100	105		ug/Kg		105	80 - 131
Chrysene	100	98.0		ug/Kg		98	71 - 120
Dibenz(a,h)anthracene	100	108		ug/Kg		108	71 - 120
Dibenzofuran	100	90.4		ug/Kg		90	77 - 120
Di-n-butyl phthalate	100	119		ug/Kg		119	68 - 129
Di-n-octyl phthalate	100	126	*	ug/Kg		126	68 - 124
Fluoranthene	100	94.8		ug/Kg		95	75 - 120
Fluorene	100	88.1		ug/Kg		88	68 - 121
Indeno[1,2,3-cd]pyrene	100	98.1		ug/Kg		98	75 - 120
Naphthalene	100	93.8		ug/Kg		94	75 - 120
Pentachlorophenol	200	74.2		ug/Kg		37	36 - 120
Phenanthrene	100	96.4		ug/Kg		96	73 - 120
Phenol	100	101		ug/Kg		101	65 - 120
Pyrene	100	95.9		ug/Kg		96	73 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol	*79*		*10 - 126*
2-Fluorobiphenyl	*81*		*57 - 110*
2-Fluorophenol	*93*		*36 - 125*
Nitrobenzene-d5	*101*		*54 - 113*
Phenol-d5	*100*		*59 - 113*
Terphenyl-d14	*88*		*68 - 120*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA

Lab Sample ID: MB 580-264022/1-A
Matrix: Solid
Analysis Batch: 263999

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 264022

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene - RA	ND		3.0	0.50	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
2-Methylnaphthalene - RA	ND		5.0	0.88	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
3 & 4 Methylphenol - RA	ND		20	1.5	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Acenaphthene - RA	ND		2.5	0.50	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Acenaphthylene - RA	ND		2.5	0.50	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Anthracene - RA	ND		2.5	0.50	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Benzo[a]anthracene - RA	ND		2.5	0.50	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Benzo[a]pyrene - RA	ND		6.0	1.3	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Benzo[g,h,i]perylene - RA	ND		6.0	1.5	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Benzofluoranthene - RA	ND		15	3.5	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Benzoic acid - RA	ND		250	110	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Bis(2-ethylhexyl) phthalate - RA	ND		60	14	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Carbazole - RA	ND		15	3.1	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Chrysene - RA	ND		6.0	1.3	ug/Kg		09/22/17 09:53	12/21/17 18:18	1

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Lab Sample ID: MB 580-264022/1-A
Matrix: Solid
Analysis Batch: 263999

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 264022

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibenz(a,h)anthracene - RA	ND		5.0	1.2	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Dibenzofuran - RA	ND		15	3.6	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Di-n-butyl phthalate - RA	ND		50	5.7	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Di-n-octyl phthalate - RA	ND		20	22	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Fluoranthene - RA	ND		2.5	0.50	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Fluorene - RA	ND		2.5	0.50	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Indeno[1,2,3-cd]pyrene - RA	ND		4.0	0.50	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Naphthalene - RA	ND		2.5	0.50	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Pentachlorophenol - RA	ND		40	9.1	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Phenanthrene - RA	ND		6.0	1.2	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Phenol - RA	ND		15	3.8	ug/Kg		09/22/17 09:53	12/21/17 18:18	1
Pyrene - RA	ND		6.0	1.5	ug/Kg		09/22/17 09:53	12/21/17 18:18	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol - RA	*41*		*10 - 126*	*09/22/17 09:53*	*12/21/17 18:18*	*1*
2-Fluorobiphenyl - RA	*82*		*57 - 110*	*09/22/17 09:53*	*12/21/17 18:18*	*1*
2-Fluorophenol - RA	*78*		*36 - 125*	*09/22/17 09:53*	*12/21/17 18:18*	*1*
Nitrobenzene-d5 - RA	*92*		*54 - 113*	*09/22/17 09:53*	*12/21/17 18:18*	*1*
Phenol-d5 - RA	*75*		*59 - 113*	*09/22/17 09:53*	*12/21/17 18:18*	*1*
Terphenyl-d14 - RA	*108*		*68 - 120*	*09/22/17 09:53*	*12/21/17 18:18*	*1*

Lab Sample ID: LCS 580-264022/2-A
Matrix: Solid
Analysis Batch: 263999

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 264022

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1-Methylnaphthalene - RA	100	82.7		ug/Kg		83	76 - 120
2-Methylnaphthalene - RA	100	85.9		ug/Kg		86	71 - 120
3 & 4 Methylphenol - RA	100	76.5		ug/Kg		77	70 - 120
Acenaphthene - RA	100	82.1		ug/Kg		82	71 - 120
Acenaphthylene - RA	100	87.0		ug/Kg		87	73 - 128
Anthracene - RA	100	89.1		ug/Kg		89	74 - 120
Benzo[a]anthracene - RA	100	102		ug/Kg		102	73 - 120
Benzo[a]pyrene - RA	100	84.2		ug/Kg		84	72 - 121
Benzo[g,h,i]perylene - RA	100	110		ug/Kg		110	75 - 122
Benzofluoranthene - RA	200	204		ug/Kg		102	71 - 120
Benzoic acid - RA	200	ND		ug/Kg		24	10 - 141
Bis(2-ethylhexyl) phthalate - RA	100	97.7		ug/Kg		98	66 - 130
Carbazole - RA	100	124		ug/Kg		124	80 - 131
Chrysene - RA	100	86.5		ug/Kg		86	71 - 120
Dibenz(a,h)anthracene - RA	100	115		ug/Kg		115	71 - 120
Dibenzofuran - RA	100	86.1		ug/Kg		86	77 - 120
Di-n-butyl phthalate - RA	100	92.6		ug/Kg		93	68 - 129
Di-n-octyl phthalate - RA	100	106		ug/Kg		106	68 - 124
Fluoranthene - RA	100	99.1		ug/Kg		99	75 - 120
Fluorene - RA	100	83.7		ug/Kg		84	68 - 121
Indeno[1,2,3-cd]pyrene - RA	100	118		ug/Kg		118	75 - 120
Naphthalene - RA	100	79.3		ug/Kg		79	75 - 120

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Lab Sample ID: LCS 580-264022/2-A
Matrix: Solid
Analysis Batch: 263999

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 264022

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Pentachlorophenol - RA	200	28.5	J *	ug/Kg		14	36 - 120
Phenanthrene - RA	100	91.9		ug/Kg		92	73 - 120
Phenol - RA	100	80.1		ug/Kg		80	65 - 120
Pyrene - RA	100	94.1		ug/Kg		94	73 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol - RA	*72*		*10 - 126*
2-Fluorobiphenyl - RA	*80*		*57 - 110*
2-Fluorophenol - RA	*89*		*36 - 125*
Nitrobenzene-d5 - RA	*97*		*54 - 113*
Phenol-d5 - RA	*98*		*59 - 113*
Terphenyl-d14 - RA	*106*		*68 - 120*

Method: Organotins - Organotins, PSEP (GC/MS)

Lab Sample ID: MB 580-257308/1-A
Matrix: Solid
Analysis Batch: 257811

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 257308

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibutyltin	ND		13	3.0	ug/Kg		09/26/17 13:24	10/02/17 13:58	1
Monobutyltin	ND		8.0	2.0	ug/Kg		09/26/17 13:24	10/02/17 13:58	1
Tetra-n-butyltin	ND		40	12	ug/Kg		09/26/17 13:24	10/02/17 13:58	1
Tributyltin	ND		7.0	1.5	ug/Kg		09/26/17 13:24	10/02/17 13:58	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*651*	*X*	*10 - 113*	*09/26/17 13:24*	*10/02/17 13:58*	*1*

Lab Sample ID: LCS 580-257308/2-A
Matrix: Solid
Analysis Batch: 257811

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 257308

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Dibutyltin	61.9	15.8		ug/Kg		26	15 - 141
Monobutyltin	50.2	2.36	J *	ug/Kg		5	10 - 140
Tetra-n-butyltin	80.6	ND	*	ug/Kg		0	10 - 110
Tributyltin	71.8	30.4		ug/Kg		42	14 - 150

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*6400*	*X*	*10 - 113*

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: Organotins - Organotins, PSEP (GC/MS) - RE

Lab Sample ID: MB 580-258108/1-A
Matrix: Solid
Analysis Batch: 258166

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 258108

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibutyltin - RE	ND		13	3.0	ug/Kg		10/04/17 16:32	10/05/17 15:35	1
Monobutyltin - RE	ND		8.0	2.0	ug/Kg		10/04/17 16:32	10/05/17 15:35	1
Tetra-n-butyltin - RE	ND		40	12	ug/Kg		10/04/17 16:32	10/05/17 15:35	1
Tributyltin - RE	ND		7.0	1.5	ug/Kg		10/04/17 16:32	10/05/17 15:35	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin - RE	*53*		*10 - 113*	*10/04/17 16:32*	*10/05/17 15:35*	*1*

Lab Sample ID: LCS 580-258108/2-A
Matrix: Solid
Analysis Batch: 258166

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 258108

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Dibutyltin - RE	61.9	36.0		ug/Kg		58	15 - 141
Monobutyltin - RE	50.2	17.8		ug/Kg		36	10 - 140
Tetra-n-butyltin - RE	80.6	28.8	J	ug/Kg		36	10 - 110
Tributyltin - RE	71.8	40.1		ug/Kg		56	14 - 150

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin - RE	*56*		*10 - 113*

Method: 8081B - Organochlorine Pesticides (GC)

Lab Sample ID: MB 580-256979/1-A
Matrix: Solid
Analysis Batch: 257614

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 256979

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4'-DDD	ND		0.20	0.030	ug/Kg		09/22/17 08:46	09/29/17 08:21	1
2,4'-DDE	ND		0.20	0.030	ug/Kg		09/22/17 08:46	09/29/17 08:21	1
2,4'-DDT	ND		0.20	0.016	ug/Kg		09/22/17 08:46	09/29/17 08:21	1
4,4'-DDD	ND		0.20	0.0074	ug/Kg		09/22/17 08:46	09/29/17 08:21	1
4,4'-DDE	ND		0.20	0.014	ug/Kg		09/22/17 08:46	09/29/17 08:21	1
4,4'-DDT	ND		0.20	0.015	ug/Kg		09/22/17 08:46	09/29/17 08:21	1
beta-Hexachlorocyclohexane	ND		0.10	0.011	ug/Kg		09/22/17 08:46	09/29/17 08:21	1
Dieldrin	ND		0.20	0.012	ug/Kg		09/22/17 08:46	09/29/17 08:21	1
Endrin ketone	ND		0.20	0.012	ug/Kg		09/22/17 08:46	09/29/17 08:21	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*56*		*16 - 123*	*09/22/17 08:46*	*09/29/17 08:21*	*1*
Tetrachloro-m-xylene	*75*		*38 - 121*	*09/22/17 08:46*	*09/29/17 08:21*	*1*

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 8081B - Organochlorine Pesticides (GC) (Continued)

Lab Sample ID: LCS 580-256979/2-A
Matrix: Solid
Analysis Batch: 257614

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 256979

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
4,4'-DDD	2.50	1.88		ug/Kg		75	68 - 122
4,4'-DDE	2.50	1.64		ug/Kg		65	64 - 121
4,4'-DDT	2.50	2.03		ug/Kg		81	49 - 137
beta-Hexachlorocyclohexane	2.50	1.58		ug/Kg		63	62 - 112
Dieldrin	2.50	1.62		ug/Kg		65	63 - 121
Endrin ketone	2.50	1.76		ug/Kg		70	56 - 128

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
DCB Decachlorobiphenyl	*58*		*16 - 123*
Tetrachloro-m-xylene	*76*		*38 - 121*

Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Lab Sample ID: MB 580-256982/1-A
Matrix: Solid
Analysis Batch: 257244

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 256982

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0010	0.000050	mg/Kg		09/22/17 08:49	09/26/17 03:12	1
PCB-1221	ND		0.0011	0.00034	mg/Kg		09/22/17 08:49	09/26/17 03:12	1
PCB-1232	ND		0.0011	0.00022	mg/Kg		09/22/17 08:49	09/26/17 03:12	1
PCB-1242	ND		0.0010	0.00021	mg/Kg		09/22/17 08:49	09/26/17 03:12	1
PCB-1248	ND		0.0011	0.00016	mg/Kg		09/22/17 08:49	09/26/17 03:12	1
PCB-1254	ND		0.0010	0.000090	mg/Kg		09/22/17 08:49	09/26/17 03:12	1
PCB-1260	ND		0.0010	0.00013	mg/Kg		09/22/17 08:49	09/26/17 03:12	1
Polychlorinated biphenyls, Total	ND		0.0011	0.00034	mg/Kg		09/22/17 08:49	09/26/17 03:12	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*85*		*25 - 149*	*09/22/17 08:49*	*09/26/17 03:12*	*1*
Tetrachloro-m-xylene	*67*		*35 - 130*	*09/22/17 08:49*	*09/26/17 03:12*	*1*

Lab Sample ID: LCS 580-256982/2-A
Matrix: Solid
Analysis Batch: 257244

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 256982

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
PCB-1016	0.0125	0.00929		mg/Kg		74	69 - 126
PCB-1260	0.0125	0.00959		mg/Kg		77	68 - 136

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
DCB Decachlorobiphenyl	*80*		*25 - 149*
Tetrachloro-m-xylene	*63*		*35 - 130*

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)

Lab Sample ID: MB 580-256713/1-A
Matrix: Solid
Analysis Batch: 257001

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 256713

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
#2 Diesel (C10-C24)	ND		50	12	mg/Kg		09/20/17 11:56	09/22/17 14:39	1
Motor Oil (>C24-C36)	ND		50	9.1	mg/Kg		09/20/17 11:56	09/22/17 14:39	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*106*		*54 - 118*	*09/20/17 11:56*	*09/22/17 14:39*	*1*

Lab Sample ID: LCS 580-256713/2-A
Matrix: Solid
Analysis Batch: 257001

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 256713

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
#2 Diesel (C10-C24)	500	500		mg/Kg		100	70 - 125
Motor Oil (>C24-C36)	500	544		mg/Kg		109	70 - 119

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*84*		*54 - 118*

Lab Sample ID: LCSD 580-256713/3-A
Matrix: Solid
Analysis Batch: 257001

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 256713

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
#2 Diesel (C10-C24)	500	500		mg/Kg		100	70 - 125	0	16
Motor Oil (>C24-C36)	500	529		mg/Kg		106	70 - 119	3	16

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*93*		*54 - 118*

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 580-257478/18-A
Matrix: Solid
Analysis Batch: 257540

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 257478

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.13	0.050	mg/Kg		09/27/17 17:02	09/28/17 09:46	5
Cadmium	ND		0.050	0.039	mg/Kg		09/27/17 17:02	09/28/17 09:46	5
Chromium	ND		0.13	0.032	mg/Kg		09/27/17 17:02	09/28/17 09:46	5
Copper	ND		0.25	0.11	mg/Kg		09/27/17 17:02	09/28/17 09:46	5
Lead	ND		0.13	0.024	mg/Kg		09/27/17 17:02	09/28/17 09:46	5
Nickel	ND		0.13	0.097	mg/Kg		09/27/17 17:02	09/28/17 09:46	5
Selenium	ND		0.25	0.11	mg/Kg		09/27/17 17:02	09/28/17 09:46	5
Silver	ND		0.050	0.010	mg/Kg		09/27/17 17:02	09/28/17 09:46	5
Zinc	ND		1.3	0.81	mg/Kg		09/27/17 17:02	09/28/17 09:46	5

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 580-257478/19-A
Matrix: Solid
Analysis Batch: 257540

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 257478

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	200	212		mg/Kg		106	80 - 120
Cadmium	5.00	5.31		mg/Kg		106	80 - 120
Chromium	20.0	21.2		mg/Kg		106	80 - 120
Copper	25.0	26.6		mg/Kg		106	80 - 120
Lead	50.0	53.1		mg/Kg		106	80 - 120
Nickel	50.0	52.2		mg/Kg		104	80 - 120
Selenium	200	213		mg/Kg		107	80 - 120
Silver	30.0	31.8		mg/Kg		106	80 - 120
Zinc	200	209		mg/Kg		105	80 - 120

Lab Sample ID: LCSD 580-257478/20-A
Matrix: Solid
Analysis Batch: 257540

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 257478

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	200	205		mg/Kg		103	80 - 120	3	20
Cadmium	5.00	5.12		mg/Kg		102	80 - 120	4	20
Chromium	20.0	20.3		mg/Kg		102	80 - 120	4	20
Copper	25.0	26.2		mg/Kg		105	80 - 120	1	20
Lead	50.0	51.4		mg/Kg		103	80 - 120	3	20
Nickel	50.0	50.8		mg/Kg		102	80 - 120	3	20
Selenium	200	206		mg/Kg		103	80 - 120	3	20
Silver	30.0	30.8		mg/Kg		103	80 - 120	3	20
Zinc	200	203		mg/Kg		101	80 - 120	3	20

Method: 7471A - Mercury (CVAA)

Lab Sample ID: MB 580-257808/22-A
Matrix: Solid
Analysis Batch: 257835

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 257808

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.030	0.0090	mg/Kg		10/02/17 12:02	10/02/17 13:42	1

Lab Sample ID: LCS 580-257808/23-A
Matrix: Solid
Analysis Batch: 257835

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 257808

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.167	0.186		mg/Kg		111	80 - 120

Lab Sample ID: LCSD 580-257808/24-A
Matrix: Solid
Analysis Batch: 257835

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 257808

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	0.167	0.176		mg/Kg		106	80 - 120	5	20

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 160.4 - Solids, Volatile and Fixed (VS)

Lab Sample ID: MB 280-388058/1
Matrix: Solid
Analysis Batch: 388058

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Volatile Solids	ND		0.10	0.10	%			09/18/17 20:50	1

Method: 350.1/Plumb - Nitrogen, Ammonia

Lab Sample ID: MB 580-256544/1-A
Matrix: Solid
Analysis Batch: 256588

Client Sample ID: Method Blank
Prep Type: Soluble

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia	ND		50	50	mg/Kg			09/19/17 12:43	1

Lab Sample ID: LCS 580-256544/2-A
Matrix: Solid
Analysis Batch: 256588

Client Sample ID: Lab Control Sample
Prep Type: Soluble

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Ammonia			500	467		mg/Kg		93	90 - 110		

Lab Sample ID: 580-71236-1 MS
Matrix: Solid
Analysis Batch: 256588

Client Sample ID: OF2-1
Prep Type: Soluble

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Ammonia	ND	F1	718	636	F1	mg/Kg	☼	89	90 - 110		

Lab Sample ID: 580-71236-1 MSD
Matrix: Solid
Analysis Batch: 256588

Client Sample ID: OF2-1
Prep Type: Soluble

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ammonia	ND	F1	638	561	F1	mg/Kg	☼	88	90 - 110	13	20

Lab Sample ID: 580-71236-1 DU
Matrix: Solid
Analysis Batch: 256588

Client Sample ID: OF2-1
Prep Type: Soluble

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Ammonia	ND	F1		ND		mg/Kg	☼			NC	20

Method: 9034 - Sulfide, Acid Soluble and Insoluble (Titrimetric)

Lab Sample ID: MB 280-387926/1-A
Matrix: Solid
Analysis Batch: 387927

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 387926

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		10	2.4	mg/Kg		09/17/17 19:15	09/18/17 00:05	1

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 9034 - Sulfide, Acid Soluble and Insoluble (Titrimetric) (Continued)

Lab Sample ID: LCS 280-387926/2-A
Matrix: Solid
Analysis Batch: 387927

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 387926

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfide	103	84.0		mg/Kg		81	38 - 104

Method: 9060_PSEP - TOC (Puget Sound)

Lab Sample ID: MB 580-258182/3
Matrix: Solid
Analysis Batch: 258182

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	118	J	2000	44	mg/Kg			10/05/17 09:26	1
TOC Result 1	118	J	2000	44	mg/Kg			10/05/17 09:26	1

Lab Sample ID: LCS 580-258182/4
Matrix: Solid
Analysis Batch: 258182

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon - Duplicates	4620	5290		mg/Kg		114	68 - 149

Lab Sample ID: LCSD 580-258182/5
Matrix: Solid
Analysis Batch: 258182

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Carbon - Duplicates	4620	5370		mg/Kg		116	68 - 149	2	32

Lab Sample ID: 580-71236-1 MS
Matrix: Solid
Analysis Batch: 258182

Client Sample ID: OF2-1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon - Duplicates	3500	H B	120000	112000		mg/Kg		91	68 - 149

Lab Sample ID: 580-71236-1 MSD
Matrix: Solid
Analysis Batch: 258182

Client Sample ID: OF2-1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Carbon - Duplicates	3500	H B	120000	113000		mg/Kg		91	68 - 149	1	32

QC Sample Results

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Method: 9060_PSEP - TOC (Puget Sound) (Continued)

Lab Sample ID: 580-71236-1 DU
Matrix: Solid
Analysis Batch: 258182

Client Sample ID: OF2-1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Organic Carbon - Duplicates	3500	H B		2660		mg/Kg				26	50
TOC Result 2	3500	H		2370		mg/Kg				39	
TOC Result 1	3400	H B		2950		mg/Kg				14	

Lab Sample ID: 580-71236-2 DU
Matrix: Solid
Analysis Batch: 258182

Client Sample ID: OF2-2
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Organic Carbon - Duplicates	2100	H B		5530	F3	mg/Kg				90	50
TOC Result 2	2100	H		6880		mg/Kg				106	
TOC Result 1	2100	H B		4180		mg/Kg				68	

Lab Sample ID: 580-71236-2 TRL
Matrix: Solid
Analysis Batch: 258182

Client Sample ID: OF2-2
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		TRL Result	TRL Qualifier	Unit	D			RSD	RSD Limit
Total Organic Carbon - Duplicates	2100	H B		3650		mg/Kg				46	
TOC Result 2	2100	H		5450		mg/Kg				51	
TOC Result 1	2100	H B		1850	J	mg/Kg				48	

Method: SM 2540B - Solids, Total

Lab Sample ID: MB 280-388057/1
Matrix: Solid
Analysis Batch: 388057

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Solids	ND		0.10	0.10	%			09/18/17 20:48	1

Lab Chronicle

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-1

Lab Sample ID: 580-71236-1

Date Collected: 09/12/17 13:45

Matrix: Solid

Date Received: 09/13/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	160.4		1	388058	09/18/17 20:50	SVC	TAL DEN
Total/NA	Analysis	9060_PSEP		1	258182	10/05/17 09:47	J1Y	TAL SEA
Total/NA	Analysis	D 2216		1	257164	09/25/17 11:09	APR	TAL SEA
Total/NA	Analysis	SM 2540B		1	388057	09/18/17 20:48	SVC	TAL DEN
Total/NA	Analysis	PSEP Plumb 1981		1	256674	09/20/17 09:05	HJM	TAL SEA

Client Sample ID: OF2-1

Lab Sample ID: 580-71236-1

Date Collected: 09/12/17 13:45

Matrix: Solid

Date Received: 09/13/17 12:50

Percent Solids: 67.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3550B	RA		264022	09/22/17 09:53	APR	TAL SEA
Total/NA	Analysis	8270D	RA	1	263999	12/21/17 19:08	W1T	TAL SEA
Total/NA	Prep	3550B			256990	09/22/17 09:53	JWL	TAL SEA
Total/NA	Analysis	8270D		5	257097	09/23/17 17:34	ERB	TAL SEA
Total/NA	Prep	Organotin Prep			257308	09/26/17 13:24	TTN	TAL SEA
Total/NA	Analysis	Organotins		1	257811	10/02/17 14:49	ERB	TAL SEA
Total/NA	Prep	Organotin Prep	RE		258108	10/04/17 16:32	ERZ	TAL SEA
Total/NA	Analysis	Organotins	RE	1	258166	10/05/17 19:31	ERB	TAL SEA
Total/NA	Prep	3550B			256979	09/22/17 08:46	JWL	TAL SEA
Total/NA	Analysis	8081B		5	257614	09/29/17 13:03	TL1	TAL SEA
Total/NA	Prep	3550B			256982	09/22/17 08:49	JWL	TAL SEA
Total/NA	Analysis	8082A		1	257244	09/26/17 03:47	JCP	TAL SEA
Total/NA	Prep	3546			256713	09/20/17 11:56	TTN	TAL SEA
Total/NA	Analysis	NWTPH-Dx		1	257001	09/22/17 16:00	T1W	TAL SEA
Total/NA	Prep	3050B			257478	09/27/17 17:02	PAB	TAL SEA
Total/NA	Analysis	6020A		5	257540	09/28/17 10:54	FCW	TAL SEA
Total/NA	Prep	7471A			257808	10/02/17 12:02	PAB	TAL SEA
Total/NA	Analysis	7471A		1	257835	10/02/17 14:39	FCW	TAL SEA
Soluble	Leach	DI Leach/Plumb			256544	09/19/17 09:31	EMM	TAL SEA
Soluble	Analysis	350.1/Plumb		1	256588	09/19/17 12:43	EMM	TAL SEA
Total/NA	Prep	9030B			387926	09/17/17 19:15	ALS	TAL DEN
Total/NA	Analysis	9034		1	387927	09/18/17 00:05	ALS	TAL DEN

Client Sample ID: OF2-2

Lab Sample ID: 580-71236-2

Date Collected: 09/12/17 15:30

Matrix: Solid

Date Received: 09/13/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	160.4		1	388058	09/18/17 20:50	SVC	TAL DEN
Total/NA	Analysis	9060_PSEP		1	258182	10/05/17 11:17	J1Y	TAL SEA
Total/NA	Analysis	D 2216		1	257164	09/25/17 11:09	APR	TAL SEA

Lab Chronicle

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-2
Date Collected: 09/12/17 15:30
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-2
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	SM 2540B		1	388057	09/18/17 20:48	SVC	TAL DEN
Total/NA	Analysis	PSEP Plumb 1981		1	256674	09/20/17 09:05	HJM	TAL SEA

Client Sample ID: OF2-2
Date Collected: 09/12/17 15:30
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-2
Matrix: Solid
Percent Solids: 71.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3550B	RA		264022	09/22/17 09:53	APR	TAL SEA
Total/NA	Analysis	8270D	RA	1	263999	12/21/17 19:33	W1T	TAL SEA
Total/NA	Prep	3550B	RA2		264022	09/22/17 09:53	APR	TAL SEA
Total/NA	Analysis	8270D	RA2	1	264060	12/22/17 16:17	TL1	TAL SEA
Total/NA	Prep	3550B			256990	09/22/17 09:53	JWL	TAL SEA
Total/NA	Analysis	8270D		5	257097	09/23/17 18:00	ERB	TAL SEA
Total/NA	Prep	Organotin Prep			257308	09/26/17 13:24	TTN	TAL SEA
Total/NA	Analysis	Organotins		1	257811	10/02/17 15:15	ERB	TAL SEA
Total/NA	Prep	Organotin Prep	RE		258108	10/04/17 16:32	ERZ	TAL SEA
Total/NA	Analysis	Organotins	RE	1	258166	10/05/17 19:57	ERB	TAL SEA
Total/NA	Prep	3550B			256979	09/22/17 08:46	JWL	TAL SEA
Total/NA	Analysis	8081B		5	257614	09/29/17 13:21	TL1	TAL SEA
Total/NA	Prep	3550B			256982	09/22/17 08:49	JWL	TAL SEA
Total/NA	Analysis	8082A		1	257244	09/26/17 04:05	JCP	TAL SEA
Total/NA	Prep	3546			256713	09/20/17 11:56	TTN	TAL SEA
Total/NA	Analysis	NWTPH-Dx		1	257001	09/22/17 16:20	T1W	TAL SEA
Total/NA	Prep	3050B			257478	09/27/17 17:02	PAB	TAL SEA
Total/NA	Analysis	6020A		5	257540	09/28/17 10:58	FCW	TAL SEA
Total/NA	Prep	7471A			257808	10/02/17 12:02	PAB	TAL SEA
Total/NA	Analysis	7471A		1	257835	10/02/17 14:41	FCW	TAL SEA
Soluble	Leach	DI Leach/Plumb			256544	09/19/17 09:31	EMM	TAL SEA
Soluble	Analysis	350.1/Plumb		1	256588	09/19/17 12:43	EMM	TAL SEA
Total/NA	Prep	9030B			387926	09/17/17 19:15	ALS	TAL DEN
Total/NA	Analysis	9034		1	387927	09/18/17 00:05	ALS	TAL DEN

Client Sample ID: OF2-3
Date Collected: 09/12/17 17:00
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-3
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	160.4		1	388058	09/18/17 20:50	SVC	TAL DEN
Total/NA	Analysis	9060_PSEP		1	258182	10/05/17 11:31	J1Y	TAL SEA
Total/NA	Analysis	D 2216		1	257164	09/25/17 11:09	APR	TAL SEA
Total/NA	Analysis	SM 2540B		1	388057	09/18/17 20:48	SVC	TAL DEN
Total/NA	Analysis	PSEP Plumb 1981		1	256674	09/20/17 09:05	HJM	TAL SEA

Lab Chronicle

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Client Sample ID: OF2-3

Date Collected: 09/12/17 17:00
Date Received: 09/13/17 12:50

Lab Sample ID: 580-71236-3

Matrix: Solid
Percent Solids: 76.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3550B	RA		264022	09/22/17 09:53	APR	TAL SEA
Total/NA	Analysis	8270D	RA	1	263999	12/21/17 19:58	W1T	TAL SEA
Total/NA	Prep	3550B			256990	09/22/17 09:53	JWL	TAL SEA
Total/NA	Analysis	8270D		5	257097	09/23/17 18:25	ERB	TAL SEA
Total/NA	Prep	Organotin Prep			257308	09/26/17 13:24	TTN	TAL SEA
Total/NA	Analysis	Organotins		1	257811	10/02/17 15:41	ERB	TAL SEA
Total/NA	Prep	Organotin Prep	RE		258108	10/04/17 16:32	ERZ	TAL SEA
Total/NA	Analysis	Organotins	RE	1	258166	10/05/17 20:23	ERB	TAL SEA
Total/NA	Prep	3550B			256979	09/22/17 08:46	JWL	TAL SEA
Total/NA	Analysis	8081B		5	257614	09/29/17 13:40	TL1	TAL SEA
Total/NA	Prep	3550B			256982	09/22/17 08:49	JWL	TAL SEA
Total/NA	Analysis	8082A		1	257244	09/26/17 04:22	JCP	TAL SEA
Total/NA	Prep	3546			256713	09/20/17 11:56	TTN	TAL SEA
Total/NA	Analysis	NWTPH-Dx		1	257001	09/22/17 16:40	T1W	TAL SEA
Total/NA	Prep	3050B			257478	09/27/17 17:02	PAB	TAL SEA
Total/NA	Analysis	6020A		5	257540	09/28/17 11:02	FCW	TAL SEA
Total/NA	Prep	7471A			257808	10/02/17 12:02	PAB	TAL SEA
Total/NA	Analysis	7471A		1	257835	10/02/17 14:43	FCW	TAL SEA
Soluble	Leach	DI Leach/Plumb			256544	09/19/17 09:31	EMM	TAL SEA
Soluble	Analysis	350.1/Plumb		1	256588	09/19/17 12:43	EMM	TAL SEA
Total/NA	Prep	9030B			387926	09/17/17 19:15	ALS	TAL DEN
Total/NA	Analysis	9034		1	387927	09/18/17 00:05	ALS	TAL DEN

Laboratory References:

Maxxam = Maxxam Analytics Inc., PO BOX 57437, Postal Station A, Toronto, Ontario M5W 5M5
TAL DEN = TestAmerica Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100
TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Laboratory: TestAmerica Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	UST-022	03-02-18
ANAB	DoD ELAP		L2236	01-19-19
ANAB	ISO/IEC 17025		L2236	01-19-19
California	State Program	9	2901	01-31-18
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-05-18
US Fish & Wildlife	Federal		LE058448-0	10-31-18
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-18

Laboratory: TestAmerica Denver

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
A2LA	DoD ELAP		2907.01	10-31-19 *
A2LA	ISO/IEC 17025		2907.01	10-31-19
Alabama	State Program	4	40730	09-30-12 *
Alaska (UST)	State Program	10	UST-30	04-05-18
Arizona	State Program	9	AZ0713	12-20-17
Arkansas DEQ	State Program	6	88-0687	06-01-18
California	State Program	9	2513	01-08-18
Connecticut	State Program	1	PH-0686	09-30-18
Florida	NELAP	4	E87667	06-30-18
Georgia	State Program	4	N/A	01-08-18
Illinois	NELAP	5	200017	04-30-18
Iowa	State Program	7	370	12-01-18
Kansas	NELAP	7	E-10166	04-30-18
Louisiana	NELAP	6	02096	06-30-18
Maine	State Program	1	CO0002	03-03-19
Minnesota	NELAP	5	8-999-405	12-31-17
Nevada	State Program	9	CO0026	07-31-18
New Hampshire	NELAP	1	205310	04-28-18
New Jersey	NELAP	2	CO004	06-30-18
New York	NELAP	2	11964	04-01-18
North Carolina (WW/SW)	State Program	4	358	12-31-17
North Dakota	State Program	8	R-034	01-09-18
Oklahoma	State Program	6	8614	08-31-18
Oregon	NELAP	10	4025	01-08-18
Pennsylvania	NELAP	3	68-00664	07-31-18
South Carolina	State Program	4	72002001	01-08-18
Texas	NELAP	6	T104704183-17-14	09-30-18
USDA	Federal		P330-16-00397	12-15-19
Utah	NELAP	8	CO00026	07-31-18
Virginia	NELAP	3	460232	06-14-18
Washington	State Program	10	C583	08-03-18
West Virginia DEP	State Program	3	354	12-31-17 *
Wisconsin	State Program	5	999615430	08-31-18
Wyoming (UST)	A2LA	8	2907.01	10-31-19

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Environmental Science Associates (ESA)
Project/Site: G-P Camas Freshwater Sediments

TestAmerica Job ID: 580-71236-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-71236-1	OF2-1	Solid	09/12/17 13:45	09/13/17 12:50
580-71236-2	OF2-2	Solid	09/12/17 15:30	09/13/17 12:50
580-71236-3	OF2-3	Solid	09/12/17 17:00	09/13/17 12:50

Confirmation of Sample Receipt

Maxxam Job Number: B7K1281
Job Received: 2017/09/15 11:03
Final Report Due: 2017/10/05 18:00

Invoice Information

Attn: Elaine Walker
TestAmerica
17461 Derian Ave
Suite 100
Irvine, CA, 92614
Email to:
elaine.walker@testamericainc.com

Report Information

Attn: Elaine Walker
TestAmerica
17461 Derian Ave
Suite 100
Irvine, CA, 92614
Email to:
elaine.walker@testamericainc.com

Project Information

Quote #: B75761
PO/AFE#:
Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS
Sampled By:

Analytical Summary

A: Due On 2017/10/05 18:00

Lab ID	Client Sample ID	Sampling Date/Time	Matrix	Dioxins and Furans by 1613
COC# 580-49672.1				
FCZ298	OF2-1(580-71236-1)	2017/09/12 13:45	SED	A
FCZ299	OF2-2(580-71236-2)	2017/09/12 15:30	SED	A
FCZ300	OF2-3(580-71236-3)	2017/09/12 17:00	SED	A

Include Criteria on CofA: No

Sample Inspection Observations & Comments

# of Samples Received: 3

Details: Sample(s) received in good condition.

Average Temperature: Package 1: 3.8 °C

Additional Notes

- Unless special storage arrangements are made, all samples will be disposed 30 days after receipt. Additional fees may be applied for extended storage.
- Additional fees may be applied for the disposal of hazardous samples.

The contents of this report are subject to change. For up to date information, please refer to the Customer Portal.

Maxxam
A Bureau Veritas Group Company

Confirmation of Sample Receipt

Maxxam Job Number: B7K1281
Job Received: 2017/09/15 11:03
Final Report Due: 2017/10/05 18:00

Parameter Summary

Package/Test	Parameter	RDL *	Unit	Samples
Dioxins and Furans by 1613	Confirmation 2,3,7,8-Tetra CDF	0.1	pg/g	All
	2,3,7,8-Tetra CDD	10	pg/g	All
	1,2,3,7,8-Penta CDD	50	pg/g	All
	1,2,3,4,7,8-Hexa CDD	50	pg/g	All
	1,2,3,6,7,8-Hexa CDD	50	pg/g	All
	1,2,3,7,8,9-Hexa CDD	50	pg/g	All
	1,2,3,4,6,7,8-Hepta CDD	50	pg/g	All
	Octa CDD	100	pg/g	All
	Total Tetra CDD	10	pg/g	All
	Total Penta CDD	50	pg/g	All
	Total Hexa CDD	50	pg/g	All
	Total Hepta CDD	50	pg/g	All
	2,3,7,8-Tetra CDF	10	pg/g	All
	1,2,3,7,8-Penta CDF	50	pg/g	All
	2,3,4,7,8-Penta CDF	50	pg/g	All
	1,2,3,4,7,8-Hexa CDF	50	pg/g	All
	1,2,3,6,7,8-Hexa CDF	50	pg/g	All
	2,3,4,6,7,8-Hexa CDF	50	pg/g	All
	1,2,3,7,8,9-Hexa CDF	50	pg/g	All
	1,2,3,4,6,7,8-Hepta CDF	50	pg/g	All
	1,2,3,4,7,8,9-Hepta CDF	50	pg/g	All
	Octa CDF	100	pg/g	All
	Total Tetra CDF	10	pg/g	All
	Total Penta CDF	50	pg/g	All
	Total Hexa CDF	50	pg/g	All
	Total Hepta CDF	50	pg/g	All
	Moisture	1	%	All

**RDLs are subject to change based on interferences present at the time of analysis.*

Maxxam PM: Stephanie Pollen (SPollen@maxxam.ca)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Shipping Order Form

S 5 8 0 - 2 6 0 1 4

TestAmerica Portland
8920 SW Gemini Dr. Building 7
Beaverton, OR 97008
Phone (503) 906-9200 Fax (503) 906-9210

Shipping Order ID: 26014 | **Ship Via: FedEx Priority Overnight** | **Due On: 9/14/2017 11:59:00PM**

Ship To Information

Project Manager:
Company Name: Maxxam Analytics
Attention: Attn: Shipping/Receiving
Address 1: PO BOX 57437
Address 2: Postal Station A
Address 3:
City: City: Toronto
State: Ontario Canada
Zip: M5W 5M5
Phone #:
Project Ref:

Notes to Bottle/Shipping Department

- ☐ Ready to Fill
- ☐ Seals on Coolers
- ☐ Seals on Bottle
- ☐ Bottle Sets
- ☐ Ice Cooler
- ☐ Labels with Bottles
- ☐ Preprinted
- ☐ Labels on Bottles
- ☐ Preprinted COC
- ☐ Rebill Freight
- ☐ Return Shipment Labels
- ☐ Number of Return Shipment Labels

Shipping Assets

Assets	Quantity	Description	Filled
			☐

Please notify us immediately if an error is found in shipment

Shipping Order ID: 26014 Page 1 of 2 Printed on 9/14/2017 1:16:02PM

Bottle Order Information

Bottle Order:
Bottle Order #:
Request From Client: 9/14/2017
Date Order Posted:
Order Status: Ready To Process
Prepared By:
Deliver By Date: ***9/14/2017 11:59:00PM***
Lab Project Number:

Order Completion Information

Creator: Steve Gonzales
Filled by:
Sent Date:
Sent Via:
Tracking #:

Sets	Bottles/Set	Qty	Bottle Type Description	Preservative	Method	Matrix	Sample Type	Comments	Lot #

Notes to Field Staff:

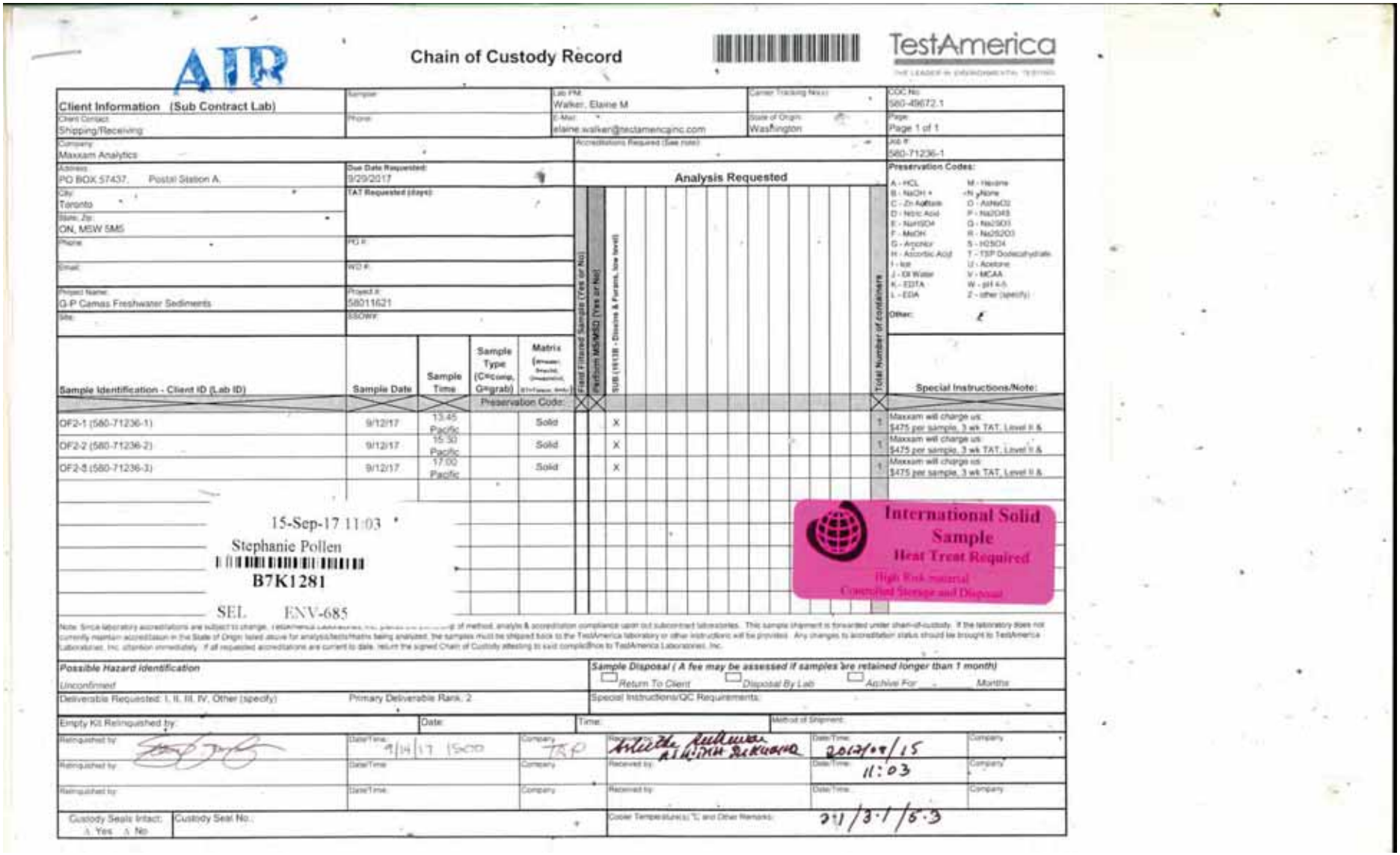
Health and Safety Notes:

Preservative Comment

Relinquished By	Company	Date	Time	Received By	Company	Seal # Seal # Seal #
Relinquished By	Company	Date	Time	Received By	Company	Seal # Seal # Seal #

Please notify us immediately if an error is found in shipment

Shipping Order ID: 26014 Page 2 of 2 Printed on 9/14/2017 1:16:02PM



AIR

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Walker, Elaine M	Carrier Tracking No(s):	COC No: 580-49672.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: elaine.walker@testamericainc.com	State of Origin: Washington	Page: Page 1 of 1
Company: Maxxam Analytics		Accreditations Required (See note):		Job #: 580-71236-1
Address: PO BOX 57437, Postal Station A	Due Date Requested: 9/29/2017	Analysis Requested		Preservation Codes: A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify), Other:
City: Toronto	TAT Requested (days):			
State, Zip: ON, M5W 5M5	PO #:			
Phone:	WO #:			
Email:	Project #: 58011621			
Project Name: Q-P Camas Freshwater Sediments	SSOW#:			
Site:				

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	538 (R13B - Diosine & Furans, low level)	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
OF2-1 (580-71236-1)	9/12/17	13:45 Pacific		Solid			X	1	Maxxam will charge us $475 per sample, 3 wk TAT, Level II &
OF2-2 (580-71236-2)	9/12/17	15:30 Pacific		Solid			X	1	Maxxam will charge us $475 per sample, 3 wk TAT, Level II &
OF2-3 (580-71236-3)	9/12/17	17:00 Pacific		Solid			X	1	Maxxam will charge us $475 per sample, 3 wk TAT, Level II &

15-Sep-17 11:03
Stephanie Pollen
B7K1281
SEL ENV-685

International Solid Sample
Heat Treat Required
High Risk material
Controlled Storage and Disposal

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. cannot accept responsibility for the performance of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification Unconfirmed	**Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)** ☐ Return To Client ☐ Disposal By Lab ☐ Archive For Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:
Empty Kit Relinquished by: Date:	Time: Method of Shipment:

	Date/Time	Company	Received by	Date/Time	Company
Relinquished by:	9/14/17 1500	TSP	Received by: Michelle Kellaway AS Kirsten Blackwood	2017/09/15 11:03	
Relinquished by:	Date/Time	Company	Received by:	Date/Time	Company
Relinquished by:	Date/Time	Company	Received by:	Date/Time	Company

Custody Seals Intact: △ Yes △ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks: 2.1/3.1/5.3

Maxxam
A Bureau Veritas Group Company

Your Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS
Your C.O.C. #: 580-49672.1

Attention:Elaine Walker

TestAmerica
17461 Derian Ave
Suite 100
Irvine, CA
USA 92614

Report Date: 2017/10/06
Report #: R4764548
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7K1281
Received: 2017/09/15, 11:03

Sample Matrix: SEDIMENT
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Dioxins/Furans in Soil (1613B) (1)	1	2017/09/18	2017/09/21	BRL SOP-00410	EPA 1613B m
Dioxins/Furans in Soil (1613B) (1)	2	2017/09/18	2017/09/22	BRL SOP-00410	EPA 1613B m
Moisture	3	N/A	2017/09/19	CAM SOP-00445	Carter 2nd ed 51.2 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Soils are reported on a dry weight basis unless otherwise specified.

Confirmatory runs for 2,3,7,8-TCDF are performed only if the primary result is greater than the RDL.

U = Undetected at the limit of quantitation.
J = Estimated concentration between the EDL & RDL.
B = Blank Contamination.
Q = One or more quality control criteria failed.
E = Analyte concentration exceeds the maximum concentration level.
K = Estimated maximum possible concentration due to ion abundance ratio failure.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Your Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS
Your C.O.C. #: 580-49672.1

Attention:Elaine Walker

TestAmerica
17461 Derian Ave
Suite 100
Irvine, CA
USA 92614

Report Date: 2017/10/06
Report #: R4764548
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7K1281
Received: 2017/09/15, 11:03

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Stephanie Pollen, Project Manager
Email: SPollen@maxxam.ca
Phone# (905) 817-5700
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

RESULTS OF ANALYSES OF SEDIMENT

Maxxam ID		FCZ298		FCZ299	FCZ300			
Sampling Date		2017/09/12 13:45		2017/09/12 15:30	2017/09/12 17:00			
COC Number		580-49672.1		580-49672.1	580-49672.1			
	UNITS	**OF2-1(580-71236-1)**	**QC Batch**	**OF2-2(580-71236-2)**	**OF2-3(580-71236-3)**	**RDL**	**MDL**	**QC Batch**
Moisture	%	30	5170637	28	27	1.0	0.50	5170704

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

DIOXINS AND FURANS BY HRMS (SEDIMENT)

Maxxam ID		FCZ298							
Sampling Date		2017/09/12 13:45							
COC Number		580-49672.1				TOXIC EQUIVALENCY		# of	
	UNITS	OF2-1(580-71236-1)	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg/g	0.0742 U	0.0742	0.200	0.400	1.00	0.0742	N/A	5176098
1,2,3,7,8-Penta CDD *	pg/g	0.0957 U	0.0957	1.00	0.400	1.00	0.0957	N/A	5176098
1,2,3,4,7,8-Hexa CDD *	pg/g	0.112 U (1)	0.112	1.00	0.400	0.100	0.0112	N/A	5176098
1,2,3,6,7,8-Hexa CDD *	pg/g	0.207 J	0.0843	1.00	0.400	0.100	0.0207	N/A	5176098
1,2,3,7,8,9-Hexa CDD *	pg/g	0.241 J	0.0823	1.00	0.400	0.100	0.0241	N/A	5176098
1,2,3,4,6,7,8-Hepta CDD *	pg/g	2.41	0.0677	1.00	0.400	0.0100	0.0241	N/A	5176098
Octa CDD *	pg/g	15.3	0.105	2.00	0.800	0.000300	0.00459	N/A	5176098
Total Tetra CDD *	pg/g	0.0742 U	0.0742	0.200	0.400	N/A	N/A	0	5176098
Total Penta CDD *	pg/g	0.0957 U	0.0957	1.00	0.400	N/A	N/A	0	5176098
Total Hexa CDD *	pg/g	0.756 J	0.0831	1.00	0.400	N/A	N/A	3	5176098
Total Hepta CDD *	pg/g	4.89	0.0677	1.00	0.400	N/A	N/A	2	5176098
2,3,7,8-Tetra CDF **	pg/g	0.0795 U	0.0795	0.200	0.400	0.100	0.00795	N/A	5176098
1,2,3,7,8-Penta CDF **	pg/g	0.104 U	0.104	1.00	0.400	0.0300	0.00312	N/A	5176098
2,3,4,7,8-Penta CDF **	pg/g	0.101 U	0.101	1.00	0.400	0.300	0.0303	N/A	5176098
1,2,3,4,7,8-Hexa CDF **	pg/g	0.104 J	0.0760	1.00	0.400	0.100	0.0104	N/A	5176098
1,2,3,6,7,8-Hexa CDF **	pg/g	0.127 J	0.0772	1.00	0.400	0.100	0.0127	N/A	5176098
2,3,4,6,7,8-Hexa CDF **	pg/g	0.108 J	0.0719	1.00	0.400	0.100	0.0108	N/A	5176098
1,2,3,7,8,9-Hexa CDF **	pg/g	0.145 J	0.0768	1.00	0.400	0.100	0.0145	N/A	5176098
1,2,3,4,6,7,8-Hepta CDF **	pg/g	0.388 J	0.0747	1.00	0.400	0.0100	0.00388	N/A	5176098
1,2,3,4,7,8,9-Hepta CDF **	pg/g	0.138 J	0.0748	1.00	0.400	0.0100	0.00138	N/A	5176098
Octa CDF **	pg/g	0.900 J	0.0984	2.00	0.800	0.000300	0.000270	N/A	5176098
Total Tetra CDF **	pg/g	0.0795 U	0.0795	0.200	0.400	N/A	N/A	0	5176098
Total Penta CDF **	pg/g	0.103 U	0.103	1.00	0.400	N/A	N/A	0	5176098
Total Hexa CDF **	pg/g	0.589 J	0.0754	1.00	0.400	N/A	N/A	5	5176098
Total Hepta CDF **	pg/g	1.04	0.0747	1.00	0.400	N/A	N/A	3	5176098
TOTAL TOXIC EQUIVALENCY	pg/g	N/A	N/A	N/A	N/A	N/A	0.350	N/A	N/A

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

DIOXINS AND FURANS BY HRMS (SEDIMENT)

Maxxam ID		FCZ298							
Sampling Date		2017/09/12 13:45							
COC Number		580-49672.1				TOXIC EQUIVALENCY		# of	
	UNITS	OF2-1(580-71236-1)	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Surrogate Recovery (%)									
37CL4 2378 Tetra CDD *	%	123	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234678 HeptaCDD *	%	80	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234678 HeptaCDF **	%	70	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123478 HexaCDD *	%	82	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123478 HexaCDF **	%	72	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234789 HeptaCDF **	%	79	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123678 HexaCDD *	%	96	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123678 HexaCDF **	%	77	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-12378 PentaCDD *	%	99	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-12378 PentaCDF **	%	84	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123789 HexaCDF **	%	99	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-234678 HexaCDF **	%	90	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-23478 PentaCDF **	%	91	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-2378 TetraCDD *	%	100	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-2378 TetraCDF **	%	88	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-OCDD *	%	92	N/A	N/A	N/A	N/A	N/A	N/A	5176098

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

DIOXINS AND FURANS BY HRMS (SEDIMENT)

Maxxam ID		FCZ299							
Sampling Date		2017/09/12 15:30							
COC Number		580-49672.1				TOXIC EQUIVALENCY		# of	
	UNITS	OF2-2(580-71236-2)	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg/g	0.0904 U	0.0904	0.200	0.400	1.00	0.0904	N/A	5176098
1,2,3,7,8-Penta CDD *	pg/g	0.115 U	0.115	1.00	0.400	1.00	0.115	N/A	5176098
1,2,3,4,7,8-Hexa CDD *	pg/g	0.144 J	0.0960	1.00	0.400	0.100	0.0144	N/A	5176098
1,2,3,6,7,8-Hexa CDD *	pg/g	0.121 J	0.0984	1.00	0.400	0.100	0.0121	N/A	5176098
1,2,3,7,8,9-Hexa CDD *	pg/g	0.201 U (1)	0.201	1.00	0.400	0.100	0.0201	N/A	5176098
1,2,3,4,6,7,8-Hepta CDD *	pg/g	1.17	0.113	1.00	0.400	0.0100	0.0117	N/A	5176098
Octa CDD *	pg/g	6.08	0.127	2.00	0.800	0.000300	0.00182	N/A	5176098
Total Tetra CDD *	pg/g	0.0904 U	0.0904	0.200	0.400	N/A	N/A	0	5176098
Total Penta CDD *	pg/g	0.115 U	0.115	1.00	0.400	N/A	N/A	0	5176098
Total Hexa CDD *	pg/g	0.450 J	0.0971	1.00	0.400	N/A	N/A	3	5176098
Total Hepta CDD *	pg/g	1.99	0.113	1.00	0.400	N/A	N/A	2	5176098
2,3,7,8-Tetra CDF **	pg/g	0.0744 U	0.0744	0.200	0.400	0.100	0.00744	N/A	5176098
1,2,3,7,8-Penta CDF **	pg/g	0.108 U	0.108	1.00	0.400	0.0300	0.00324	N/A	5176098
2,3,4,7,8-Penta CDF **	pg/g	0.105 U	0.105	1.00	0.400	0.300	0.0315	N/A	5176098
1,2,3,4,7,8-Hexa CDF **	pg/g	0.0897 U	0.0897	1.00	0.400	0.100	0.00897	N/A	5176098
1,2,3,6,7,8-Hexa CDF **	pg/g	0.0912 U	0.0912	1.00	0.400	0.100	0.00912	N/A	5176098
2,3,4,6,7,8-Hexa CDF **	pg/g	0.0849 U	0.0849	1.00	0.400	0.100	0.00849	N/A	5176098
1,2,3,7,8,9-Hexa CDF **	pg/g	0.0948 J	0.0907	1.00	0.400	0.100	0.00948	N/A	5176098
1,2,3,4,6,7,8-Hepta CDF **	pg/g	0.230 U (1)	0.230	1.00	0.400	0.0100	0.00230	N/A	5176098
1,2,3,4,7,8,9-Hepta CDF **	pg/g	0.0703 U (1)	0.0703	1.00	0.400	0.0100	0.000703	N/A	5176098
Octa CDF **	pg/g	0.444 J	0.119	2.00	0.800	0.000300	0.000133	N/A	5176098
Total Tetra CDF **	pg/g	0.0744 U	0.0744	0.200	0.400	N/A	N/A	0	5176098
Total Penta CDF **	pg/g	0.107 U	0.107	1.00	0.400	N/A	N/A	0	5176098
Total Hexa CDF **	pg/g	0.0948 J	0.0890	1.00	0.400	N/A	N/A	1	5176098
Total Hepta CDF **	pg/g	0.137 J	0.0681	1.00	0.400	N/A	N/A	1	5176098
TOTAL TOXIC EQUIVALENCY	pg/g	N/A	N/A	N/A	N/A	N/A	0.347	N/A	N/A

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

DIOXINS AND FURANS BY HRMS (SEDIMENT)

Maxxam ID		FCZ299							
Sampling Date		2017/09/12 15:30							
COC Number		580-49672.1				TOXIC EQUIVALENCY		# of	
	UNITS	OF2-2(580-71236-2)	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Surrogate Recovery (%)									
37CL4 2378 Tetra CDD *	%	125	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234678 HeptaCDD *	%	64	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234678 HeptaCDF **	%	36	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123478 HexaCDD *	%	46	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123478 HexaCDF **	%	35	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234789 HeptaCDF **	%	74	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123678 HexaCDD *	%	63	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123678 HexaCDF **	%	44	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-12378 PentaCDD *	%	101	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-12378 PentaCDF **	%	85	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123789 HexaCDF **	%	97	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-234678 HexaCDF **	%	84	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-23478 PentaCDF **	%	75	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-2378 TetraCDD *	%	102	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-2378 TetraCDF **	%	85	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-OCDD *	%	69	N/A	N/A	N/A	N/A	N/A	N/A	5176098

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

DIOXINS AND FURANS BY HRMS (SEDIMENT)

Maxxam ID		FCZ299							
Sampling Date		2017/09/12 15:30							
COC Number		580-49672.1				TOXIC EQUIVALENCY		# of	
	UNITS	OF2-2(580-71236-2) Lab-Dup	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg/g	0.0784 U	0.0784	0.200	0.400	1.00	0.0784	N/A	5176098
1,2,3,7,8-Penta CDD *	pg/g	0.103 U	0.103	0.999	0.400	1.00	0.103	N/A	5176098
1,2,3,4,7,8-Hexa CDD *	pg/g	0.0921 U	0.0921	0.999	0.400	0.100	0.00921	N/A	5176098
1,2,3,6,7,8-Hexa CDD *	pg/g	0.110 J	0.0944	0.999	0.400	0.100	0.0110	N/A	5176098
1,2,3,7,8,9-Hexa CDD *	pg/g	0.151 J	0.0922	0.999	0.400	0.100	0.0151	N/A	5176098
1,2,3,4,6,7,8-Hepta CDD *	pg/g	1.38	0.105	0.999	0.400	0.0100	0.0138	N/A	5176098
Octa CDD *	pg/g	11.3 (1)	0.122	2.00	0.800	0.000300	0.00339	N/A	5176098
Total Tetra CDD *	pg/g	0.0784 U	0.0784	0.200	0.400	N/A	N/A	0	5176098
Total Penta CDD *	pg/g	0.103 U	0.103	0.999	0.400	N/A	N/A	0	5176098
Total Hexa CDD *	pg/g	0.665 J	0.0932	0.999	0.400	N/A	N/A	4	5176098
Total Hepta CDD *	pg/g	3.55	0.105	0.999	0.400	N/A	N/A	2	5176098
2,3,7,8-Tetra CDF **	pg/g	0.0879 U	0.0879	0.200	0.400	0.100	0.00879	N/A	5176098
1,2,3,7,8-Penta CDF **	pg/g	0.0975 U	0.0975	0.999	0.400	0.0300	0.00293	N/A	5176098
2,3,4,7,8-Penta CDF **	pg/g	0.0947 U	0.0947	0.999	0.400	0.300	0.0284	N/A	5176098
1,2,3,4,7,8-Hexa CDF **	pg/g	0.0674 U	0.0674	0.999	0.400	0.100	0.00674	N/A	5176098
1,2,3,6,7,8-Hexa CDF **	pg/g	0.0685 U	0.0685	0.999	0.400	0.100	0.00685	N/A	5176098
2,3,4,6,7,8-Hexa CDF **	pg/g	0.0638 U	0.0638	0.999	0.400	0.100	0.00638	N/A	5176098
1,2,3,7,8,9-Hexa CDF **	pg/g	0.102 J	0.0681	0.999	0.400	0.100	0.0102	N/A	5176098
1,2,3,4,6,7,8-Hepta CDF **	pg/g	0.191 J	0.0811	0.999	0.400	0.0100	0.00191	N/A	5176098
1,2,3,4,7,8,9-Hepta CDF **	pg/g	0.0812 U	0.0812	0.999	0.400	0.0100	0.000812	N/A	5176098
Octa CDF **	pg/g	0.481 J	0.0987	2.00	0.800	0.000300	0.000144	N/A	5176098
Total Tetra CDF **	pg/g	0.0879 U	0.0879	0.200	0.400	N/A	N/A	0	5176098
Total Penta CDF **	pg/g	0.0961 U	0.0961	0.999	0.400	N/A	N/A	0	5176098
Total Hexa CDF **	pg/g	0.102 J	0.0669	0.999	0.400	N/A	N/A	1	5176098
Total Hepta CDF **	pg/g	0.427 J	0.0812	0.999	0.400	N/A	N/A	2	5176098
TOTAL TOXIC EQUIVALENCY	pg/g	N/A	N/A	N/A	N/A	N/A	0.307	N/A	N/A

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

(1) Duplicate results exceeded RPD acceptance criteria. This may be due to sample heterogeneity.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

DIOXINS AND FURANS BY HRMS (SEDIMENT)

Maxxam ID		FCZ299							
Sampling Date		2017/09/12 15:30							
COC Number		580-49672.1				TOXIC EQUIVALENCY		# of	
	UNITS	OF2-2(580-71236-2) Lab-Dup	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Surrogate Recovery (%)									
37CL4 2378 Tetra CDD *	%	122	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234678 HeptaCDD *	%	76	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234678 HeptaCDF **	%	61	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123478 HexaCDD *	%	72	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123478 HexaCDF **	%	63	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234789 HeptaCDF **	%	72	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123678 HexaCDD *	%	84	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123678 HexaCDF **	%	69	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-12378 PentaCDD *	%	95	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-12378 PentaCDF **	%	80	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123789 HexaCDF **	%	91	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-234678 HexaCDF **	%	83	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-23478 PentaCDF **	%	82	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-2378 TetraCDD *	%	98	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-2378 TetraCDF **	%	77	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-OCDD *	%	81	N/A	N/A	N/A	N/A	N/A	N/A	5176098

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

DIOXINS AND FURANS BY HRMS (SEDIMENT)

Maxxam ID		FCZ300							
Sampling Date		2017/09/12 17:00							
COC Number		580-49672.1				TOXIC EQUIVALENCY		# of	
	UNITS	OF2-3(580-71236-3)	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg/g	0.0915 U	0.0915	0.200	0.400	1.00	0.0915	N/A	5176098
1,2,3,7,8-Penta CDD *	pg/g	0.106 U	0.106	1.00	0.400	1.00	0.106	N/A	5176098
1,2,3,4,7,8-Hexa CDD *	pg/g	0.0914 U	0.0914	1.00	0.400	0.100	0.00914	N/A	5176098
1,2,3,6,7,8-Hexa CDD *	pg/g	0.0937 U	0.0937	1.00	0.400	0.100	0.00937	N/A	5176098
1,2,3,7,8,9-Hexa CDD *	pg/g	0.107 J	0.0915	1.00	0.400	0.100	0.0107	N/A	5176098
1,2,3,4,6,7,8-Hepta CDD *	pg/g	1.11	0.0800	1.00	0.400	0.0100	0.0111	N/A	5176098
Octa CDD *	pg/g	6.86	0.111	2.00	0.800	0.000300	0.00206	N/A	5176098
Total Tetra CDD *	pg/g	0.0915 U	0.0915	0.200	0.400	N/A	N/A	0	5176098
Total Penta CDD *	pg/g	0.106 U	0.106	1.00	0.400	N/A	N/A	0	5176098
Total Hexa CDD *	pg/g	0.491 J	0.0925	1.00	0.400	N/A	N/A	3	5176098
Total Hepta CDD *	pg/g	2.31	0.0800	1.00	0.400	N/A	N/A	2	5176098
2,3,7,8-Tetra CDF **	pg/g	0.0923 U	0.0923	0.200	0.400	0.100	0.00923	N/A	5176098
1,2,3,7,8-Penta CDF **	pg/g	0.0915 U	0.0915	1.00	0.400	0.0300	0.00275	N/A	5176098
2,3,4,7,8-Penta CDF **	pg/g	0.0888 U	0.0888	1.00	0.400	0.300	0.0266	N/A	5176098
1,2,3,4,7,8-Hexa CDF **	pg/g	0.0819 U	0.0819	1.00	0.400	0.100	0.00819	N/A	5176098
1,2,3,6,7,8-Hexa CDF **	pg/g	0.0833 U	0.0833	1.00	0.400	0.100	0.00833	N/A	5176098
2,3,4,6,7,8-Hexa CDF **	pg/g	0.0775 U	0.0775	1.00	0.400	0.100	0.00775	N/A	5176098
1,2,3,7,8,9-Hexa CDF **	pg/g	0.0828 U	0.0828	1.00	0.400	0.100	0.00828	N/A	5176098
1,2,3,4,6,7,8-Hepta CDF **	pg/g	0.143 U (1)	0.143	1.00	0.400	0.0100	0.00143	N/A	5176098
1,2,3,4,7,8,9-Hepta CDF **	pg/g	0.101 U	0.101	1.00	0.400	0.0100	0.00101	N/A	5176098
Octa CDF **	pg/g	0.394 J	0.0972	2.00	0.800	0.000300	0.000118	N/A	5176098
Total Tetra CDF **	pg/g	0.0923 U	0.0923	0.200	0.400	N/A	N/A	0	5176098
Total Penta CDF **	pg/g	0.0901 U	0.0901	1.00	0.400	N/A	N/A	0	5176098
Total Hexa CDF **	pg/g	0.0813 U	0.0813	1.00	0.400	N/A	N/A	0	5176098
Total Hepta CDF **	pg/g	0.182 J	0.101	1.00	0.400	N/A	N/A	1	5176098
TOTAL TOXIC EQUIVALENCY	pg/g	N/A	N/A	N/A	N/A	N/A	0.314	N/A	N/A

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

DIOXINS AND FURANS BY HRMS (SEDIMENT)

Maxxam ID		FCZ300							
Sampling Date		2017/09/12 17:00							
COC Number		580-49672.1				TOXIC EQUIVALENCY		# of	
	UNITS	OF2-3(580-71236-3)	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Surrogate Recovery (%)									
37CL4 2378 Tetra CDD *	%	103	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234678 HeptaCDD *	%	65	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234678 HeptaCDF **	%	61	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123478 HexaCDD *	%	62	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123478 HexaCDF **	%	57	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-1234789 HeptaCDF **	%	70	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123678 HexaCDD *	%	74	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123678 HexaCDF **	%	60	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-12378 PentaCDD *	%	83	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-12378 PentaCDF **	%	64	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-123789 HexaCDF **	%	79	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-234678 HexaCDF **	%	71	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-23478 PentaCDF **	%	69	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-2378 TetraCDD *	%	82	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-2378 TetraCDF **	%	65	N/A	N/A	N/A	N/A	N/A	N/A	5176098
C13-OCDD *	%	73	N/A	N/A	N/A	N/A	N/A	N/A	5176098

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

TEST SUMMARY

Maxxam ID: FCZ298
Sample ID: OF2-1(580-71236-1)
Matrix: SEDIMENT

Collected: 2017/09/12
Shipped:
Received: 2017/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dioxins/Furans in Soil (1613B)	HRMS/MS	5176098	2017/09/18	2017/09/21	Owen Cosby
Moisture	BAL	5170637	N/A	2017/09/19	Min Yang

Maxxam ID: FCZ299
Sample ID: OF2-2(580-71236-2)
Matrix: SEDIMENT

Collected: 2017/09/12
Shipped:
Received: 2017/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dioxins/Furans in Soil (1613B)	HRMS/MS	5176098	2017/09/18	2017/09/22	Owen Cosby
Moisture	BAL	5170704	N/A	2017/09/19	Nimarta Singh

Maxxam ID: FCZ299 Dup
Sample ID: OF2-2(580-71236-2)
Matrix: SEDIMENT

Collected: 2017/09/12
Shipped:
Received: 2017/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dioxins/Furans in Soil (1613B)	HRMS/MS	5176098	2017/09/18	2017/09/22	Owen Cosby

Maxxam ID: FCZ300
Sample ID: OF2-3(580-71236-3)
Matrix: SEDIMENT

Collected: 2017/09/12
Shipped:
Received: 2017/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dioxins/Furans in Soil (1613B)	HRMS/MS	5176098	2017/09/18	2017/09/22	Owen Cosby
Moisture	BAL	5170704	N/A	2017/09/19	Nimarta Singh

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5170637	CYN	RPD - Sample/Sample Dup	Moisture	2017/09/19	4.4		%	20
5170704	CYN	RPD - Sample/Sample Dup	Moisture	2017/09/19	0.90		%	20
5176098	OBC	Matrix Spike(FCZ298)	37CL4 2378 Tetra CDD	2017/09/22		103	%	35 - 197
			C13-1234678 HeptaCDD	2017/09/22		70	%	23 - 140
			C13-1234678 HeptaCDF	2017/09/22		57	%	28 - 143
			C13-123478 HexaCDD	2017/09/22		69	%	32 - 141
			C13-123478 HexaCDF	2017/09/22		58	%	26 - 152
			C13-1234789 HeptaCDF	2017/09/22		67	%	26 - 138
			C13-123678 HexaCDD	2017/09/22		75	%	28 - 130
			C13-123678 HexaCDF	2017/09/22		67	%	26 - 123
			C13-12378 PentaCDD	2017/09/22		90	%	25 - 181
			C13-12378 PentaCDF	2017/09/22		79	%	24 - 185
			C13-123789 HexaCDF	2017/09/22		83	%	29 - 147
			C13-234678 HexaCDF	2017/09/22		77	%	28 - 136
			C13-23478 PentaCDF	2017/09/22		80	%	21 - 178
			C13-2378 TetraCDD	2017/09/22		94	%	25 - 164
			C13-2378 TetraCDF	2017/09/22		78	%	24 - 169
			C13-OCDD	2017/09/22		78	%	17 - 157
			2,3,7,8-Tetra CDD	2017/09/22		90	%	67 - 158
			1,2,3,7,8-Penta CDD	2017/09/22		96	%	25 - 181
			1,2,3,4,7,8-Hexa CDD	2017/09/22		106	%	70 - 164
			1,2,3,6,7,8-Hexa CDD	2017/09/22		107	%	76 - 134
			1,2,3,7,8,9-Hexa CDD	2017/09/22		116	%	64 - 162
			1,2,3,4,6,7,8-Hepta CDD	2017/09/22		103	%	70 - 140
			Octa CDD	2017/09/22		101	%	78 - 144
			2,3,7,8-Tetra CDF	2017/09/22		100	%	75 - 158
			1,2,3,7,8-Penta CDF	2017/09/22		93	%	80 - 134
			2,3,4,7,8-Penta CDF	2017/09/22		107	%	68 - 160
			1,2,3,4,7,8-Hexa CDF	2017/09/22		107	%	72 - 134
			1,2,3,6,7,8-Hexa CDF	2017/09/22		102	%	84 - 130
			2,3,4,6,7,8-Hexa CDF	2017/09/22		91	%	70 - 156
			1,2,3,7,8,9-Hexa CDF	2017/09/22		105	%	78 - 130
			1,2,3,4,6,7,8-Hepta CDF	2017/09/22		96	%	82 - 122
			1,2,3,4,7,8,9-Hepta CDF	2017/09/22		112	%	78 - 138
			Octa CDF	2017/09/22		96	%	63 - 170
5176098	OBC	Spiked Blank	37CL4 2378 Tetra CDD	2017/09/21		119	%	35 - 197
			C13-1234678 HeptaCDD	2017/09/21		83	%	23 - 140
			C13-1234678 HeptaCDF	2017/09/21		61	%	28 - 143
			C13-123478 HexaCDD	2017/09/21		80	%	32 - 141
			C13-123478 HexaCDF	2017/09/21		63	%	26 - 152
			C13-1234789 HeptaCDF	2017/09/21		81	%	26 - 138
			C13-123678 HexaCDD	2017/09/21		92	%	28 - 130
			C13-123678 HexaCDF	2017/09/21		76	%	26 - 123
			C13-12378 PentaCDD	2017/09/21		107	%	25 - 181
			C13-12378 PentaCDF	2017/09/21		87	%	24 - 185
			C13-123789 HexaCDF	2017/09/21		102	%	29 - 147
			C13-234678 HexaCDF	2017/09/21		97	%	28 - 136
			C13-23478 PentaCDF	2017/09/21		87	%	21 - 178
			C13-2378 TetraCDD	2017/09/21		103	%	25 - 164
			C13-2378 TetraCDF	2017/09/21		88	%	24 - 169
			C13-OCDD	2017/09/21		91	%	17 - 157
			2,3,7,8-Tetra CDD	2017/09/21		97	%	67 - 158
			1,2,3,7,8-Penta CDD	2017/09/21		88	%	25 - 181

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			1,2,3,4,7,8-Hexa CDD	2017/09/21		105	%	70 - 164
			1,2,3,6,7,8-Hexa CDD	2017/09/21		102	%	76 - 134
			1,2,3,7,8,9-Hexa CDD	2017/09/21		119	%	64 - 162
			1,2,3,4,6,7,8-Hepta CDD	2017/09/21		106	%	70 - 140
			Octa CDD	2017/09/21		104	%	78 - 144
			2,3,7,8-Tetra CDF	2017/09/21		103	%	75 - 158
			1,2,3,7,8-Penta CDF	2017/09/21		95	%	80 - 134
			2,3,4,7,8-Penta CDF	2017/09/21		110	%	68 - 160
			1,2,3,4,7,8-Hexa CDF	2017/09/21		110	%	72 - 134
			1,2,3,6,7,8-Hexa CDF	2017/09/21		111	%	84 - 130
			2,3,4,6,7,8-Hexa CDF	2017/09/21		91	%	70 - 156
			1,2,3,7,8,9-Hexa CDF	2017/09/21		96	%	78 - 130
			1,2,3,4,6,7,8-Hepta CDF	2017/09/21		100	%	82 - 122
			1,2,3,4,7,8,9-Hepta CDF	2017/09/21		96	%	78 - 138
			Octa CDF	2017/09/21		93	%	63 - 170
5176098	OBC	Spiked Blank DUP	37CL4 2378 Tetra CDD	2017/09/21		122	%	35 - 197
			C13-1234678 HeptaCDD	2017/09/21		86	%	23 - 140
			C13-1234678 HeptaCDF	2017/09/21		73	%	28 - 143
			C13-123478 HexaCDD	2017/09/21		84	%	32 - 141
			C13-123478 HexaCDF	2017/09/21		76	%	26 - 152
			C13-1234789 HeptaCDF	2017/09/21		79	%	26 - 138
			C13-123678 HexaCDD	2017/09/21		95	%	28 - 130
			C13-123678 HexaCDF	2017/09/21		77	%	26 - 123
			C13-12378 PentaCDD	2017/09/21		105	%	25 - 181
			C13-12378 PentaCDF	2017/09/21		86	%	24 - 185
			C13-123789 HexaCDF	2017/09/21		100	%	29 - 147
			C13-234678 HexaCDF	2017/09/21		91	%	28 - 136
			C13-23478 PentaCDF	2017/09/21		89	%	21 - 178
			C13-2378 TetraCDD	2017/09/21		104	%	25 - 164
			C13-2378 TetraCDF	2017/09/21		80	%	24 - 169
			C13-OCDD	2017/09/21		92	%	17 - 157
			2,3,7,8-Tetra CDD	2017/09/21		89	%	67 - 158
			1,2,3,7,8-Penta CDD	2017/09/21		90	%	25 - 181
			1,2,3,4,7,8-Hexa CDD	2017/09/21		104	%	70 - 164
			1,2,3,6,7,8-Hexa CDD	2017/09/21		105	%	76 - 134
			1,2,3,7,8,9-Hexa CDD	2017/09/21		114	%	64 - 162
			1,2,3,4,6,7,8-Hepta CDD	2017/09/21		99	%	70 - 140
			Octa CDD	2017/09/21		103	%	78 - 144
			2,3,7,8-Tetra CDF	2017/09/21		105	%	75 - 158
			1,2,3,7,8-Penta CDF	2017/09/21		95	%	80 - 134
			2,3,4,7,8-Penta CDF	2017/09/21		107	%	68 - 160
			1,2,3,4,7,8-Hexa CDF	2017/09/21		106	%	72 - 134
			1,2,3,6,7,8-Hexa CDF	2017/09/21		110	%	84 - 130
			2,3,4,6,7,8-Hexa CDF	2017/09/21		89	%	70 - 156
			1,2,3,7,8,9-Hexa CDF	2017/09/21		87	%	78 - 130
			1,2,3,4,6,7,8-Hepta CDF	2017/09/21		94	%	82 - 122
			1,2,3,4,7,8,9-Hepta CDF	2017/09/21		97	%	78 - 138
			Octa CDF	2017/09/21		97	%	63 - 170
5176098	OBC	RPD	2,3,7,8-Tetra CDD	2017/09/21	8.6		%	25
			1,2,3,7,8-Penta CDD	2017/09/21	2.2		%	25
			1,2,3,4,7,8-Hexa CDD	2017/09/21	0.96		%	25
			1,2,3,6,7,8-Hexa CDD	2017/09/21	2.9		%	25
			1,2,3,7,8,9-Hexa CDD	2017/09/21	4.3		%	25

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			1,2,3,4,6,7,8-Hepta CDD	2017/09/21	6.8		%	25
			Octa CDD	2017/09/21	0.97		%	25
			2,3,7,8-Tetra CDF	2017/09/21	1.9		%	25
			1,2,3,7,8-Penta CDF	2017/09/21	0		%	25
			2,3,4,7,8-Penta CDF	2017/09/21	2.8		%	25
			1,2,3,4,7,8-Hexa CDF	2017/09/21	3.7		%	25
			1,2,3,6,7,8-Hexa CDF	2017/09/21	0.90		%	25
			2,3,4,6,7,8-Hexa CDF	2017/09/21	2.2		%	25
			1,2,3,7,8,9-Hexa CDF	2017/09/21	9.8		%	25
			1,2,3,4,6,7,8-Hepta CDF	2017/09/21	6.2		%	25
			1,2,3,4,7,8,9-Hepta CDF	2017/09/21	1.0		%	25
			Octa CDF	2017/09/21	4.2		%	25
5176098	OBC	Method Blank	37CL4 2378 Tetra CDD	2017/09/21		125	%	35 - 197
			C13-1234678 HeptaCDD	2017/09/21		84	%	23 - 140
			C13-1234678 HeptaCDF	2017/09/21		66	%	28 - 143
			C13-123478 HexaCDD	2017/09/21		74	%	32 - 141
			C13-123478 HexaCDF	2017/09/21		66	%	26 - 152
			C13-1234789 HeptaCDF	2017/09/21		88	%	26 - 138
			C13-123678 HexaCDD	2017/09/21		90	%	28 - 130
			C13-123678 HexaCDF	2017/09/21		71	%	26 - 123
			C13-12378 PentaCDD	2017/09/21		105	%	25 - 181
			C13-12378 PentaCDF	2017/09/21		87	%	24 - 185
			C13-123789 HexaCDF	2017/09/21		96	%	29 - 147
			C13-234678 HexaCDF	2017/09/21		91	%	28 - 136
			C13-23478 PentaCDF	2017/09/21		90	%	21 - 178
			C13-2378 TetraCDD	2017/09/21		106	%	25 - 164
			C13-2378 TetraCDF	2017/09/21		85	%	24 - 169
			C13-OCDD	2017/09/21		85	%	17 - 157
			2,3,7,8-Tetra CDD	2017/09/21	0.0765 U, EDL=0.0765		pg/g	
			1,2,3,7,8-Penta CDD	2017/09/21	0.112 U, EDL=0.112		pg/g	
			1,2,3,4,7,8-Hexa CDD	2017/09/21	0.194 J, EDL=0.0809		pg/g	
			1,2,3,6,7,8-Hexa CDD	2017/09/21	0.141 U, EDL=0.141 (1)		pg/g	
			1,2,3,7,8,9-Hexa CDD	2017/09/21	0.175 U, EDL=0.175 (1)		pg/g	
			1,2,3,4,6,7,8-Hepta CDD	2017/09/21	0.254 J, EDL=0.0956		pg/g	
			Octa CDD	2017/09/21	0.823 J, EDL=0.102		pg/g	
			Total Tetra CDD	2017/09/21	0.0765 U, EDL=0.0765		pg/g	
			Total Penta CDD	2017/09/21	0.112 U, EDL=0.112		pg/g	
			Total Hexa CDD	2017/09/21	0.194 J, EDL=0.0818		pg/g	
			Total Hepta CDD	2017/09/21	0.369 J, EDL=0.0956		pg/g	
			2,3,7,8-Tetra CDF	2017/09/21	0.0952 U, EDL=0.0952		pg/g	

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			1,2,3,7,8-Penta CDF	2017/09/21	0.107 U, EDL=0.107		pg/g	
			2,3,4,7,8-Penta CDF	2017/09/21	0.134 J, EDL=0.103		pg/g	
			1,2,3,4,7,8-Hexa CDF	2017/09/21	0.163 U, EDL=0.163 (1)		pg/g	
			1,2,3,6,7,8-Hexa CDF	2017/09/21	0.173 J, EDL=0.0761		pg/g	
			2,3,4,6,7,8-Hexa CDF	2017/09/21	0.168 J, EDL=0.0708		pg/g	
			1,2,3,7,8,9-Hexa CDF	2017/09/21	0.227 J, EDL=0.0757		pg/g	
			1,2,3,4,6,7,8-Hepta CDF	2017/09/21	0.198 J, EDL=0.0734		pg/g	
			1,2,3,4,7,8,9-Hepta CDF	2017/09/21	0.184 J, EDL=0.0735		pg/g	
			Octa CDF	2017/09/21	0.418 J, EDL=0.102		pg/g	
			Total Tetra CDF	2017/09/21	0.0952 U, EDL=0.0952		pg/g	
			Total Penta CDF	2017/09/21	0.134 J, EDL=0.105		pg/g	
			Total Hexa CDF	2017/09/21	0.567 J, EDL=0.0743		pg/g	
			Total Hepta CDF	2017/09/21	0.381 J, EDL=0.0735		pg/g	
5176098	OBC	RPD - Sample/Sample Dup	2,3,7,8-Tetra CDD	2017/09/22	NC		%	25
			1,2,3,7,8-Penta CDD	2017/09/22	NC		%	25
			1,2,3,4,7,8-Hexa CDD	2017/09/22	NC		%	25
			1,2,3,6,7,8-Hexa CDD	2017/09/22	NC		%	25
			1,2,3,7,8,9-Hexa CDD	2017/09/22	NC		%	25
			1,2,3,4,6,7,8-Hepta CDD	2017/09/22	16		%	25
			Octa CDD	2017/09/22	60 (2)		%	25
			Total Tetra CDD	2017/09/22	NC		%	25
			Total Penta CDD	2017/09/22	NC		%	25
			Total Hexa CDD	2017/09/22	NC		%	25
			Total Hepta CDD	2017/09/22	NC		%	25
			2,3,7,8-Tetra CDF	2017/09/22	NC		%	25
			1,2,3,7,8-Penta CDF	2017/09/22	NC		%	25
			2,3,4,7,8-Penta CDF	2017/09/22	NC		%	25
			1,2,3,4,7,8-Hexa CDF	2017/09/22	NC		%	25
			1,2,3,6,7,8-Hexa CDF	2017/09/22	NC		%	25
			2,3,4,6,7,8-Hexa CDF	2017/09/22	NC		%	25
			1,2,3,7,8,9-Hexa CDF	2017/09/22	NC		%	25
			1,2,3,4,6,7,8-Hepta CDF	2017/09/22	NC		%	25
			1,2,3,4,7,8,9-Hepta CDF	2017/09/22	NC		%	25
			Octa CDF	2017/09/22	NC		%	25
			Total Tetra CDF	2017/09/22	NC		%	25
			Total Penta CDF	2017/09/22	NC		%	25
			Total Hexa CDF	2017/09/22	NC		%	25

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Total Hepta CDF	2017/09/22	NC		%	25

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

(2) Duplicate results exceeded RPD acceptance criteria. This may be due to sample heterogeneity.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7K1281
Report Date: 2017/10/06

TestAmerica
Client Project #: 58011621
Site Location: G-P CAMAS FRESHWATER SEDIMENTS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Branko Vrzic, A.SC.T., Senior Analyst, HRMS Services

Cristina Carriere, Scientific Service Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Phone (253) 922-2310 Fax (253) 922-5047

Chain of Custody Record

580-71236 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information
Client Contact: Jim Good
Company: Environmental Science Associates (ESA)
Address: 5309 Shilshole Avenue NW, Suite 200
City: Seattle
State, Zip: WA, 98107
Phone: 206-204-6960(Tel)
Email: JGood@esassoc.com
Project Name: G-P Camas Freshwater Sediments
Site:

Sampler: J. Vlaftelicia, C. French
Phone: 503-830-5693
Lab PM: Walker, Elaine M
E-Mail: elaine.walker@testamericainc.com
Due Date Requested:
TAT Requested (days):
PO #: D160430.00, Task 2
WO #: D160430.00, Task 2
Project #: 58011621
SSOW#:

COC No: 580-25858-8523.2
Page: Page 2 of 2
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	350.1 - Ammonia	6020A_LL - As,Cd,Cr,Cu,Pb,Se,Ag,Ni,Zn 7471A - Mercury	8081B - Pesticides, Low Level	8082A - PCBs, Low Level	8070D Semivolatiles, Low Level	9060 - TOC	NWTPH-Dx	Organotins	160.4 - Total Volatile Solids	9034 - Sulfide	SM2540B - Total Solids	Grain Size	1613B - Dioxins & Furans (Maxxam Analytical)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	N	N	N	N	N	N	N	N	N	N	N	N		
OF2-1	9/12/17	1345	C	S			X	X	X	X	X	X	X	X	X		X	X	X	6	
OF2-1	9/12/17	1345	G	S												X				1	Zn. Acetate Preserv.
OF2-2	9/12/17	1530	C	S			X	X	X	X	X	X	X	X	X		X	X	X	6	
OF2-2	9/12/17	1530	G	S												X				1	Zn. Acetate Preserv.
OF2-3	9/12/17	1700	C	S			X	X	X	X	X	X	X	X	X		X	X	X	6	
OF2-3	9/12/17	1700	G	S												X				1	Zn. Acetate Preserv.

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)
Special Instructions/QC Requirements:

Empty Kit Relinquished by: Date: Time: Method of Shipment:

	Date/Time	Company		Date/Time	Company
Relinquished by:	9/13/17 0705	ESA	Received by:	9/13/17 1110	ESS
Relinquished by: Jessica Nyr	9/13/17 1250	ESS	Received by:	9/13/17 1250	KF
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks: 2.3

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Loc: 580
71236

Client Name	Project No.	Shipping Information
TestAmerica		Carrier: FedEx
Address	Phone No.	Airbill No.
5755 8th Street East	253.248.4972	8112 7869 9953
City, State, Zip code	Report Attention	
Tacoma, WA 98424	M. Elaine Walker	

Lab Sample No.	Date Sampled	Time Sampled	Sampled by / Sample Description	Number of Containers	Testing Required	Comments
	9/12/17	1345	OF2-1	1		
	9/12/17	1530	OF2-2	1		
	9/12/17	1700	OF2-3	1		

580-71236 Chain of Custody

Therm. ID A2 Cor 1.2 Unc 2.1
Cooler Dsc Lg Blue @Lab
Wet/Packs Packing Other
Fed Ex Custody Seal: Yes X No

Signature	Print Name	Company	Date	Time	
Relinquished by: Gerald Irissarri	Gerald Irissarri	Northwestern Aquatic Sciences	12/11/17	0830	Custody Seal: Present / Not Present Cooler: Intact / Not Intact
Received by: Tom Blankinship	Blankinship	TA-Sea	12/12/17	0925	
Relinquished by					Internal Cooler Temperature Upon Lab Receipt (°C)
Received by laboratory					

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Walker, Elaine M	Carrier Tracking No(s):	COC No: 580-49668.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: elaine.walker@testamericainc.com	State of Origin: Washington	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 580-71236-1
Address: 4955 Yarrow Street, ,	Due Date Requested: 9/29/2017			
City: Arvada	TAT Requested (days):			
State, Zip: CO, 80002				
Phone: 303-736-0100(Tel) 303-431-7171(Fax)	PO #:			
Email:	WO #:			
Project Name: G-P Camas Freshwater Sediments	Project #: 58011621			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Wastewater, Sample, Groundwater, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	SM2540B	160.4_VS	9034/9030B	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
OF2-1 (580-71236-1)	9/12/17	13:45 Pacific		Solid			X	X	X	2	, Total Sulfide by PSEP - requires special narrative comment (ask Seattle)
OF2-2 (580-71236-2)	9/12/17	15:30 Pacific		Solid			X	X	X	2	, Total Sulfide by PSEP - requires special narrative comment (ask Seattle)
OF2-3 (580-71236-3)	9/12/17	17:00 Pacific		Solid			X	X	X	2	, Total Sulfide by PSEP - requires special narrative comment (ask Seattle)

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	9/14/17 1500	TAP		9/16-17 0840	TAP
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 0.2 Fed 7 +0.1 Transfer RP 9-16-17

Login Sample Receipt Checklist

Client: Environmental Science Associates (ESA)

Job Number: 580-71236-1

Login Number: 71236
List Number: 1
Creator: Gonzales, Steve

List Source: TestAmerica Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Environmental Science Associates (ESA)

Job Number: 580-71236-1

Login Number: 71236
List Number: 3
Creator: Gall, Brandon A

List Source: TestAmerica Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	Lab does not accept radioactive samples.
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Not requested on COC.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Environmental Science Associates (ESA)

Job Number: 580-71236-1

Login Number: 71236
List Number: 2
Creator: Pottruff, Reed W

List Source: TestAmerica Denver
List Creation: 09/16/17 10:38 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

REPORT

of

TEST NO. 885-1 & 2

Toxicity of Freshwater Sediments Using Sediment Bioassays as Part of the Remedial Investigation at the Georgia-Pacific mill site in Camas, Washington

Submitted to

Environmental Science Associates
5309 Shilshole Ave. NW, Suite 200
Seattle, WA 98107

Submitted by

Northwestern Aquatic Sciences
3814 Yaquina Bay Road
P.O. Box 1437
Newport, OR 97365

October 31, 2017

EXECUTIVE SUMMARY OF SEDIMENT BIOASSAYS

Two freshwater sediment bioassays, a 10-day *Hyalella* amphipod survival test and a 20-day *Chironomus dilutus* midge survival and growth test were conducted for Environmental Science Associates (ESA) as part of the Remedial Investigation at the Georgia-Pacific mill site in Camas, Washington. Nine test sediments were compared to the control sediment to assess sediment toxicity and to interpret organism response under the Washington State *Sediment Management Standards* (Chapter 173-204 WAC, Last Update: 2/25/13). The test and control sediments tested are listed in Table 1.

TEST AND CONTROL SEDIMENT INFORMATION

The test sediments were provided to Northwestern Aquatic Sciences (NAS) by ESA personnel. The negative control sediment was collected by NAS personnel from an area approximately one mile east of the Highway 101 bridge at Beaver Creek, approximately eight miles south of Newport, Oregon. All sediments were stored at 4°C in the dark until used. Sample identification and collection information is as follows:

Table 1. Sample identification and collection dates.

Sample description	Hart Crowser Sample Identification	NAS Sample Identification	Collection Date	Receipt Date
Beaver Creek Control*	Control	5989G	9-13-17	9-13-17
Test sediment	OF1-1	5994G	9-13-17	9-15-17
Test sediment	OF1-2	5995G	9-13-17	9-15-17
Test sediment	OF1-3	5996G	9-13-17	9-15-17
Test sediment	OF1-4	5999G	9-14-17	9-15-17
Test sediment	OF2-1	5991G	9-12-17	9-15-17
Test sediment	OF2-2	5992G	9-12-17	9-15-17
Test sediment	OF2-3	5993G	9-12-17	9-15-17
Test sediment	OF2-4	5997G	9-14-17	9-15-17
Test sediment	OF2-5	5998G	9-14-17	9-15-17

*Control used for data interpretation.

BIOASSAY INTERPRETATION CRITERIA

Biological test interpretation for freshwater sediments, as presented in the *Sediment Management Standards* (SMS), uses biological criteria to identify sediments that have no adverse effects on biological resources, and correspond to no significant health risk to humans. The SMS includes Sediment Cleanup Objective (SCO) and Cleanup Screening Level (CSL) biological criteria. The Sediment Cleanup Objectives establish a no adverse effects level, including no acute or chronic adverse effect, to the benthic community. The Cleanup Screening Levels establish a minor adverse effects level, including acute or chronic effects, to the benthic community. The SCO biological criteria are exceeded when one of the biological test results is above the SCO for that bioassay endpoint. The CSL biological criteria are exceeded when 1) any two bioassay test results are above the SCO, or 2) when one of the bioassay test results is above the CSL.

Sediment Cleanup Objective Criteria

When any one of the biological test results shows a test sediment response that exceeds the bioassay-specific response guidelines presented below, and that response is statistically different ($p \leq 0.05$) from the control, the test sediment is judged to have exceeded the SCO.

In accordance with the SMS, the bioassay-specific response guidelines for evaluating an exceedance under the SCO criteria are as follows:

Amphipod 10-day Survival Bioassay. Mean mortality in the test sediment is greater than 15 percent over the mean control and statistically different from the control ($p \leq 0.05$).

Midge 20-Day Survival/Growth Bioassay. Mean mortality in the test sediment is 15 percent over the control mortality and statistically different from control ($p \leq 0.05$). For the growth endpoint, a mean reduction in

biomass that is greater than 25 percent compared to the control and statistically different from the control ($p \leq 0.05$).

Cleanup Screening Levels Criteria

When any two biological test results show test sediment responses that are above the SCO listed above, OR when any one of the biological test results is above the Cleanup Screening Level criteria listed below, that sediment is judged to have exceeded the CSL.

In accordance with the SMS, the bioassay-specific response guidelines for evaluating an exceedance under the CSL criteria are as follows:

Amphipod 10-day Survival/Growth Bioassay. Mean mortality in the test sediment is greater than 25 percent over the mean control and statistically different from the control ($p \leq 0.05$).

Midge 20-Day Survival/Growth Bioassay. Mean mortality in the test sediment is 25 percent over the control mortality and statistically different from the control ($p \leq 0.05$). For the growth endpoint, a mean reduction in biomass that is greater than 40 percent from the control sediment response and statistically different from the control ($p \leq 0.05$).

RESULTS OF AMPHIPOD, *HYALELLA AZTECA* 10-DAY SURVIVAL TEST (885-1)

All water quality observations were within the protocol specified ranges (Table 1, Section A). The test met applicable test acceptability criteria. Although the reference toxicant (positive control) LC50 result (0.48 g/L KCl) was slightly outside the laboratory's control chart action limits (0.29 – 0.46 g/L KCl), it was within the control chart action limits (0.25 – 0.52 g/L KCl). A review of test organisms and test conditions and procedures indicated that there was no evidence that these organisms were unusual in any way and there were no unusual circumstances that may have affected the test results. Control chart warning limits of ± 2 SD will be exceeded 5% of the time by chance alone. (Section A).

The control sediment exhibited a mean mortality of 1.3% (Table 1). None of the test sediments resulted in an exceedance for mortality under either the SCO or the CSL of the SMS guidelines in the *Hyalella* bioassay.

RESULTS OF MIDGE, *CHIRONOMUS DILUTUS*, 20-DAY SURVIVAL AND GROWTH TEST (885-2)

All water quality observations were within the protocol specified ranges (Table 1, Section B). The test met all other applicable acceptability criteria including positive control performance (Section B).

The mean mortality in the control sediment in the *Chironomid* test was 2.5% (Table 2). Five of the test sediments resulted in mortality that was statistically significantly higher than that in the control sediment, but none of the test sediments were more than either 15% or 25% over the control mortality. Therefore, none of the sediments exceeded the SCO or CSL criteria for mortality. The control average individual ash-free dry weight was 1.63 mg (Table 3). Eight of the test sediments resulted in growth that was statistically significantly lower than control growth. Only one test sediment, OF1-3, was statistically significantly lower than the control and exceeded limits under the SCO guidelines with an ash-free dry weight of 1.17 mg/individual. No sediment exceeded the CSL criteria for growth.

SUMMARY OF SEDIMENT BIOASSAY RESULTS

The *Sediment Management Standards* include Sediment Cleanup Objectives (SCO) and Cleanup Screening Levels (CSL) biological criteria to identify sediments that have adverse effects on biological resources. The SCO establishes a no adverse effects level, including no acute or chronic adverse effect, to the benthic community. The CSL establishes a minor adverse effects level, including acute or chronic effects, to the benthic community.

The SCO biological criteria are exceeded when one of the biological tests results is above the SCO for that bioassay endpoint. One test sediment, OF1-3, resulted in an exceedance under the SCO guidelines for growth in the *Chironomus* bioassay.

The CSL biological criteria is exceeded when 1) any two bioassay test results are above the SCO criteria; or 2) when one of the bioassay test results is above the CSL criteria. None of the test sediments exceeded the CSL criteria by resulting in either one test result that was a CSL exceedance or two test results that were SCO exceedances (Table 4).

STUDY APPROVAL

Assistant Laboratory Director — Date: 10-31-17
For Linda Nemoth

Project Manager — Date: 10-30-17

Table 1. Mortality results of *Hyalella* 10-day toxicity test and data interpretation using guidelines from the Washington State SMS (2013).

Sample description	Percent mortality (Mean ± SD)	Significantly higher than control sediment at α=0.05?	Percent higher (absolute) than control sediment	Exceedance under SCO? [1]	Exceedance under one-test criteria for CSL? [2]
Control (NAS# 5989G)	1.3 ± 3.5	---	---	---	---
OF1-1 (NAS# 5994G)	1.3 ± 3.5	No	0.0	No	No
OF1-2 (NAS# 5995G)	0.0 ± 0.0	No	-1.3	No	No
OF1-3 (NAS# 5996G)	2.5 ± 7.1	No	1.2	No	No
OF1-4 (NAS# 5999G)	3.8 ± 7.4	No	2.5	No	No
OF2-1 (NAS# 5991G)	3.8 ± 7.4	No	2.5	No	No
OF2-2 (NAS# 5992G)	0.0 ± 0.0	No	-1.3	No	No
OF2-3 (NAS# 5993G)	1.3 ± 3.5	No	0.0	No	No
OF2-4 (NAS# 5997G)	0.0 ± 0.0	No	-1.3	No	No
OF2-5 (NAS# 5998G)	1.3 ± 3.5	No	0.0	No	No

[1] Sediment Cleanup Objectives (SCO) exceedance if the test sediment mean mortality is significantly higher (1-tailed t-test at P≤0.05) than the control sediment mean mortality and the absolute difference is >15%.
[2] Cleanup Screening Levels (CSL) exceedance if the test sediment mean mortality is significantly higher (1-tailed t-test at P≤0.05) than the control sediment mean mortality and the absolute difference is >25%.

Table 2. Mortality results of *Chironomus* 20-day toxicity test and data interpretation using guidelines from the Washington State SMS (2013).

Sample description	Percent mortality (Mean ± SD)	Significantly higher than control sediment at α=0.05?	Percent higher (absolute) than control sediment	Exceedance under SCO? [1]	Exceedance under one-test criteria for CSL? [2]
Control (NAS# 5989G)	2.5 ± 4.6	---	---	---	---
OF1-1 (NAS# 5994G)	15.0 ± 14.1	Yes	12.5	No	No
OF1-2 (NAS# 5995G)	11.3 ± 14.6	No	8.8	No	No
OF1-3 (NAS# 5996G)	5.0 ± 7.6	No	2.5	No	No
OF1-4 (NAS# 5999G)	12.5 ± 11.6	Yes	10.0	No	No
OF2-1 (NAS# 5991G)	13.8 ± 13.0	Yes	11.3	No	No
OF2-2 (NAS# 5992G)	8.8 ± 8.3	No	6.3	No	No
OF2-3 (NAS# 5993G)	7.1 ± 7.6	No	4.6	No	No
OF2-4 (NAS# 5997G)	8.8 ± 6.4	Yes	6.3	No	No
OF2-5 (NAS# 5998G)	12.5 ± 12.8	Yes	10.0	No	No

[1] Sediment Cleanup Objectives (SCO) exceedance if the test sediment mean mortality is significantly higher (1-tailed t-test at P≤0.05) than the control sediment mean mortality and the absolute difference is >15%.
[2] Cleanup Screening Levels (CSL) exceedance if the test sediment mean mortality is significantly higher (1-tailed t-test at P≤0.05) than the control sediment mean mortality and the absolute difference is >25%.

Table 3. Growth results of *Chironomus* 20-day toxicity test and data interpretation using guidelines from the Washington State SMS (2013).

Sample description	Average ash-free dry wt/midge (mg)* (Mean ± SD)	Statistically significantly lower than control sediment at α=0.05?	Percent lower than control sediment	Exceedance under SCO?[1] (MIG_C-MIG_T/MIG_C>0.25)	Exceedance under one-test criteria for CSL?[2] (MIG_C-MIG_T/MIG_C>0.40)
Control (NAS# 5989G)	1.63 ± 0.16	---	---	---	---
OF1-1 (NAS# 5994G)	1.35 ± 0.14	Yes	17.5	No	No
OF1-2 (NAS# 5995G)	1.24 ± 0.16	Yes	23.9	No	No
OF1-3 (NAS# 5996G)	1.17 ± 0.12	Yes	28.9	Yes	No
OF1-4 (NAS# 5999G)	1.32 ± 0.20	Yes	19.1	No	No
OF2-1 (NAS# 5991G)	1.51 ± 0.28	No	7.5	No	No
OF2-2 (NAS# 5992G)	1.35 ± 0.16	Yes	17.5	No	No
OF2-3 (NAS# 5993G)	1.32 ± 0.11	Yes	19.3	No	No
OF2-4 (NAS# 5997G)	1.49 ± 0.14	Yes	9.0	No	No
OF2-5 (NAS# 5998G)	1.43 ± 0.20	Yes	12.4	No	No

* Pupae were not included in the sample to estimate ash-free dry weight (as per EPA/600/R-99/064, p. 59, section 12.3.8.2)
[1] Sediment Cleanup Objectives (SCO) exceedance if the test sediment mean growth is significantly lower (1-tailed t-test at P≤0.05) than the control sediment mean growth, and the difference is >25%.
[2] Cleanup Screening Levels (CSL) exceedance (one-test criteria) if the test sediment mean individual growth in significantly lower (1-tailed t-test at P≤0.05) than the control sediment mean growth, and the difference is >40%.

Table 4. Interpretation of bioassay test results for Georgia-Pacific mill site based on Washington State Sediment Management Standards - Sediment Cleanup Objectives (SCO) and Cleanup Screening Level (CSL) criteria.

Sample Description	SCO Exceedance / CSL Exceedance[1]			CSL Exceedance by two SCO Exceedances[2]
	Test No. 885-1 *Hyalella* 10-day Survival	Test No. 885-2 *Chironomus* 20-day Survival	Test No. 885-2 *Chironomus* 20-day Growth	
	SCO / CSL	SCO / CSL	SCO / CSL	CSL
Control (NAS# 5989G)	---	---	---	---
OF1-1 (NAS# 5994G)	No / No	No / No	No / No	No
OF1-2 (NAS# 5995G)	No / No	No / No	No / No	No
OF1-3 (NAS# 5996G)	No / No	No / No	**YES** / No	No
OF1-4 (NAS# 5999G)	No / No	No / No	No / No	No
OF2-1 (NAS# 5991G)	No / No	No / No	No / No	No
OF2-2 (NAS# 5992G)	No / No	No / No	No / No	No
OF2-3 (NAS# 5993G)	No / No	No / No	No / No	No
OF2-4 (NAS# 5997G)	No / No	No / No	No / No	No
OF2-5 (NAS# 5998G)	No / No	No / No	No / No	No

[1]One test result must exceed an SCO or a CSO criterion. Two test sediments exceeded the SCO criterion for *Chironomus* growth. No other single criterion exceedances occurred under either SCO or CSO criteria.
[2]Two test results must exceed the SCO criteria to exceed the CSL under this interpretation. No test sediments exceeded the CSL by having two SCO exceedances.

SECTION A

Amphipod (*Hyalella azteca*) 10-day sediment bioassay 885-1 data report

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 885-1

Title: Toxicity of freshwater sediments using a 10-day amphipod, *Hyalella azteca*, sediment bioassay as part of the remedial investigation at the Georgia-Pacific mill site in Camas, Washington.

Protocol No.: NAS-XXX-HA4b, April 7, 1998. Revision 1 (10-27-03). Based on ASTM 2001 (Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates, E1706-00), Am. Soc. Test. Mat., Phila., PA, and EPA Method 100.1 (Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, EPA/600/R-99/064). Washington State Sediment Management Standards (SMS) (Chapter 173-204 WAC, Last Update: 2/25/13).

STUDY MANAGEMENT

Study Sponsor: Environmental Science Associates, 5309 Shilshole Ave. NW, Suite 200, Seattle, WA 98107.

Sponsor's Study Monitor: Mr. Jim Good

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365

Test Location: Newport laboratory

Laboratory's Study Personnel: G.J. Irissarri, B.S., Proj. Mngr./ Study Dir.; L.K. Nemeth, B.A., M.B.A., QA Officer; G.A. Buhler, B.S., Aq. Toxicol.; J.B. Brown, B.S., D.V.M, Assoc. Aq. Toxicol.; Y. Nakahama, Sr. Tech.

Study Schedule:

Test Beginning: 9-22-17, 1045 hrs.

Test Ending: 10-2-17, 1030 hrs.

Disposition of Study Records: All raw data, reports, and other study records are stored at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Freshwater test sediments collected as part of the remedial investigation at the Georgia-Pacific mill site in Camas, Washington. Details are as follows:

NAS Sample No.	5991G	5992G	5993G	5994G	5995G
Description	OF2-1	OF2-2	OF2-3	OF1-1	OF1-2
Collection Date	9/12/17	9/12/17	9/12/17	9/13/17	9/13/17
Receipt Date	9/15/17	9/15/17	9/15/17	9/15/17	9/15/17

NAS Sample No.	5996G	5997G	5998G	5999G
Description	OF1-3	OF2-4	OF2-5	OF1-4
Collection Date	9/13/17	9/14/17	9/14/17	9/14/17
Receipt Date	9/15/17	9/15/17	9/15/17	9/15/17

Control Sediment: The negative control sediment (NAS#5989G) was collected on 9-13-17 from an area approximately one mile east of the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR.

Treatments: Homogenized at test set up by mixing using stainless steel implements.

Storage: All test and control sediments were stored at 4°C in the dark in sealed containers until used.

TEST WATER

Source: Dechlorinated municipal tap water.

Dates of Preparation: 9-19-17

Water Quality:

pH: 7.6

conductivity: 102µmhos/cm

hardness: 26 mg/L as $CaCO_3$
alkalinity: 30 mg/L as $CaCO_3$.
total chlorine: <0.02 mg/L
Pretreatment: Dechlorinated and aerated ≥24 hr.

TEST ORGANISMS

Species: *Hyalella azteca,* amphipod.
Age/Size: 7-8 days old
Source: Chesapeake Cultures, Hayes, VA; received 9-21-17
Acclimation: Holding conditions prior to testing averaged: Temperature, 22.2 °C; dissolved oxygen, 11.0 mg/L; pH, 7.8; conductivity, 702 µmhos/cm; hardness, 171 mg/L as $CaCO_3$; and alkalinity, 190 mg/L as $CaCO_3$. Photoperiod, 16:8, L:D. Half of the water was replaced daily with test water, dechlorinated municipal tap water, during holding. Animals were fed YTC during holding.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 300 ml high-form glass beakers
Test Volumes: 100 ml sediment layer; 175 ml test water.
Replicates/Treatment: 8
Organisms/Treatment: 80
Water Volume Changes: 2 water volumes per day
Aeration: None.
Feeding: Animals are fed 1.0 ml of YTC suspension per beaker daily.
Acceptance Criteria: Results are valid if mean control mortality does not exceed 20%.
Effects Criteria: survival after 10 days. Death is defined as no visible movement or response to tactile stimulation. Missing organisms were considered to be dead.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, conductivity, pH, hardness, alkalinity, and ammonia-nitrogen were measured in the overlying water of one replicate test container per treatment on days 0 and 10 of the test. Temperature and dissolved oxygen were measured daily in the overlying water of one replicate test container per treatment. Hardness and alkalinity were measured with titrimetric methods. Ammonia-N was measured using Hach reagents based on the salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric method; samples were not distilled prior to analysis. The photoperiod was 16:8, L:D.

DATA ANALYSIS METHODS

Percent survival and percent mortality were calculated for each replicate as follows:

percent survival = 100 x (number surviving/initial number tested)
percent mortality = 100 x (number dead/initial number tested)

Means and standard deviations for the biological endpoints described above, and for water quality data, were computed using Microsoft Excel 2010. Mean percent mortality of each test sediment was statistically compared to the control sediment. Where appropriate, an arcsine square root transformation was performed on percent mortality data before analysis. Following determination of normality and homogeneity of variances, a one-tailed Student T-test, Mann-Whitney or Approximate T test was conducted at the 0.05 level of significance. The statistical software used was BioStat (version Feb 9, 2006 (EXCEL)) bioassay software developed by the U.S. Army Corps of Engineers, Seattle District.

PROTOCOL DEVIATIONS

None

REFERENCE TOXICANT TEST

The reference toxicant test is a multi-concentration toxicity test using potassium chloride, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-3712
Reference Toxicant and Source: Potassium Chloride (KCl), Fisher Lot #147960.
Test Date: 9-22-17.
Dilution Water Used: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Result: 96-hr LC50, 0.48 g/L. This result is slightly outside the laboratory's control chart warning limits (0.29 – 0.46 g/L). A review of test organisms and test conditions and procedures indicated that there were no unusual circumstances that may have affected the test results. Control chart warning limits of ± 2 SD will be exceeded 5% of the time by chance alone, and there was no evidence that these organisms were unusual in any way.

TEST RESULTS

Observations of water quality in the overlying water throughout the test are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. The means and standard deviations of percent mortality of *Hyalella* exposed for 10 days to sediments are summarized in Table 2. Detailed data organized by sample and replicate, and summary statistics for these observations, are given in Appendix II.

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Ammonia-N in the overlying water ranged between <0.1 and 0.1 mg/L for all day 0 and day 10 measurements.

The test met the acceptability criteria specified in the SMS with 1.3 % mean control mortality (≤20% required). The reference toxicant (positive control) LC50 result was slightly outside the laboratory's control chart action limits (0.48 g/L; control chart mean ± 2 S.D. = 0.36 ± 0.08). A review of test conditions and procedures did not detect any unusual circumstances.

Interpretation was based on guidelines from the Washington State Sediment Management Standards (SMS) (Chapter 173-204 WAC, Last Update: 2/25/13). The SMS include Sediment Cleanup Objectives (SCO) and Cleanup Screening Levels (CSL) biological criteria. The Sediment Cleanup Objectives establish a no adverse effects level, including no acute or chronic adverse effect, to the benthic community. The Cleanup Screening Levels establish a minor adverse effects level, including acute or chronic effects, to the benthic community. To exceed the SCO for mortality, the mean mortality in the test sediment must be greater than 15 percent over the mean control and statistically different from the control ($p \leq 0.05$). To exceed the CSL criterion, mean mortality in the test sediment must be greater than 25 percent over the mean control and statistically different from the control ($p \leq 0.05$).

None of the test sediments resulted in an exceedance for mortality under either the SCO or the CSL of the SMS guidelines.

STUDY APPROVAL

Project Manager/Study Director — Date: 10-30-17

Quality Assurance Unit — Date: 10-31-17
For Julie Fiore

Assistant Laboratory Director — Date: 10-31-17
For Linda Nemeth

Exhibit 8 SHOR23-01

Table 1. Summary of water quality conditions during tests of the amphipod, *Hyalella azteca*, exposed to freshwater sediments.

Water Quality Parameter	Mean ± S.D.	Minimum	Maximum	N
Temperature (°C)	22.9 ± 0.4	22.0	23.8	110
Dissolved oxygen (mg/L)	7.7 ± 0.3	6.9	8.3	110
Conductivity (µmhos/cm)	116 ± 6.6	108	138	20
pH	7.4 ± 0.2	7.0	8.0	20
Hardness (mg/L as $CaCO_3$)	20 ± 5	17	34	20
Alkalinity (mg/L as $CaCO_3$)	33 ± 5	30	40	20
Total ammonia (mg/L)	---	<0.1	0.1	20

Table 2. Mortality results of *Hyalella* 10-day toxicity test and data interpretation using guidelines from the Washington State SMS (2013).

Sample description	Percent mortality (Mean ± SD)	Significantly higher than the control sediment at α=0.05?	Percent higher (absolute) than control sediment	Exceedance under SCO?[1]	Exceedance under one-test criteria for CSL[2]
Control (NAS# 5989G)	1.3 ± 3.5	---	---	---	---
OF1-1 (NAS# 5994G)	1.3 ± 3.5	No	0.0	No	No
OF1-2 (NAS# 5995G)	0.0 ± 0.0	No	-1.3	No	No
OF1-3 (NAS# 5996G)	2.5 ± 7.1	No	1.2	No	No
OF1-4 (NAS# 5999G)	3.8 ± 7.4	No	2.5	No	No
OF2-1 (NAS# 5991G)	3.8 ± 7.4	No	2.5	No	No
OF2-2 (NAS# 5992G)	0.0 ± 0.0	No	-1.3	No	No
OF2-3 (NAS# 5993G)	1.3 ± 3.5	No	0.0	No	No
OF2-4 (NAS# 5997G)	0.0 ± 0.0	No	-1.3	No	No
OF2-5 (NAS# 5998G)	1.3 ± 3.5	No	0.0	No	No

[1] Sediment Cleanup Objectives (SCO) exceedance if the test sediment mean mortality is significantly higher (1-tailed t-test at P≤0.05) than the control sediment mean mortality and the absolute difference is >15%.

[2] Cleanup Screening Levels (CSL) exceedance if the test sediment mean mortality is significantly higher (1-tailed t-test at P≤0.05) than the control sediment mean mortality and the absolute difference is >25%.

APPENDIX I

PROTOCOL

TEST PROTOCOL

FRESHWATER AMPHIPOD, *HYALELLA AZTECA*, 10-DAY SEDIMENT TOXICITY TEST

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this study is to characterize the toxicity of freshwater sediments based on survival and, optionally, growth using the amphipod, *Hyalella azteca.*

1.2 Referenced Method: This protocol is based on EPA Method 100.1 (EPA/600/R-99/064) and ASTM Method E 1706-00 (ASTM 2001).

1.3 Summary of Method: A summary of test conditions for the amphipod 10-day sediment toxicity test is tabulated below. The 10-day sediment toxicity test with *Hyalella azteca* is conducted at 23 ± 1°C with a 16L:8D photoperiod at an illuminance of about 100 to 1000 lux. Test chambers are 300-mL high-form lipless beakers containing 100 mL of sediment and 175 mL of overlying water. Ten 7-14 day old amphipods (1 to 2 day range in age) are used in each replicate. The number of replicates/treatment depends on the objective of the test. Eight replicates are recommended for routine testing. Amphipods in each test chamber are fed 1.0 mL of a YCT food daily. Each chamber receives two volume additions per day of overlying water. Overlying water can be culture water, well water, surface water, site water, or reconstituted water. Test endpoints include survival and/or growth.

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
3814 Yaquina Bay Road, P.O. Box 1437
Newport, OR 97365.

2.4 Test Location: _____

2.5 Laboratory's Personnel to be Assigned to the Study:
Study Director: _____
Quality Assurance Unit: _____
Aquatic Toxicologist: _____
Aquatic Toxicologist: _____

2.6 Proposed Testing Schedule: Tests are to begin within 14 days of sample collection unless otherwise specified. Reference toxicant test to be run concurrently.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Exhibit 8 SHOR23-01

3. TEST MATERIAL

The test materials are freshwater sediments. The control, reference, and test sediments are placed in solvent cleaned 1 L glass jars fitted with PTFE-lined screw caps. At the laboratory the samples are stored at 4°C in the dark. The original sealed containers may be stored for up to 14 days prior to testing. If jars are not not full when received or if sediment is removed for testing, headspaces should be filled with nitrogen to retard deterioration. A negative control sediment is collected from a clean site. In addition, a reference sediment, a clean sediment with physical characteristics similar to the test sediments, may be employed as a comparison station.

4. TEST WATER

Test water (overlying water) at NAS is normally moderately hard synthetic water at a hardness of 80-100 mg/L as $CaCO_3$ and alkalinity of 60-70 mg/L as $CaCO_3$. Dilution water is prepared from Milli-Q reagent grade water and reagent grade chemicals. Test water may also be well water, surface water or site water, depending on the study design.

5. TEST ORGANISMS

5.1 Species: amphipod, *Hyalella azteca*.

5.2 Source: Cultured at NAS or purchased from a reputable commercial supplier.

5.3 Age: 7-14 days old at start of test; with 1 to 2 day range in age.

5.4 Acclimation and Pretest Observation: Test organisms must be cultured and tested at 23°C . Ideally they should be cultured in the same water that will be the test water. However, acclimation to test water is not required. Isolated young should be held similarly to mass cultures for at least two days (eliminate the feeding instructions) before starting the test to eliminate animals injured during handling

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are 300-mL high-form lipless glass beakers. Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or by placement in a temperature-controlled room. Aeration is not employed unless dissolved oxygen drops below 2.5 mg/L. The test is conducted under an illuminance of 100 to 1000 lx with a 16L:8D photoperiod.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027F. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The test involves exposure of amphipods to test, control, and reference sediments. The sediments are placed on the bottom of the test containers and are overlain with test water. The test exposure is for 10 days. The renewal of overlying water consists of two volume additions per day, either continuous or

intermittent. Each treatment consists of eight replicate test containers, each containing 10 organisms. Test chamber positions are completely randomized. Test organisms are randomly distributed to the test chambers. Blind testing is normally used.

7.2 Setup of Test Containers: Sediments are homogenized and placed in test chambers on the day before addition of test organisms. Sediment (100 ml) is placed into each of eight replicate beakers. After addition of the sediment, 175 ml of test water is gently added to each beaker in a manner to prevent resuspension. The overlying water is replaced twice daily. The test begins when amphipods are introduced to the test chambers. Initial water quality measurements are taken prior to the addition of test organisms.

7.3 Effect Criterion: The effect criterion used in the amphipod bioassay is mortality, defined as the lack of movement of body or appendages on response to tactile stimulation. The optional sublethal effect criterion is growth which is determined by using dry weight measurements or body length measurements.

7.4 Test Conditions: No aeration is employed unless dissoved oxygen falls below 2.5 mg/L. The test temperature employed is 23 ± 1°C. A 16:8, L:D photoperiod is used. Illumination is supplied by daylight fluorescent lamps at 100 to 1000 lux. The overlying water is replaced twice daily.

7.5 Beginning the Test: On the day the test begins, amphipods are impartially counted into small containers of test water (10/container). The test is begun by rinsing test organisms into the equilibrated test containers. If the optional growth endpoint is to be used. Twenty organisms are archived for length determination or 80 organisms for dry weight.

7.6 Feeding: Amphipods are fed 1.0 mL of YCT daily per test chamber. A feeding may be skipped if there is a build up of excess food. However, all beakers must be treated similarly.

7.7 Test Duration, Type and Frequency of Observations, and Methods: The duration of the acute toxicity test is 10 days. The type and frequency of observations to be made are summarized as follows:

TYPE OF OBSERVATION	TIMES OF OBSERVATION
BIOLOGICAL DATA	
Survival, growth	Day 10
PHYSICAL AND CHEMICAL DATA	
Hardness, alkalinity, ammonia-N, conductivity, pH, dissolved oxygen, and temperature	Beginning and end of test in overlying water of one replicate beaker from each treatment.
Dissolved oxygen, temperature	Daily in overlying water of one replicate beaker from each treatment.

Dissolved oxygen is measured using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. The pH is measured using a pH probe and a properly calibrated meter with scale divisions of 0.1 pH units. Temperature is measured with a calibrated mercury thermometer or telethermometer. Conductivity is measured with a conductivity meter. Hardness and alkalinity are measured using titrometric methods. Ammonia-nitrogen is measured using the salicylate colerimetric method (Clin. Chim. Acta 14:403, 1996).

Overlying water should be sampled just before water renewal from about 1 to 2 cm above the sediment surface using a pipet. It may be necessay to pool water samples from individual replicates. The pipet should be checked to make sure no organisms are removed during sampling of overlying water.

7.8 Growth Measurement: Growth is measured as average dry weight of animals in a test replicate at the end of the test on day 10 or average total length of preserved animals. Pooled animals from each test replicate are rinsed with deionized water and placed into tared aluminum weigh pans. The pans are dried at 60-90°C to constant weight. The dried amphipods are placed into a dessicator and weighed as soon as possible to the nearest 0.01 mg (desirable

to use 0.001 mg). The total weight of the dried amphipods in each pan is divided by the number of amphipods weighed to obtain an average dry weight per surviving amphipod per replicate.

If the length growth endpoint is to be used, either in place of or along with the weight endpoint, amphipods from each replicate are pooled and preserved in vials. Later, the preserved amphipods from one vial are carefully stretched out on a glass microscope slide and quickly measured using a dissecting microscope fitted with a calibrated ocular micrometer. Then, if weight is to be determined, the animals are quickly transferred to tared aluminum foil cups. Fine-tipped forceps or fine brushes are required for these handling operations.

If both measurements are to be used, total length measurements are taken first, then the animals are transferred to tared aluminum foil cups for weighing.

8. CRITERIA OF TEST ACCEPTANCE

The test results are acceptable if the minimum survival of organisms in the control treatment at the end of the test is at least 80%. For the growth endpoint, the test results are acceptable if there is measureable growth of test organisms in the control sediment.

9. DATA ANALYSIS

The endpoints of the toxicity test are survival and growth (optional). Survival is obtained as a direct count of living organisms in each test container at the end of the test. Average amphipod dry weight, also measured at the end of the test, may be used to compare growth between treatment sediments and the control or reference sediment. Body length may be used instead of dry weight. Ordinarily the following data analysis is performed. Due to special requirements, alternative methods may be used. The means and standard deviations are calculated for each treatment level. Identification of toxic sediments is established by statistical comparison of test endpoints between test and control or reference sediments. Between treatment comparisons may be made using a Student's t-test or Wilcoxon's Two-Sample test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons.

10. REPORTING

The final report of the test results must include all of the following standard information at a minimum: name and identification of the test; the investigator and laboratory; date and time of test beginning and end; information on the test material; information on the source and quality of the overlying/test water; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including feeding, if any, and water quality; definition of the effect criteria and other observations; responses, if any, in the control treatment; tabulation and statistical analysis of measured responses and a summary table of endpoints; a description of the statistical methods used; any unusual information about the test or deviations from procedures; reference toxicant testing information.

11. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

12. REFERENCE TOXICANT

The reference toxicant test is a standard multi-concentration toxicity test using a specified chemical toxicant to evaluate the performance of test organisms used in the study. Reference toxicant tests are 96-hour, water only exposures, not 10-day sediment exposures. The reference toxicant test is run concurrently. Performance is evaluated by comparing the results of the reference toxicant test with historical results (e.g., control charts) obtained at the laboratory.

13. REFERENCED GUIDELINES

ASTM. 2001. Standard Test Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Fresh Water Invertebrates. ASTM Standard Method No. E 1706-00. Am. Soc. Test. Mat., Philadelphia, PA.

U.S. EPA. 2000. Section 11, Test Method 100.1, *Hyalella azteca* 10-d Survival and Growth Test for Sediments, pp. 47-54 In: Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates (Second Edition). EPA/600/R-99/064.

Weber, C.I. (Ed.) 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fourth Edition). EPA/600/4-90/027F.

14. APPROVALS

_____ for _____
Name Date

_____ for **Northwestern Aquatic Sciences**
Name Date

Appendix A
Test Conditions Summary

1. Test type	whole sediment toxicity test with renewal of overlying water
2. Test duration	10 days
3. Temperature	23 ± 1°C
4. Light quality	daylight flourescent light
5. Illuminance	100 - 1000 lux
6. Photoperiod	16L:8D
7. Test chamber size	300-mL high-form lipless beakers, (Pyrex® 1040 or equivalent)
8. Sediment volume	100 mL
9. Overlying water volume	175 mL
10. Renewal overlying water	2 volume additions/day (continuous or intermittent)
11. Age of test organisms	7-14 days old at test initiation (1 to 2 day range in age)
12. Organisms per test chamber	10
13. Replicates per treatment	8 recommended for routine testing (depends on design)
14. Organisms per treatment	80
15. Feeding regime	YCT food, fed 1.0 mL daily/chamber
16. Cleaning	if screens are used, clean as needed
17. Aeration	None, unless DO falls below 2.5 mg/L
18. Overlying (test) water	Culture water, well water, surface water, site water or reconstituted water
19. Water quality	Hardness, alkalinity, conductivity, pH, ammonia-N beginning and end; temperature and dissolved oxygen daily
20. Endpoints	Survival (optional, growth by dry weight or length)
21. Test acceptability criteria	Minimum control survival of 80%
22. Sample holding	14 days at 4°C in the dark
23. Sample volume required	1L (800 mL per sediment)
24. Reference toxicant	Concurrent testing required

APPENDIX II

RAW DATA

RAW DATA DIVIDER PAGE
Test No. 885-1

TEST DESCRIPTION, MONITORING, AND RESULTS BENCHSHEETS

NORTHWESTERN AQUATIC SCIENCES
HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

PROTOCOL NO. NAS-XXX-HA4b

REVIEWED PAGES 1-30 - GJI

Test No. 885-1 Client ESA Investigator

STUDY MANAGEMENT

Client: Environmental Science Associates, 5309 Shilshole Ave. NW, Suite 200, Seattle, WA 98107
Client's Study Monitor: Mr. Jim Good
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Proj. Man./Study Dir. G.J. Irissarri GJI
QA Officer L.K. Nemeth
1. Wes Matalama 2. GABrieves
3. C. Brown GJI 4.
5. 6.
7. 8.

Study Schedule:
Test Beginning: 9-22-17 1045 Test Ending: 10-2-17 1030

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	5991G	5992G	5993G	5994G
Description:	OF2-1	OF2-2	OF2-3	OF1-1
Collection Date:	9/12/17	9/12/17	9/12/17	9/13/17
Receipt Date:	9/15/17	9/15/17	9/15/17	9/15/17
:				

NAS Sample No.:	5995G	5996G	5997G	5998G
Description:	OF1-2	OF1-3	OF2-4	OF2-5
Collection Date:	9/13/17	9/13/17	9/14/17	9/14/17
Receipt Date:	9/15/17	9/15/17	9/15/17	9/15/17
:				

NAS Sample No.:	5999G			
Description:	OF1-4			
Collection Date:	9/14/17			
Receipt Date:	9/15/17			
:				

NAS Sample No.:				
Description:				
Collection Date:				
Receipt Date:				
:				

NAS Sample No.:				
Description:				
Collection Date:				
Receipt Date:				
:				

Error codes: 1) correction of handwriting error
2) written in wrong location; entry deleted
3) wrong date deleted, replaced with correct date
4) error found in measurement; measurement repeated

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator

SEDIMENT DESCRIPTIONS – SUPPLEMENTAL NOTES

Sample No.	Description
5989G	Fine Black Mud
5991G	BROWN SAND w/ SMALL CLAMS & PLANT DEBRIS
5992G	GRAY SAND w/ SMALL CLAMS & PLANT DEBRIS
5993G	BROWN SAND w/ SMALL CLAMS & PLANT DEBRIS
5994G	GRAY/BROWN SAND w/ SOME PLANT DEBRIS
5995G	Gray/Brown Sand w/ small clams & Plant Debris
5996G	BROWN SAND
5997G	Brown Sand w/ small clams & Plant Debris
5998G	BROWN SAND W/ SMALL clam shells & plant debris
5999G	GRAY SAND

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator

TEST WATER

Source: Dechlorinated Newport, OR tap water

Date of Collection: 9-19-17

pH 7.6

Cond (umhos/cm^2) 102

Hardness (mg/L) 26

Alkalinity (mg/L) 30

Total Chlorine (mg/L) <0.02

Treatments: Aerated ≥ 24 hrs

TEST ORGANISMS

Species: *Hyalella azteca* Age: 7-8 DAYS Date received: 9-21-17

Source: Chesapeake Cultures, Hayes, VA

Acclimation Data:

Date	Temp. (deg.C)	pH	DO (mg/L)	Cond umhos/cm	Feeding amount	Feeding description	Water changes	Hardness (mg/L)	Alkalinity (mg/L)
9-21-17	22.4	7.3	14.7	821	10 mL	YTC	YES	205	220
9-22-17	21.9	8.3	7.7	583	—	—	—	137	160
Mean	22.2	7.8	11.0	702				171	190
S.D.	—	—	—	—				—	—
(N)	2	2	2	2				2	2

Photoperiod during acclimation: 16:8 L:D

TEST PROCEDURES AND CONDITIONS

Test chambers: 300 ml glass beakers

Test volumes: 100 ml of test sediment; 275 ml total volume

Replicates/treatment: (8) 8 Organisms/treatment: (80) 80 (10/REP)

Test water changes: Twice daily

Aeration: only if DO falls below 2.5 mg/L

Feeding: everyday beginning with day zero

Test temperature (deg.C): 23

Beaker placement: Total randomization

Photoperiod: 16:8, L:D

Control Sediment:

Source: From an area approximately one mile east of the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR.

Date collected: 9/13/17

Sieved through 0.5 -mm screen

Storage: 4°C in the dark in closed containers. NAS# 5989G

MISCELLANEOUS NOTES

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator _____

Test conducted in (circle one): (room 1) room 2 trailer water bath other:_____

Randomization chart:

5									80
4									79
3									78
2									77
1									76

TOP SHELF – FRONT

Randomization chart:

Randomization chart:

Randomization chart:

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator

DAILY RECORD SHEET

Day 0 (9/22/17) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness* (mg/L)	Alkalinity* (mg/L)	NH3* (ppm)	Comments
12	22.0	8.2	115	7.5	26	30		Each beaker fed 1.0 ml
20	22.8	8.3	116	7.4	26	40		YTC suspension
28	22.2	8.0	116	7.3	17	30		Initials: GJS
51	22.2	8.0	117	7.1	26	30		
52	22.3	8.2	112	7.4	17	30		
56	22.4	8.2	115	7.4	17	40		
60	22.9	7.6	138	~~8.2~~ 7.0	17	30		
66	22.7	~~8.0~~	118	~~8.0~~ 7.1	17	30		Water changed in all
68	22.9	8.1	121	~~8.1~~ 7.2	34	40		beakers.
70	23.0	6.9	120	7.2	26	30		Time: 0610
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1705
								Initials: YC

9-22-17 GJ

*Water quality measurements to be taken.

Day 1 (9/23/17) GJS

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
12	22.2	8.1						Each beaker fed 1.0 ml
20	22.9	8.2						YTC suspension
28	22.3	8.2						Initials: GJS
51	22.3	8.1						
52	22.3	8.0						
56	22.4	8.0						
60	23.3	7.8						
66	22.7	8.1						Water changed in all
68	22.8	8.2						beakers.
70	23.1	7.8						Time: 0550
								Initials: GJS
								Water changed in all
								beakers.
								Time: 1800
								Initials: YC

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator [redacted]

DAILY RECORD SHEET

Day 2 (9/24/17) GJL

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
12	22.1	8.1						Each beaker fed 1.0 ml
20	22.6	8.1						YTC suspension
28	22.2	8.0						Initials: GJL
51	22.3	7.9						
52	22.3	7.9						
56	22.4	7.9						
60	23.0	7.6						
66	22.7	7.8						Water changed in all
68	22.8	7.9						beakers.
70	23.0	7.9						Time: 0555
								Initials: GJL
								Water changed in all
								beakers.
								Time: 1825
								Initials: [redacted]

*Water quality measurements to be taken.

Day 3 (9/25/17) GJL

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
12	22.3	7.8						Each beaker fed 1.0 ml
20	23.1	7.7						YTC suspension
28	22.4	7.7						Initials: GJL
51	22.5	7.6						
52	22.5	7.6						
56	22.7	7.6						
60	23.3	7.3						
66	23.0	7.6						Water changed in all
68	23.1	7.7						beakers.
70	23.3	7.8						Time: 0600
								Initials: GJL
								Water changed in all
								beakers.
								Time: 1745
								Initials: [redacted]

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator [redacted]

DAILY RECORD SHEET

Day 4 (9/26/17) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
12	22.7	7.6						Each beaker fed 1.0 ml
20	23.8	7.5						YTC suspension
28	23.0	7.5						Initials: GJ
51	23.1	7.4						
52	23.1	7.4						
56	23.3	7.5						
60	23.7	7.3						
66	23.4	7.4						Water changed in all
68	23.5	7.5						beakers.
70	23.7	7.5						Time: 0550
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1725
								Initials: [redacted]

*Water quality measurements to be taken.

Day 5 (9/27/17) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
12	22.8	7.6						Each beaker fed 1.0 ml
20	23.4	7.6						YTC suspension
28	22.9	7.4						Initials: GJ
51	23.0	7.4						
52	23.0	7.4						
56	23.1	7.5						
60	23.5	7.1						
66	23.3	7.2						Water changed in all
68	23.4	7.4						beakers.
70	23.5	7.3						Time: 0605
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1715
								Initials: [redacted]

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator _____

DAILY RECORD SHEET

Day 6 (9/28/17) CAF

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
12	23.0	7.5						Each beaker fed 1.0 ml
20	23.3	7.6						YTC suspension
28	22.9	7.5						Initials: OB
51	22.9	7.6						
52	22.9	7.5						
56	22.9	7.4						
60	23.4	7.2						
66	23.2	7.4						Water changed in all
68	23.2	7.6						beakers.
70	23.2	7.5						Time: 0600
								Initials: OB
								Water changed in all
								beakers.
								Time: 1715
								Initials:

*Water quality measurements to be taken.

Day 7 (9/29/17) CAF

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
12	22.5	7.4						Each beaker fed 1.0 ml
20	23.1	7.5						YTC suspension
28	22.7	7.6						Initials: CAF
51	22.8	7.5						
52	22.8	7.3						
56	22.9	7.4						
60	23.4	7.2						
66	23.2	7.5						Water changed in all
68	23.2	7.5						beakers.
70	23.3	7.3						Time: 0555
								Initials: OB
								Water changed in all
								beakers.
								Time: 1730
								Initials:

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator

DAILY RECORD SHEET

Day 8 (9/30/17) GB

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
12	22.8	7.7						Each beaker fed 1.0 ml
20	23.3	7.7						YTC suspension
28	22.8	7.6						Initials: GB
51	22.8	7.5						
52	22.8	7.8						
56	22.9	7.7						
60	23.4	7.6						
66	23.1	7.8						Water changed in all
68	23.1	7.7						beakers.
70	23.4	7.7						Time: 0550
								Initials: GB
								Water changed in all
								beakers.
								Time: 1715
								Initials:

*Water quality measurements to be taken.

Day 9 (10/1/17) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
12	22.4	7.7						Each beaker fed 1.0 ml
20	23.2	7.8						YTC suspension
28	22.7	7.6						Initials: GJ
51	22.8	7.5						
52	22.8	7.6						
56	22.9	7.7						
60	23.3	7.4						
66	23.1	7.4						Water changed in all
68	23.1	7.7						beakers.
70	23.3	7.5						Time: 0610
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1830
								Initials:

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator _____

DAILY RECORD SHEET

Day 10 (10 / 2 /17) GJL

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness* (mg/L)	Alkalinity* (mg/L)	NH3* (ppm)	Comments
12	22.2	7.9	108	7.6	17	30		
20	23.1	7.9	112	7.6	17	40		
28	22.4	7.8	112	7.6	17	30		
51	22.5	7.7	113	7.5	17	30		
52	22.5	7.8	110	7.6	17	30		
56	22.6	7.9	110	7.6	17	40		
60	23.3	7.4	126	8.0	17	30		
66	22.9	7.6	114	7.5	26	40		Water changed in all
68	23.0	7.7	115	7.6	17	30		beakers.
70	23.2	7.8	113	7.5	17	30		Time: 0605
								Initials: GJL

*Water quality measurements to be taken.

Day _____(/ /)

Beaker No.	Temp. (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
								Each beaker fed 1.0 ml
								YTC suspension
								Initials:
								Water changed in all
								beakers.
								Time:
								Initials:
								Water changed in all
								beakers.
								Time:
								Initials:

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-1 Client ESA Investigator

DAY 10 TEST TERMINATION SHEET

Beaker No.	Number of survivors	Initials
1	9	
2	10	
3	10	GJL
4	10	GJL
5	10	
6	10	
7	10	GJL
8	10	GJL
9	10	
10	10	
11	10	GJL
12	8	GJL
13	10	
14	10	
15	10	GJL
16	10	GJL
17	10	
18	10	
19	10	GJL
20	10	GJL
21	10	GJL
22	10	GJL
23	10	
24	10	
25	10	GJL
26	10	GJL
27	8	
28	10	
29	10	GJL
30	8	GJL
31	10	
32	9	
33	10	GJL
34	10	GJL
35	10	GJL
36	10	GJL
37	10	
38	10	
39	10	GJL
40	10	GJL
41	10	
42	10	
43	10	GJL
44	10	GJL
45	10	

Beaker No.	Number of survivors	Initials
46	10	
47	10	GJL
48	10	GJL
49	10	GJL
50	10	GJL
51	10	
52	9	
53	10	GJL
54	10	GJL
55	10	
56	10	
57	10	
58	10	
59	10	GJL
60	10	GJL
61	10	
62	10	
63	10	GJL
64	9	GJL GJL 10-2-17
65	10	
66	9	
67	10	GJL
68	10	GJL
69	10	
70	10	
71	10	
72	10	
73	10	GJL
74	9	GJL
75	10	
76	10	
77	10	GJL
78	10	GJL
79	10	
80	10	

Rec'd 9-21-17 E

Chesapeake Cultures
P.O. Box 507 Hayes, VA 23072 (804)693-4046 growfish@chesapeakecultures.com

NAS

Shipment Information

Species Hyalella azteca Date 9/20/17

Age ~5-6 days 1.4-1.6mm P.O. No. —

Quantity 1200+ Invoice No. 9393

Temperature 24°C Salinity _____ pH 7.86

Notes _____

Biologist _____

Please inspect shipment and report any problem immediately

RAW DATA DIVIDER PAGE
Test No. 885-1

TEST DATA ANALYSIS RECORDS

Test Number: 885-1

Freshwater Sediment Test
10-Day Hyalella azteca

data entry verified against laboratory bench sheets 11-12-17 DRF

Endpoints Data Entry and Calculations File

BKR=beaker number
INIT=initial number
SURV=number survivors
MORT=number dead=INIT-SURV
PSURV=%survival=100(SURV/INIT)
PMORT=%mortality=100(MORT/INIT)

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL		INIT	SURV	MORT	PSURV	PMORT		SURV	MORT	PSURV	PMORT
1	57	5989G	Control	1		10	10	0	100.0	0.0					
2	49	5989G	Control	2		10	10	0	100.0	0.0					
3	23	5989G	Control	3		10	10	0	100.0	0.0					
4	29	5989G	Control	4		10	10	0	100.0	0.0					
5	35	5989G	Control	5		10	10	0	100.0	0.0	Mean	9.9	0.1	98.8	1.3
6	1	5989G	Control	6		10	9	1	90.0	10.0	SD	0.4	0.4	3.5	3.5
7	11	5989G	Control	7		10	10	0	100.0	0.0	n	8	8	8	8
8	60	5989G	Control	8	wq replicate	10	10	0	100.0	0.0					
9	77	5991G	OF2-1	1		10	10	0	100.0	0.0					
10	13	5991G	OF2-1	2		10	10	0	100.0	0.0					
11	64	5991G	OF2-1	3		10	9	1	90.0	10.0					
12	25	5991G	OF2-1	4		10	10	0	100.0	0.0					
13	42	5991G	OF2-1	5		10	10	0	100.0	0.0	Mean	9.6	0.4	96.3	3.8
14	71	5991G	OF2-1	6		10	10	0	100.0	0.0	SD	0.7	0.7	7.4	7.4
15	30	5991G	OF2-1	7		10	8	2	80.0	20.0	n	8	8	8	8
16	51	5991G	OF2-1	8	wq replicate	10	10	0	100.0	0.0					
17	7	5992G	OF2-2	1		10	10	0	100.0	0.0					
18	48	5992G	OF2-2	2		10	10	0	100.0	0.0					
19	15	5992G	OF2-2	3		10	10	0	100.0	0.0					
20	53	5992G	OF2-2	4		10	10	0	100.0	0.0					
21	31	5992G	OF2-2	5		10	10	0	100.0	0.0	Mean	10.0	0.0	100.0	0.0
22	44	5992G	OF2-2	6		10	10	0	100.0	0.0	SD	0.0	0.0	0.0	0.0
23	6	5992G	OF2-2	7		10	10	0	100.0	0.0	n	8	8	8	8
24	70	5992G	OF2-2	8	wq replicate	10	10	0	100.0	0.0					
25	17	5993G	OF2-3	1		10	10	0	100.0	0.0					
26	67	5993G	OF2-3	2		10	10	0	100.0	0.0					
27	43	5993G	OF2-3	3		10	10	0	100.0	0.0					
28	32	5993G	OF2-3	4		10	9	1	90.0	10.0					
29	8	5993G	OF2-3	5		10	10	0	100.0	0.0	Mean	9.9	0.1	98.8	1.3
30	79	5993G	OF2-3	6		10	10	0	100.0	0.0	SD	0.4	0.4	3.5	3.5
31	61	5993G	OF2-3	7		10	10	0	100.0	0.0	n	8	8	8	8
32	28	5993G	OF2-3	8	wq replicate	10	10	0	100.0	0.0					
33	5	5994G	OF1-1	1		10	10	0	100.0	0.0					
34	69	5994G	OF1-1	2		10	10	0	100.0	0.0					
35	39	5994G	OF1-1	3		10	10	0	100.0	0.0					
36	73	5994G	OF1-1	4		10	10	0	100.0	0.0					
37	46	5994G	OF1-1	5		10	10	0	100.0	0.0	Mean	9.9	0.1	98.8	1.3
38	65	5994G	OF1-1	6		10	10	0	100.0	0.0	SD	0.4	0.4	3.5	3.5
39	21	5994G	OF1-1	7		10	10	0	100.0	0.0	n	8	8	8	8
40	52	5994G	OF1-1	8	wq replicate	10	9	1	90.0	10.0					
41	14	5995G	OF1-2	1		10	10	0	100.0	0.0					
42	80	5995G	OF1-2	2		10	10	0	100.0	0.0					
43	22	5995G	OF1-2	3		10	10	0	100.0	0.0					
44	47	5995G	OF1-2	4		10	10	0	100.0	0.0					
45	40	5995G	OF1-2	5		10	10	0	100.0	0.0	Mean	10.0	0.0	100.0	0.0
46	2	5995G	OF1-2	6		10	10	0	100.0	0.0	SD	0.0	0.0	0.0	0.0
47	24	5995G	OF1-2	7		10	10	0	100.0	0.0	n	8	8	8	8
48	20	5995G	OF1-2	8	wq replicate	10	10	0	100.0	0.0					
49	50	5996G	OF1-3	1		10	10	0	100.0	0.0					
50	34	5996G	OF1-3	2		10	10	0	100.0	0.0					
51	27	5996G	OF1-3	3		10	8	2	80.0	20.0					
52	36	5996G	OF1-3	4		10	10	0	100.0	0.0					
53	76	5996G	OF1-3	5		10	10	0	100.0	0.0	Mean	9.8	0.3	97.5	2.5
54	37	5996G	OF1-3	6		10	10	0	100.0	0.0	SD	0.7	0.7	7.1	7.1
55	63	5996G	OF1-3	7		10	10	0	100.0	0.0	n	8	8	8	8
56	56	5996G	OF1-3	8	wq replicate	10	10	0	100.0	0.0					

Test Number: 885-1

Freshwater Sediment Test
10-Day Hyalella azteca

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL		INIT	SURV	MORT	PSURV	PMORT		SURV	MORT	PSURV	PMORT
57	72	5997G	OF2-4	1		10	10	0	100.0	0.0					
58	16	5997G	OF2-4	2		10	10	0	100.0	0.0					
59	55	5997G	OF2-4	3		10	10	0	100.0	0.0					
60	59	5997G	OF2-4	4		10	10	0	100.0	0.0					
61	10	5997G	OF2-4	5		10	10	0	100.0	0.0	Mean	10.0	0.0	100.0	0.0
62	62	5997G	OF2-4	6		10	10	0	100.0	0.0	SD	0.0	0.0	0.0	0.0
63	33	5997G	OF2-4	7		10	10	0	100.0	0.0	n	8	8	8	8
64	68	5997G	OF2-4	8	wq replicate	10	10	0	100.0	0.0					
65	9	5998G	OF2-5	1		10	10	0	100.0	0.0					
66	26	5998G	OF2-5	2		10	10	0	100.0	0.0					
67	4	5998G	OF2-5	3		10	10	0	100.0	0.0					
68	18	5998G	OF2-5	4		10	10	0	100.0	0.0					
69	41	5998G	OF2-5	5		10	10	0	100.0	0.0	Mean	9.9	0.1	98.8	1.3
70	45	5998G	OF2-5	6		10	10	0	100.0	0.0	SD	0.4	0.4	3.5	3.5
71	3	5998G	OF2-5	7		10	10	0	100.0	0.0	n	8	8	8	8
72	66	5998G	OF2-5	8	wq replicate	10	9	1	90.0	10.0					
73	19	5999G	OF1-4	1		10	10	0	100	0					
74	74	5999G	OF1-4	2		10	9	1	90	10					
75	38	5999G	OF1-4	3		10	10	0	100	0					
76	54	5999G	OF1-4	4		10	10	0	100	0					
77	78	5999G	OF1-4	5		10	10	0	100	0	Mean	9.6	0.4	96.3	3.8
78	58	5999G	OF1-4	6		10	10	0	100	0	SD	0.7	0.7	7.4	7.4
79	75	5999G	OF1-4	7		10	10	0	100	0	n	8	8	8	8
80	12	5999G	OF1-4	8	wq replicate	10	8	2	80	20					

Project Name: P885-1 Hyalella % Mortality

Sample:	x1
Samp ID:	OF2-1
Alias:	NAS# 5991G
Replicates:	8
Mean:	3.75
SD:	7.44
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS# 5989G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	7.573
SS:	1089.791
K:	8
b:	26.694
Alpha Level:	0.05
Calculated Value:	0.6539
Critical Value:	<= 0.887
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	8.438
Test Residual SD:	5.643
Ref. Residual Mean:	4.033
Ref. Residual SD:	4.888
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	1.6688
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	8
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	36.5
Critical Value:	>= 49.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	7	0	7	5.625	2.304	7		-5.625
2	0	7	0	7	5.625	2.304	7		-5.625
3	10	14.5	0	7	12.81	2.304	7		-5.625
4	0	7	0	7	5.625	2.304	7		-5.625
5	0	7	0	7	5.625	2.304	7		-5.625
6	0	7	10	14.5	5.625	16.131	7		-5.625
7	20	16	0	7	20.94	2.304	7		-2.304
8	0	7	0	7	5.625	2.304	7		-2.304
9							7		-2.304
10							7		-2.304
11							7		-2.304
12							7		-2.304
13							7		-2.304
14							14.5		12.81
15							14.5		16.131
16							16		20.94

The percent mortality in OF2-1 was not significantly higher than that of the Control at α=0.05.

-CJ1

Project Name: P885-1 Hyalella % Mortality

Sample:	x1
Samp ID:	OF2-2
Alias:	NAS# 5992G
Replicates:	8
Mean:	0
SD:	0
Tr Mean:	-0.118
Trans SD:	0

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS# 5989G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	0.118
Trans SD:	0.666

Shapiro-Wilk Results:

Residual Mean:	
Residual SD:	
SS:	
K:	
b:	
Alpha Level:	N/A
Calculated Value:	N/A
Critical Value:	N/A
Normally Distributed:	N/A
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	0
Test Residual SD:	0
Ref. Residual Mean:	0.412
Ref. Residual SD:	0.5
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	2.3333
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	Rankits
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	7
Experimental Alpha Level:	0.05
Calculated Value:	-1
Critical Value:	>= 1.895
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	-0.118	0	-0.118	0	0.235		-0.118	
2	0	-0.118	0	-0.118	0	0.235		-0.118	
3	0	-0.118	0	-0.118	0	0.235		-0.118	
4	0	-0.118	0	-0.118	0	0.235		-0.118	
5	0	-0.118	0	-0.118	0	0.235		-0.118	
6	0	-0.118	10	1.766	0	1.648		-0.118	
7	0	-0.118	0	-0.118	0	0.235		-0.118	
8	0	-0.118	0	-0.118	0	0.235		-0.118	
9								-0.118	
10								-0.118	
11								-0.118	
12								-0.118	
13								-0.118	
14								-0.118	
15								-0.118	
16								1.766	

The percent mortality in OF2-2 was not significantly higher than that of the Control at α=0.05.

-CJ1

Project Name: P885-1 Hyalella % Mortality

Sample:	x1
Samp ID:	OF2-3
Alias:	NAS# 5993G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS# 5989G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	5.595
SS:	594.733
K:	8
b:	15.386
Alpha Level:	0.05
Calculated Value:	0.398
Critical Value:	<= 0.887
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	4.033
Test Residual SD:	4.888
Ref. Residual Mean:	4.033
Ref. Residual SD:	4.888
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	8
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	32
Critical Value:	>= 49.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
2	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
3	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
4	10	15.5	0	7.5	16.131	2.304	7.5		-2.304
5	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
6	0	7.5	10	15.5	2.304	16.131	7.5		-2.304
7	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
8	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
9							7.5		-2.304
10							7.5		-2.304
11							7.5		-2.304
12							7.5		-2.304
13							7.5		-2.304
14							7.5		-2.304
15							15.5		16.131
16							15.5		16.131

The percent mortality in OF2-3 was not significantly higher than that of the Control at α=0.05.

-GJ1

Project Name: P885-1 Hyalella % Mortality

Sample:	x1
Samp ID:	OF1-1
Alias:	NAS# 5994G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS# 5989G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	5.595
SS:	594.733
K:	8
b:	15.386
Alpha Level:	0.05
Calculated Value:	0.398
Critical Value:	<= 0.887
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	4.033
Test Residual SD:	4.888
Ref. Residual Mean:	4.033
Ref. Residual SD:	4.888
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	8
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	32
Critical Value:	>= 49.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
2	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
3	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
4	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
5	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
6	0	7.5	10	15.5	2.304	16.131	7.5		-2.304
7	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
8	10	15.5	0	7.5	16.131	2.304	7.5		-2.304
9							7.5		-2.304
10							7.5		-2.304
11							7.5		-2.304
12							7.5		-2.304
13							7.5		-2.304
14							7.5		-2.304
15							15.5		16.131
16							15.5		16.131

The percent mortality in OF1-1 was not significantly higher than that of the Control at α=0.05.

-CJ1

Project Name: P885-1 Hyalella % Mortality

Sample:	x1
Samp ID:	OF1-2
Alias:	NAS# 5995G
Replicates:	8
Mean:	0
SD:	0
Tr Mean:	-0.118
Trans SD:	0

Ref Samp:	x2
Ref ID:	Control
Alias	NAS# 5989G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	0.118
Trans SD:	0.666

Shapiro-Wilk Results:

Residual Mean:	
Residual SD:	
SS:	
K:	
b:	
Alpha Level:	N/A
Calculated Value:	N/A
Critical Value:	N/A
Normally Distributed:	N/A
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	0
Test Residual SD:	0
Ref. Residual Mean:	0.412
Ref. Residual SD:	0.5
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	2.3333
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	Rankits
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	7
Experimental Alpha Level:	0.05
Calculated Value:	-1
Critical Value:	>= 1.895
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	-0.118	0	-0.118	0	0.235		-0.118	
2	0	-0.118	0	-0.118	0	0.235		-0.118	
3	0	-0.118	0	-0.118	0	0.235		-0.118	
4	0	-0.118	0	-0.118	0	0.235		-0.118	
5	0	-0.118	0	-0.118	0	0.235		-0.118	
6	0	-0.118	10	1.766	0	1.648		-0.118	
7	0	-0.118	0	-0.118	0	0.235		-0.118	
8	0	-0.118	0	-0.118	0	0.235		-0.118	
9								-0.118	
10								-0.118	
11								-0.118	
12								-0.118	
13								-0.118	
14								-0.118	
15								-0.118	
16								1.766	

The percent mortality in OF1-2 was not significantly higher than that of the Control at α=0.05.

-631

Project Name: P885-1 Hyalella % Mortality

Sample:	x1
Samp ID:	OF1-3
Alias:	NAS# 5996G
Replicates:	8
Mean:	2.5
SD:	7.071
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS# 5989G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	6.939
SS:	914.856
K:	8
b:	20.593
Alpha Level:	0.05
Calculated Value:	0.4636
Critical Value:	<= 0.887
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	5.811
Test Residual SD:	7.044
Ref. Residual Mean:	4.033
Ref. Residual SD:	4.888
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.5867
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	8
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	32.5
Critical Value:	>= 49.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Ranklits	Shipiro-Wilk Residuals
1	0	7.5	0	7.5	3.321	2.304	7.5		-3.321
2	0	7.5	0	7.5	3.321	2.304	7.5		-3.321
3	20	16	0	7.5	23.244	2.304	7.5		-3.321
4	0	7.5	0	7.5	3.321	2.304	7.5		-3.321
5	0	7.5	0	7.5	3.321	2.304	7.5		-3.321
6	0	7.5	10	15	3.321	16.131	7.5		-3.321
7	0	7.5	0	7.5	3.321	2.304	7.5		-3.321
8	0	7.5	0	7.5	3.321	2.304	7.5		-2.304
9							7.5		-2.304
10							7.5		-2.304
11							7.5		-2.304
12							7.5		-2.304
13							7.5		-2.304
14							7.5		-2.304
15							15		16.131
16							16		23.244

The percent mortality in OF1-3 was not significantly higher than that of the Control at α=0.05.

-631

Project Name: P885-1 Hyalella % Mortality

Sample:	x1
Samp ID:	OF2-4
Alias:	NAS# 5997G
Replicates:	8
Mean:	0
SD:	0
Tr Mean:	-0.118
Trans SD:	0

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS# 5989G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	0.118
Trans SD:	0.666

Shapiro-Wilk Results:

Residual Mean:	
Residual SD:	
SS:	
K:	
b:	
Alpha Level:	N/A
Calculated Value:	N/A
Critical Value:	N/A
Normally Distributed:	N/A
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	0
Test Residual SD:	0
Ref. Residual Mean:	0.412
Ref. Residual SD:	0.5
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	2.3333
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	Rankits

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	7
Experimental Alpha Level:	0.05
Calculated Value:	-1
Critical Value:	>= 1.895
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	-0.118	0	-0.118	0	0.235		-0.118	
2	0	-0.118	0	-0.118	0	0.235		-0.118	
3	0	-0.118	0	-0.118	0	0.235		-0.118	
4	0	-0.118	0	-0.118	0	0.235		-0.118	
5	0	-0.118	0	-0.118	0	0.235		-0.118	
6	0	-0.118	10	1.766	0	1.648		-0.118	
7	0	-0.118	0	-0.118	0	0.235		-0.118	
8	0	-0.118	0	-0.118	0	0.235		-0.118	
9								-0.118	
10								-0.118	
11								-0.118	
12								-0.118	
13								-0.118	
14								-0.118	
15								-0.118	
16								1.766	

The percent mortality in OF2-4 was not significantly higher than that of the Control at α=0.05.

-CJL

Project Name: P885-1 Hyalella % Mortality

Sample:	x1
Samp ID:	OF2-5
Alias:	NAS# 5998G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS# 5989G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	5.595
SS:	594.733
K:	8
b:	15.386
Alpha Level:	0.05
Calculated Value:	0.398
Critical Value:	<= 0.887
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	4.033
Test Residual SD:	4.888
Ref. Residual Mean:	4.033
Ref. Residual SD:	4.888
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	8
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	32
Critical Value:	>= 49.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Ranks	Shipiro-Wilk Residuals
1	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
2	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
3	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
4	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
5	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
6	0	7.5	10	15.5	2.304	16.131	7.5		-2.304
7	0	7.5	0	7.5	2.304	2.304	7.5		-2.304
8	10	15.5	0	7.5	16.131	2.304	7.5		-2.304
9							7.5		-2.304
10							7.5		-2.304
11							7.5		-2.304
12							7.5		-2.304
13							7.5		-2.304
14							7.5		-2.304
15							15.5		16.131
16							15.5		16.131

The percent mortality in OF2-5 was not significantly higher than that of the Control at α=0.05.

-651

Project Name: P885-1 Hyalella % Mortality

Sample:	x1
Samp ID:	OF1-4
Alias:	NAS# 5999G
Replicates:	8
Mean:	3.75
SD:	7.44
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS# 5989G
Replicates:	8
Mean:	1.25
SD:	3.536
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	7.573
SS:	1089.791
K:	8
b:	26.694
Alpha Level:	0.05
Calculated Value:	0.6539
Critical Value:	<= 0.887
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	8.438
Test Residual SD:	5.643
Ref. Residual Mean:	4.033
Ref. Residual SD:	4.888
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	1.6688
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	8
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	36.5
Critical Value:	>= 49.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	7	0	7	5.625	2.304	7		-5.625
2	10	14.5	0	7	12.81	2.304	7		-5.625
3	0	7	0	7	5.625	2.304	7		-5.625
4	0	7	0	7	5.625	2.304	7		-5.625
5	0	7	0	7	5.625	2.304	7		-5.625
6	0	7	10	14.5	5.625	16.131	7		-5.625
7	0	7	0	7	5.625	2.304	7		-2.304
8	20	16	0	7	20.94	2.304	7		-2.304
9							7		-2.304
10							7		-2.304
11							7		-2.304
12							7		-2.304
13							7		-2.304
14							14.5		12.81
15							14.5		16.131
16							16		20.94

The percent mortality in OF1-4 was not significantly higher than that of the Control at α=0.05.

-GL

Test Number: 885-1

Freshwater Sediment Test
10-Day Hyalella azteca

data entry verified against laboratory bench sheets 10-19-17 SRC

Water Quality Data

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	Overlying water TEMP	DO	COND	pH	NH3	HARD	ALK
12	5999G	OF1-4	8	0	22.0	8.2	115	7.5	<0.1	26	30
20	5995G	OF1-2	8	0	22.8	8.3	116	7.4	<0.1	26	40
28	5993G	OF2-3	8	0	22.2	8.0	116	7.3	<0.1	17	30
51	5991G	OF2-1	8	0	22.2	8.0	117	7.1	0.1	26	30
52	5994G	OF1-1	8	0	22.3	8.2	112	7.4	<0.1	17	30
56	5996G	OF1-3	8	0	22.4	8.2	115	7.4	<0.1	17	40
60	5989G	Control	8	0	22.9	7.6	138	7.0	0.1	17	30
66	5998G	OF2-5	8	0	22.7	8.0	118	7.1	<0.1	17	30
68	5997G	OF2-4	8	0	22.9	8.1	121	7.2	<0.1	34	40
70	5992G	OF2-2	8	0	23.0	6.9	120	7.2	<0.1	26	30
12	5999G	OF1-4	8	1	22.2	8.1					
20	5995G	OF1-2	8	1	22.9	8.2					
28	5993G	OF2-3	8	1	22.3	8.2					
51	5991G	OF2-1	8	1	22.3	8.1					
52	5994G	OF1-1	8	1	22.3	8.0					
56	5996G	OF1-3	8	1	22.4	8.0					
60	5989G	Control	8	1	23.3	7.8					
66	5998G	OF2-5	8	1	22.7	8.1					
68	5997G	OF2-4	8	1	22.8	8.2					
70	5992G	OF2-2	8	1	23.1	7.8					
12	5999G	OF1-4	8	2	22.1	8.1					
20	5995G	OF1-2	8	2	22.6	8.1					
28	5993G	OF2-3	8	2	22.2	8.0					
51	5991G	OF2-1	8	2	22.3	7.9					
52	5994G	OF1-1	8	2	22.3	7.9					
56	5996G	OF1-3	8	2	22.4	7.9					
60	5989G	Control	8	2	23.0	7.6					
66	5998G	OF2-5	8	2	22.7	7.8					
68	5997G	OF2-4	8	2	22.8	7.9					
70	5992G	OF2-2	8	2	23.0	7.9					
12	5999G	OF1-4	8	3	22.3	7.8					
20	5995G	OF1-2	8	3	23.1	7.7					
28	5993G	OF2-3	8	3	22.4	7.7					
51	5991G	OF2-1	8	3	22.5	7.6					
52	5994G	OF1-1	8	3	22.5	7.6					
56	5996G	OF1-3	8	3	22.7	7.6					
60	5989G	Control	8	3	23.3	7.3					
66	5998G	OF2-5	8	3	23.0	7.6					
68	5997G	OF2-4	8	3	23.1	7.7					
70	5992G	OF2-2	8	3	23.3	7.8					
12	5999G	OF1-4	8	4	22.7	7.6					
20	5995G	OF1-2	8	4	23.8	7.5					
28	5993G	OF2-3	8	4	23.0	7.5					
51	5991G	OF2-1	8	4	23.1	7.4					
52	5994G	OF1-1	8	4	23.1	7.4					
56	5996G	OF1-3	8	4	23.3	7.5					
60	5989G	Control	8	4	23.7	7.3					
66	5998G	OF2-5	8	4	23.4	7.4					
68	5997G	OF2-4	8	4	23.5	7.5					
70	5992G	OF2-2	8	4	23.7	7.5					

Test Number: 885-1

Freshwater Sediment Test
10-Day Hyalella azteca

12	5999G	OF1-4	8	5	22.8	7.6					
20	5995G	OF1-2	8	5	23.4	7.6					
28	5993G	OF2-3	8	5	22.9	7.4					
51	5991G	OF2-1	8	5	23.0	7.4					
52	5994G	OF1-1	8	5	23.0	7.4					
56	5996G	OF1-3	8	5	23.1	7.5					
60	5989G	Control	8	5	23.5	7.1					
66	5998G	OF2-5	8	5	23.3	7.2					
68	5997G	OF2-4	8	5	23.4	7.4					
70	5992G	OF2-2	8	5	23.5	7.3					
12	5999G	OF1-4	8	6	23.0	7.5					
20	5995G	OF1-2	8	6	23.3	7.6					
28	5993G	OF2-3	8	6	22.9	7.5					
51	5991G	OF2-1	8	6	22.9	7.6					
52	5994G	OF1-1	8	6	22.9	7.5					
56	5996G	OF1-3	8	6	22.9	7.4					
60	5989G	Control	8	6	23.4	7.2					
66	5998G	OF2-5	8	6	23.2	7.4					
68	5997G	OF2-4	8	6	23.2	7.6					
70	5992G	OF2-2	8	6	23.3	7.5					
12	5999G	OF1-4	8	7	22.5	7.4					
20	5995G	OF1-2	8	7	23.1	7.5					
28	5993G	OF2-3	8	7	22.7	7.6					
51	5991G	OF2-1	8	7	22.8	7.5					
52	5994G	OF1-1	8	7	22.8	7.3					
56	5996G	OF1-3	8	7	22.9	7.4					
60	5989G	Control	8	7	23.4	7.2					
66	5998G	OF2-5	8	7	23.2	7.5					
68	5997G	OF2-4	8	7	23.2	7.5					
70	5992G	OF2-2	8	7	23.3	7.3					
12	5999G	OF1-4	8	8	22.8	7.7					
20	5995G	OF1-2	8	8	23.3	7.7					
28	5993G	OF2-3	8	8	22.8	7.6					
51	5991G	OF2-1	8	8	22.8	7.5					
52	5994G	OF1-1	8	8	22.8	7.8					
56	5996G	OF1-3	8	8	22.9	7.7					
60	5989G	Control	8	8	23.4	7.6					
66	5998G	OF2-5	8	8	23.1	7.8					
68	5997G	OF2-4	8	8	23.1	7.7					
70	5992G	OF2-2	8	8	23.4	7.7					
12	5999G	OF1-4	8	9	22.4	7.7					
20	5995G	OF1-2	8	9	23.2	7.8					
28	5993G	OF2-3	8	9	22.7	7.6					
51	5991G	OF2-1	8	9	22.8	7.5					
52	5994G	OF1-1	8	9	22.8	7.6					
56	5996G	OF1-3	8	9	22.9	7.7					
60	5989G	Control	8	9	23.3	7.4					
66	5998G	OF2-5	8	9	23.1	7.4					
68	5997G	OF2-4	8	9	23.1	7.7					
70	5992G	OF2-2	8	9	23.3	7.5					
12	5999G	OF1-4	8	10	22.2	7.9	108	7.6	<0.1	17	30
20	5995G	OF1-2	8	10	23.1	7.9	112	7.6	<0.1	17	40
28	5993G	OF2-3	8	10	22.4	7.8	112	7.6	<0.1	17	30

Test Number: 885-1

Freshwater Sediment Test
10-Day Hyalella azteca

51	5991G	OF2-1	8	10	22.5	7.7	113	7.5	<0.1	17	30
52	5994G	OF1-1	8	10	22.5	7.8	110	7.6	<0.1	17	30
56	5996G	OF1-3	8	10	22.6	7.9	110	7.6	<0.1	17	40
60	5989G	Control	8	10	23.3	7.4	126	8.0	<0.1	17	30
66	5998G	OF2-5	8	10	22.9	7.6	114	7.5	<0.1	26	40
68	5997G	OF2-4	8	10	23.0	7.7	115	7.6	<0.1	17	30
70	5992G	OF2-2	8	10	23.2	7.8	113	7.5	<0.1	17	30
				Mean	22.9	7.7	116	7.4	---	20	33
				SD	0.4	0.3	6.6	0.2	---	5	5
				n	110	110	20	20	20	20	20
				Min	22.0	6.9	108	7.0	<0.1	17	30
				Max	23.8	8.3	138	8.0	0.1	34	40

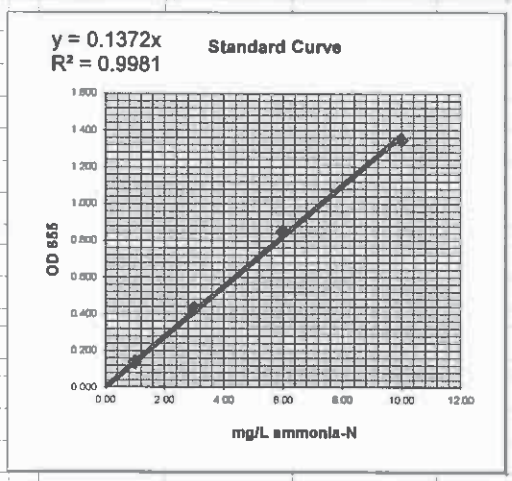
RAW DATA DIVIDER PAGE
Test No. 885-1

AMMONIA EXPOSURE BENCHSHEETS AND ANALYSIS

Total Ammonia-N in Sediment Pore Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD_{655}	NH_3-N (mg/L)	pH	Salinity (ppt)
	Blank	----	-----	----		
	1.0 mg/L NH_3-N Std.	----	0.139	1.00		
	3.0 mg/L NH_3-N Std.	----	0.431	3.00		
	6.0 mg/L NH_3-N Std.	----	0.850	6.00		
	10.0 mg/L NH_3-N Std.	----	1.350	10.00		
	3.0 mg/L spike	----	0.433	3.15		
	3.0 mg/L spike dupl.	----	0.435	3.17		
	5.0 mg/L 2nd source		0.620	4.52		
1.	Day 0 (9-22-17)					
2.	12	1	0.008	ND		
3.	20	1	0.008	ND		
4.	28	1	0.004	ND		
5.	51	1	0.017	0.12		
6.	52	1	0.000	ND		
7.	56	1	0.002	ND		
8.	60	1	0.019	0.14		
9.	66	1	0.001	ND		
10.	68	1	0.001	ND		
11.	70	1	0.002	ND		
12.						
13.	Day 10 (10-2-17)					
14.	12	1	0.010	ND		
15.	20	1	0.001	ND		
16.	28	1	0.000	ND		
17.	51	1	0.000	ND		
18.	52	1	0.000	ND		
19.	56	1	0.001	ND		
20.	60	1	0.000	ND		
21.	66	1	0.001	ND		
22.	68	1	0.000	ND		
23.	70	1	0.001	ND		
24.						
25.						
26.						
27.						
28.						
29.						
30.						
31.						
32.						
33.						
34.						
35.						
36.						



Reporting limit (mg/L) =	0.1
Recovery (%) =	105.4
Precision (RPD) =	-0.46
2nd source (%) =	90.3
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Proj. No.: **885-1**

Test Day: **0 & 10**

Species: ***Hyalella***

Sample Type (check)

- Bulk Sediment Porewaters
- Test Beaker Porewaters
- X Overlying Water

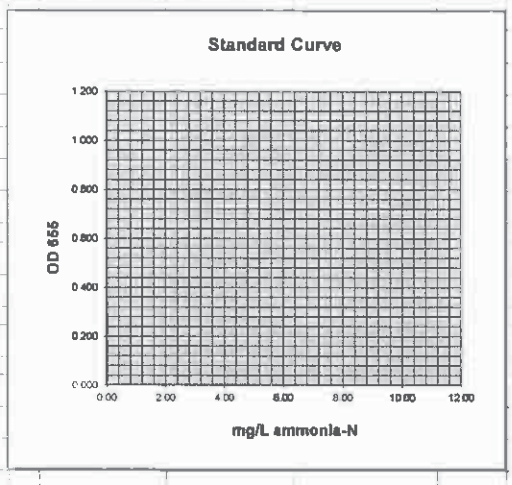
Analyst: **JB**

Date analyzed: **10/13/2017**

Total Ammonia-N in Sediment Pore Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD_{655}	NH_3-N (mg/L)	pH	Salinity (ppt)
	Blank	-----	----	-----		
	1.0 mg/L NH_3-N Std.	-----	0.139	1.00		
	3.0 mg/L NH_3-N Std.	-----	0.431	3.00		
	6.0 mg/L NH_3-N Std.	-----	0.850	6.00		
	10.0 mg/L NH_3-N Std.	-----	1.350	10.00		
	3.0 mg/L spike	----	0.433			
	3.0 mg/L spike dupl.	-----	0.435			
	5.0 mg/L 2nd source		0.620			
1.	Day 0 (9-22-17)					
2.	12	1	0.008			
3.	20	1	0.008			
4.	28	1	0.004			
5.	51	1	0.017			
6.	52	1	0.000			
7.	56	1	0.002			
8.	60	1	0.019			
9.	66	1	0.001			
10.	68	1	0.001			
11.	70	1	0.002			
12.						
13.	Day 10 (10-2-17)					
14.	12	1	0.010			
15.	20	1	0.001			
16.	28	1	0.000			
17.	51	1	0.000			
18.	52	1	0.000			
19.	56	1	0.001			
20.	60	1	0.000			
21.	66	1	0.001			
22.	68	1	0.000			
23.	70	1	0.001			
24.						
25.						
26.						
27.						
28.						
29.						
30.						
31.						
32.						
33.						
34.						
35.						
36.						



Reporting limit (mg/L) =	0.1
Recovery (%) =	#VALUE!
Precision (RPD) =	#VALUE!
2nd source (%) =	#VALUE!
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Proj. No.: 885-1
Test Day: 0 & 10
Species: *Hyalella*

Sample Type (check)

- Bulk Sediment Porewaters
- Test Beaker Porewaters
- X Overlying Water

Analyst: JB
Date analyzed: 10/13/2017

RAW DATA DIVIDER PAGE
Test No. 885-1

CHAIN-OF-CUSTODY RECORDS

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information	Testing Required					
Environmental Science Associates (ESA)	D160430	Carrier:	H. azteca 10-day mortality	C. dilutus 20-day survival/growth				
Address: 5309 Shilshole Ave. NW, Suite 200	Phone No.: 206-204-6960	Airbill No.						
City, State, Zip code: Seattle, WA 98107	Report Attention: Jim Good							

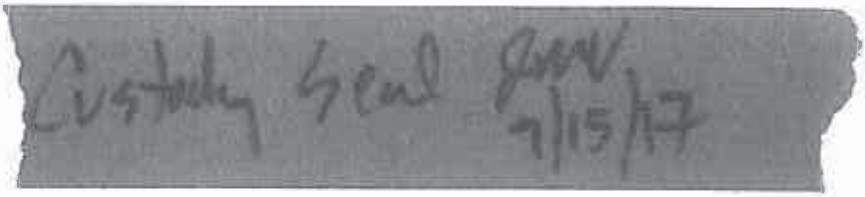
Lab Sample No.	Date Sampled	Time Sampled	Sampled by: J. Vlastelicia, C. French Sample Description	Number of Containers	H. azteca 10-day mortality	C. dilutus 20-day survival/growth				Comments
59916	9/12/17	1345	Camas Slough Sediment; OF2-1	6	X	X				
59926	9/12/17	1530	Camas Slough Sediment; OF2-2	6	X	X				
59936	9/12/17	1700	Camas Slough Sediment; OF2-3	6	X	X				
59946	9/13/17	1300	Columbia River Sediment; OF1-1	6	X	X				
59956	9/13/17	1505	Columbia River Sediment; OF1-2	6	X	X				
59966	9/13/17	1825	Columbia River Sediment; OF1-3	6	X	X				only 5 Jars
59976	9/14/17	1129	Camas Slough Sediment; OF2-4	3	X	X				
59986	9/14/17	1330	Camas Slough Sediment; OF2-5	3	X	X				
59996	9/14/17	1655	Columbia River Sediment; OF1-4	3	X	X				

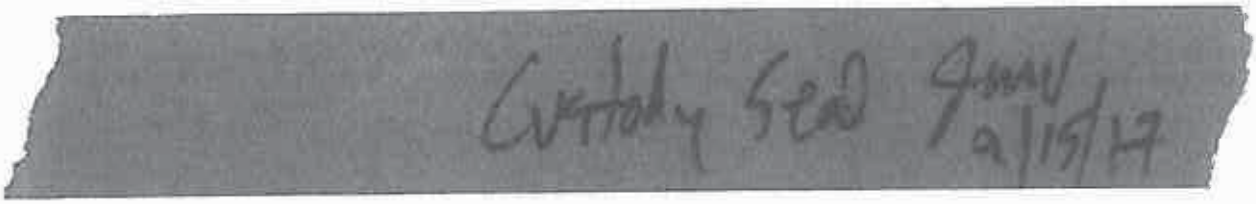
	Signature	Print Name	Company	Date	Time
Relinquished by		John Vlastelicia	ESA	9/15/17	1040
Received by		Luke Johnson	ESA	9/15/17	1040
Relinquished by		Luke Johnson	ESA	9/15/17	14:19
Received by laboratory		Gary Bohler	NAS	9/15/17	14:19

Custody Seal: Present/ ~~Not Present~~
Cooler: Intact/ Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C): All coolers 0.5°C.

Custody Seal
9/15/17


Custody Seal
9/15/17


Custody Seal
9/15/17

Custody Seal
9/15/17

APPENDIX III

RAW DATA – REFERENCE TOXICANT TEST

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-HA1

ACUTE TOXICITY TEST (ALL SPECIES)

REVIEWED PAGES 1-9 - GJI

Test No. 999-3712 Client: QC Test Investigator

Test Type (rangefinding/definitive) Test Length (hr) 96

Species *Hyalella azteca*

STUDY MANAGEMENT

Client: QC test

Client's Study Monitor: QC test

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. Irissarri GJI

QA Officer L. K. Nemeth

1. [illegible] 2. GA Bubler 09-22-17

3. 4.

Test Beginning: 09-22-17 1015 Test Ending: 9-26-17 0920

TEST MATERIAL

Description: Potassium Chloride Crystals - Lot No.: FISHER 147960

NAS Sample No.				
Date of Collection:				
Date of Receipt:				
Temperature (deg C):				
Dissolved oxygen (mg/L):				
pH:				
Conductivity (umhos/cm):				
Hardness (mg/L):				
Alkalinity (mg/L):				
Salinity (ppt):				
Total chlorine (mg/L):				
Total ammonia-N (mg/L):				
:				

DILUTION WATER

Description: Moderately hard synthetic water

Date of Preparation/Collection: 9-14-17

Water Quality: Cond. (umhos/cm): 309 Salinity (ppt) [illegible] pH 8.0

Hardness (mg/L as $CaCO_3$): 94 Alkalinity (mg/L as $CaCO_3$): 70

Treatments: Aerated ≥ 24 hrs

TEST LOCATION

Test conducted in (circle one): (room 1) room 2 trailer water bath other:

Randomization chart:

REPL										
A	0.125	0.063	1	ϕ	0.5	0.25				
B	0.5	ϕ	0.25	0.063	1	0.125				

Error codes: 1) Correction of handwriting error
2) Written in wrong location; entry deleted
3) Wrong date deleted; replaced with correct date
4) Error found in measurement; measurement repeated

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA1

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-3712 Client QC Test Investigator

TEST ORGANISMS

Species: *Hyalella azteca* Age: 7-8 DAYS Size:

Source: Chesapeake Cultures, Hayes, VA Date received: 9-21-17

Acclimation Data:

Date	Temp. (deg.C)	pH	DO (mg/L)	Cond. umhos/cm	Hardness (mg/L)	Alkalinity (mg/L)	Feeding Amount	Feeding description	Water changes
9-21-17	22.4	7.3	14.3	821	205	220	10 mL	YTC	YES
9-22-17	21.9	8.3	7.7	583	137	160	—	—	—
				702 9-27-17					
Mean	22.2	7.8	11.0	296	171	190			
S.D.	—	—	—	—	—	—			
(N)	2	2	2	2	2	2			

Photoperiod during acclimation: 16:8, L:D

TEST PROCEDURES AND CONDITIONS

Test concentrations (50% series recommended): 1, 0.5, 0.25, 0.125, 0.063 0 g/L

Test chamber: 250 ml glass beakers Test volume: 100 ml

Replicates/treatment: 2 Organisms/treatment: 20 (10/rep)

Test water changes: None Aeration during test: None

Feeding: 0.5 ml YTC suspension per beaker on days 0 and 2

Duration: 24-hr, 48-hr, 96-hr Test temperature (deg.C): 23 ± 1 or 20 ± 1

Beaker placement: Stratified randomization Photoperiod: 16:8, L:D

MISCELLANEOUS NOTES

Test solution preparation:

Working stock: Dissolve 0.5g KCl crystals in dilution water and dilute to 500 mL.
Final conc.: 1.0 g/L.

Test concentration (g/L)	KCl working stock (ml/200ml)	Dilution water
1	200	Brought up to final volume of 200 ml with dilution water and distributed evenly between two replicates
0.5	100	
0.25	50	
0.125	25	
0.063	12.5	
0	0	

9-22-17 631

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA1

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-3712 Client QC Test

DAILY RECORD SHEET

Day 0 (9 /22 /17) GJL

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	23.2	7.9	1506	7.6	94	70	10	10
2. 0.5	23.1	7.9	932	7.7			10	10
3. 0.25	23.1	7.9	625	7.7			10	10
4. 0.125	23.2	7.9	486	7.6			10	10
5. 0.063	23.1	7.9	407	7.7			10	10
6. 0	23.0	7.9	317	7.6	94	70	10	10
Each beaker fed 0.5 ml YTC suspension. Initials: YN								

Day 1 (9/23/17) GBJ

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	23.9	7.8	1534	8.2			10	10
2. 0.5	23.9	7.8	951	8.1			10	10
3. 0.25	23.7	7.8	645	8.2			10	10
4. 0.125	23.8	7.8	498	8.1			10	10
5. 0.063	23.9	7.7	420	8.3			10	10
6. 0	23.9	7.7	330	8.2			10	10

Day 2 (9 /24 /17) GJL

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	23.7	7.8	1547	7.6			0(10D)	2(8D)
2. 0.5	23.6	7.8	998	7.7			10	10
3. 0.25	23.6	7.7	667	7.7			10	10
4. 0.125	23.8	7.7	518	7.7			10	10
5. 0.063	23.6	7.6	438	7.8			10	10
6. 0	23.7	7.6	348	7.8			10	10
Each beaker fed 0.5 ml YTC suspension. Initials: GJL								

Day 3 (9 /25/17) GJL

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	—	—	—	—			ϕ	ϕ(2D)
2. 0.5	23.7	7.8	990	7.7			6(4D)	4(6D)
3. 0.25	23.7	7.8	679	7.7			10	10
4. 0.125	23.9	7.8	527	7.7			10	10
5. 0.063	23.8	7.8	449	7.8			10	10
6. 0	23.8	7.8	349	7.9			10	10

Day 4 (9 /26 /17) GJL

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	—	—	—	—	—	—	ϕ	ϕ
2. 0.5	23.7	8.0	1016	7.7			6	3(1D)
3. 0.25	23.7	8.0	765	7.7			10	10
4. 0.125	23.8	7.9	539	7.7			10	10
5. 0.063	23.8	7.9	461	7.7			10	10
6. 0	23.9	7.8	354	7.8	94	70	10	10
Mean	23.6	7.8		7.8	94	70		
SD	0.3	0.1		0.2	0	0		
n	28	28		28	3	3		

Rec'd 9-21-17 ~

Chesapeake Cultures
P.O. Box 507 Hayes, VA 23072 (804)693-4046 growfish@chesapeakecultures.com

NAS

Shipment Information

Species Hyalella azteca Date 9/20/17

Age ~5-6 days 1.4-1.6mm P.O. No. —

Quantity 1200+ Invoice No. 9393

Temperature 24°C Salinity _____ pH 7.86

Notes _____

Biologist _____

Please inspect shipment and report any problem immediately

CETIS Analytical Report

Report Date: 02 Oct-17 06:48 (p 1 of 2)
Test Code: 999-3712 | 10-8807-8412

Reference Toxicant 96-h Acute Survival Test — Northwestern Aquatic Sciences

Analysis ID:	00-9419-0182	Endpoint:	96h Proportion Survived	CETIS Version:	CETISv1.8.7
Analyzed:	02 Oct-17 6:46	Analysis:	Parametric-Control vs Treatments	Official Results:	Yes
Batch ID:	02-6946-4629	Test Type:	Survival (96h)	Analyst:	
Start Date:	22 Sep-17 10:15	Protocol:	EPA/821/R-02-012 (2002)	Diluent:	Mod-Hard Synthetic Water
Ending Date:	26 Sep-17 09:20	Species:	Hyalella azteca	Brine:	
Duration:	95h	Source:	Chesapeake Cultures, VA	Age:	
Sample ID:	15-3756-4298	Code:	5BA55E8A	Client:	Internal Lab
Sample Date:	22 Sep-17 10:15	Material:	Potassium chloride	Project:	
Receive Date:	22 Sep-17 10:15	Source:	Reference Toxicant		
Sample Age:	NA	Station:			

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Angular (Corrected)	NA	C > T	NA	NA	17.7%	0.25	0.5	0.3536	

Dunnett Multiple Comparison Test

Control	vs	C-gm/L	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		0.063	0	2.849	0.276	2	0.8000	CDF	Non-Significant Effect
		0.125	0	2.849	0.276	2	0.8000	CDF	Non-Significant Effect
		0.25	0	2.849	0.276	2	0.8000	CDF	Non-Significant Effect
		0.5*	7.009	2.849	0.276	2	0.0014	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.7380083	0.1845021	4	19.65	0.0029	Significant Effect
Error	0.04695193	0.009390387	5			
Total	0.7849602		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Distribution	Shapiro-Wilk W Normality	0.6583	0.7411	0.0003	Non-normal Distribution

96h Proportion Survived Summary

C-gm/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	2	1	1	1	1	1	1	0	0.0%	0.0%
0.063		2	1	1	1	1	1	1	0	0.0%	0.0%
0.125		2	1	1	1	1	1	1	0	0.0%	0.0%
0.25		2	1	1	1	1	1	1	0	0.0%	0.0%
0.5		2	0.45	0	1	0.45	0.3	0.6	0.15	47.14%	55.0%
1		2	0	0	0	0	0	0	0		100.0%

Angular (Corrected) Transformed Summary

C-gm/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	2	1.412	1.409	1.415	1.412	1.412	1.412	0	0.0%	0.0%
0.063		2	1.412	1.409	1.415	1.412	1.412	1.412	0	0.0%	0.0%
0.125		2	1.412	1.409	1.415	1.412	1.412	1.412	0	0.0%	0.0%
0.25		2	1.412	1.409	1.415	1.412	1.412	1.412	0	0.0%	0.0%
0.5		2	0.7329	-1.214	2.68	0.7329	0.5796	0.8861	0.1532	29.57%	48.1%
1		2	0.1588	0.1587	0.1589	0.1588	0.1588	0.1588	0	0.0%	88.76%

96h Proportion Survived Detail

C-gm/L	Control Type	Rep 1	Rep 2
0	Dilution Water	1	1
0.063		1	1
0.125		1	1
0.25		1	1
0.5		0.6	0.3
1		0	0

CETIS Analytical Report

Test Code: 999-3712 | 10-8807-8412

Reference Toxicant 96-h Acute Survival Test — Northwestern Aquatic Sciences

Analysis ID:	00-9419-0182	**Endpoint:**	96h Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	02 Oct-17 6:46	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Angular (Corrected) Transformed Detail

C-gm/L	Control Type	Rep 1	Rep 2
0	Dilution Water	1.412	1.412
0.063		1.412	1.412
0.125		1.412	1.412
0.25		1.412	1.412
0.5		0.8861	0.5796
1		0.1588	0.1588

CETIS Analytical Report

Report Date: 02 Oct-17 06:48 (p 1 of 1)
Test Code: 999-3712 | 10-8807-8412

Reference Toxicant 96-h Acute Survival Test — **Northwestern Aquatic Sciences**

Analysis ID:	03-1853-6091	**Endpoint:**	96h Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	02 Oct-17 6:46	**Analysis:**	Untrimmed Spearman-Kärber	**Official Results:**	Yes
Batch ID:	02-6946-4629	**Test Type:**	Survival (96h)	**Analyst:**	
Start Date:	22 Sep-17 10:15	**Protocol:**	EPA/821/R-02-012 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	26 Sep-17 09:20	**Species:**	Hyalella azteca	**Brine:**	
Duration:	95h	**Source:**	Chesapeake Cultures, VA	**Age:**	
Sample ID:	15-3756-4298	**Code:**	5BA55E8A	**Client:**	Internal Lab
Sample Date:	22 Sep-17 10:15	**Material:**	Potassium chloride	**Project:**	
Receive Date:	22 Sep-17 10:15	**Source:**	Reference Toxicant		
Sample Age:	NA	**Station:**			

Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0	0.00%	-0.3161	0.03349	0.483	0.4139	0.5635

96h Proportion Survived Summary — Calculated Variate(A/B)

C-gm/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	2	1	1	1	0	0	0.0%	0.0%	20	20
0.063		2	1	1	1	0	0	0.0%	0.0%	20	20
0.125		2	1	1	1	0	0	0.0%	0.0%	20	20
0.25		2	1	1	1	0	0	0.0%	0.0%	20	20
0.5		2	0.45	0.3	0.6	0.15	0.2121	47.14%	55.0%	9	20
1		2	0	0	0	0	0		100.0%	0	20

96h Proportion Survived Detail

C-gm/L	Control Type	Rep 1	Rep 2
0	Dilution Water	1	1
0.063		1	1
0.125		1	1
0.25		1	1
0.5		0.6	0.3
1		0	0

CETIS Test Data Worksheet

Report Date: 02 Oct-17 06:47 (p 1 of 1)
Test Code: 10-8807-8412/999-3712

Reference Toxicant 96-h Acute Survival Test				Northwestern Aquatic Sciences
Start Date:	22 Sep-17 10:15	Species: Hyalella azteca	Sample Code:	5BA55E8A
End Date:	26 Sep-17 09:20	Protocol: EPA/821/R-02-012 (2002)	Sample Source:	Reference Toxicant
Sample Date:	22 Sep-17 10:15	Material: Potassium chloride	Sample Station:	

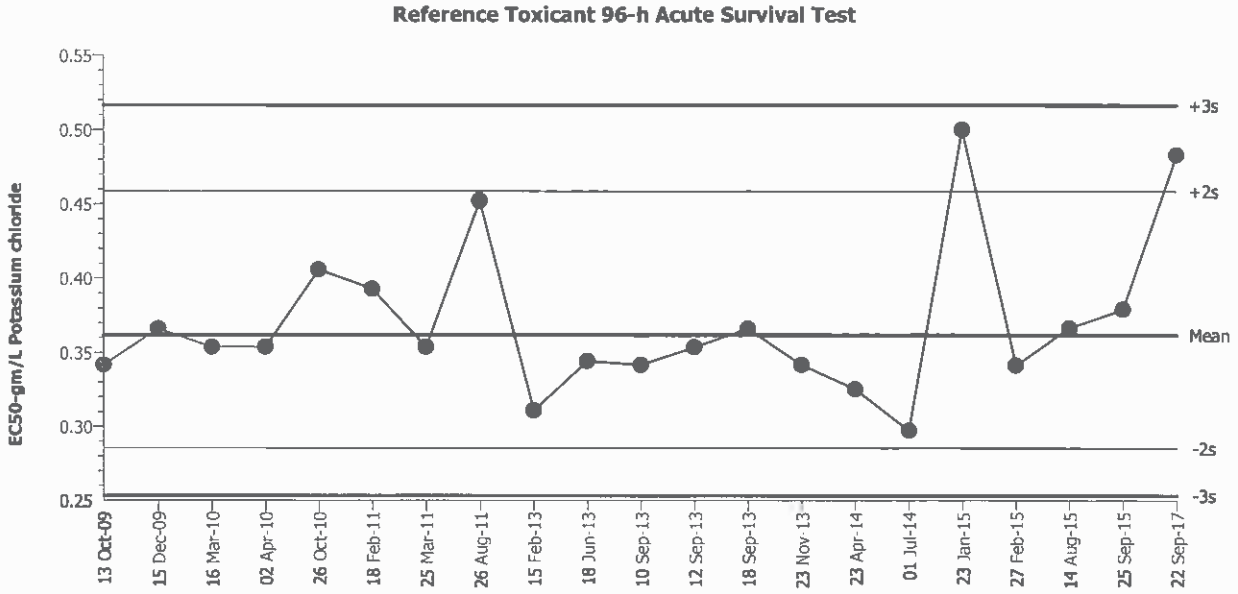
C-gm/L	Code	Rep	Pos	# Exposed	24h Survival	48h Survival	72h Survival	96h Survival	Notes
0	D	1	5	10				10	
0	D	2	7	10				10	
0.063		1	1	10				10	
0.063		2	11	10				10	
0.125		1	6	10				10	
0.125		2	3	10				10	
0.25		1	10	10				10	
0.25		2	9	10				10	
0.5		1	2	10				6	
0.5		2	4	10				3	
1		1	8	10				0	
1		2	12	10				0	

data entry verified against laboratory bench sheets 10-12-17 JRF

CETIS QC Plot

Report Date: 02 Oct-17 13:54 (1 of 1)

Reference Toxicant 96-h Acute Survival Test			Northwestern Aquatic Sciences
Test Type: Survival (96h)	**Organism:** Hyalella azteca (Freshwater Amphip	**Material:**	Potassium chloride
Protocol: EPA/821/R-02-012 (2002)	**Endpoint:** 96h Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	0.3617	**Count:**	20	**-2s Warning Limit:**	0.2852	**-3s Action Limit:**	0.2533
Sigma:	NA	**CV:**	12.60%	**+2s Warning Limit:**	0.4586	**+3s Action Limit:**	0.5164

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2009	Oct	13	11:45	0.3415	-0.02017	-0.4834			18-9211-1534	15-1719-8467
2		Dec	15	12:05	0.366	0.004343	0.1006			07-7600-4762	10-5577-8618
3	2010	Mar	16	9:30	0.3536	-0.00813	-0.1914			19-2856-3151	01-8608-7439
4		Apr	2	9:45	0.3536	-0.00809	-0.1906			12-9008-9807	06-9335-1560
5		Oct	26	9:15	0.4058	0.04408	0.9688			13-3538-5406	17-1519-2066
6	2011	Feb	18	11:40	0.3928	0.03113	0.6956			20-2400-2930	19-9425-6046
7		Mar	25	10:50	0.3536	-0.00813	-0.1914			00-3927-9371	02-0123-2170
8		Aug	26	9:50	0.452	0.09033	1.878			08-0649-5130	17-0621-1561
9	2013	Feb	15	10:35	0.3107	-0.05099	-1.28			02-0730-7998	00-5455-1236
10		Jun	18	12:00	0.3441	-0.01758	-0.4199			09-0989-6270	06-1335-1972
11		Sep	10	11:05	0.3415	-0.02017	-0.4834			18-8504-1406	15-9421-5802
12			12	9:25	0.3536	-0.00813	-0.1914			00-6567-4353	10-6247-8720
13			18	10:50	0.366	0.004343	0.1006			13-2935-5475	16-5217-6513
14		Nov	23	8:00	0.3415	-0.02017	-0.4834			20-2953-8455	00-5678-8769
15	2014	Apr	23	10:10	0.3252	-0.0365	-0.8962			07-9558-8458	13-0269-8981
16		Jul	1	10:30	0.2973	-0.06438	-1.651			04-4395-5547	15-3935-4536
17	2015	Jan	23	9:15	0.5	0.1383	2.728	(+)		20-8359-7616	04-1511-7063
18		Feb	27	0:00	0.3412	-0.02044	-0.49			03-3890-7879	04-6075-9233
19		Aug	14	9:40	0.3663	0.004668	0.108			07-9658-3981	16-7990-4312
20		Sep	25	10:15	0.379	0.01733	0.3942			12-3120-7561	07-8700-7869
21	2017		22	10:15	0.483	0.1213	2.436	(+)		10-8807-8412	03-1853-6091

SECTION B

Midge (*Chironomus dilutus*) 20-day sediment bioassay 885-2 data report

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 885-2

Title: Toxicity of freshwater sediments using a 20-day midge, *Chironomus dilutus*, sediment bioassay as part of the remedial investigation at the Georgia-Pacific mill site in Camas, Washington.

Protocol No.: NAS-XXX-CT4c, October 18, 2000. Revision 1 (11-8-03). Based on ASTM 2001 (Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates, E1706-00), Am. Soc. Test. Mat., Phila., PA, and EPA Method 100.5 (Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, EPA/600/R-99/064). Washington State Sediment Management Standards (SMS) (Chapter 173-204 WAC, Last Update: 2/25/13).

STUDY MANAGEMENT

Study Sponsor: Environmental Science Associates, 5309 Shilshole Ave. NW, Suite 200, Seattle, WA 98107.
Sponsor's Study Monitor: Mr. Jim Good
Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365
Test Location: Newport laboratory
Laboratory's Study Personnel: G.J. Irissarri, B.S., Proj. Mngr./ Study Dir.; L.K. Nemeth, B.A., M.B.A., QA Officer; G.A. Buhler, B.S., Aq. Toxicol.; J.B. Brown, B.S., D.V.M, Assoc. Aq. Toxicol.; Y. Nakahama, Sr. Tech.
Study Schedule:
Test Beginning: 9-22-17, 1400 hrs.
Test Ending: 10-12-17, 1130 hrs.
Disposition of Study Records: All raw data, reports, and other study records are stored at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.
Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Freshwater test sediments collected as part of the remedial investigation at the Georgia-Pacific mill site in Camas, Washington. Details are as follows:

NAS Sample No.	5991G	5992G	5993G	5994G	5995G
Description	OF2-1	OF2-2	OF2-3	OF1-1	OF1-2
Collection Date	9/12/17	9/12/17	9/12/17	9/13/17	9/13/17
Receipt Date	9/15/17	9/15/17	9/15/17	9/15/17	9/15/17

NAS Sample No.	5996G	5997G	5998G	5999G
Description	OF1-3	OF2-4	OF2-5	OF1-4
Collection Date	9/13/17	9/14/17	9/14/17	9/14/17
Receipt Date	9/15/17	9/15/17	9/15/17	9/15/17

Control Sediment: The negative control sediment (NAS#5989G) was collected on 9-13-17 from an area approximately one mile east of the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR.
Treatments: Homogenized at test set up by mixing using stainless steel implements.
Storage: All test and control sediments were stored at 4°C in the dark in sealed containers until used.

TEST WATER

Source: Dechlorinated municipal tap water.
Dates of Preparation: 9-19-17, 10-9-17
Water Quality:
pH: 7.6, 7.2

Exhibit 8 SHOR23-01

conductivity: 102, 104 µmhos/cm
hardness: 26, 17 mg/L as $CaCO_3$
alkalinity: 30, 30 mg/L as $CaCO_3$.
total chlorine: <0.02, <0.02 mg/L
Pretreatment: Dechlorinated and aerated ≥24 hr.

TEST ORGANISMS

Species: *Chironomus dilutus* (formerly *C. tentans*), midge.
Size: 1st instar
Source: NAS cultures
Acclimation: Holding conditions prior to testing averaged: Temperature, 21.2 ± 1.9°C; dissolved oxygen, 8.5 ± 0.2 mg/L; pH, 7.6 ± 0.2; conductivity, 162 ± 24 µmhos/cm; hardness, 30 mg/L as $CaCO_3$; and alkalinity, 40 mg/L as $CaCO_3$. Photoperiod was 16:8, L:D.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 300 ml high-form glass beakers
Test Volumes: 100 ml sediment layer; 175 ml test water.
Replicates/Treatment: 8
Organisms/Treatment: 80
Water Volume Changes: 2 water volumes per day
Aeration: None.
Feeding: Animals were fed 1.5 ml of Tetra Fin suspension (1.5 ml contains 6 mg dry solids) per beaker daily.
Acceptance Criteria: Results are valid if mean control mortality does not exceed 32%, and the mean individual ash-free dry weight at test termination is ≥ 0.60 mg.
Effects Criteria: 1) survival after 20 days, and 2) average individual biomass (based on ash-free dry weight) after 20 days. Death is defined as no visible movement or response to tactile stimulation. Missing organisms were considered to be dead.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, conductivity, pH, hardness, alkalinity and ammonia-nitrogen were measured in the overlying water of one replicate test container per treatment on days 0 and 20 of the test. Temperature was measured daily, pH and dissolved oxygen three times per week, and conductivity weekly, in the overlying water of one replicate test container per treatment. Hardness and alkalinity were measured with titrimetric methods. Ammonia-N was measured using Hach reagents based on the salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric method; samples were not distilled prior to analysis. The photoperiod was 16:8, L:D.

DATA ANALYSIS METHODS

Percent survival and average individual ash-free dry weight were calculated for each replicate as follows:

percent survival = 100 x (number surviving/initial number tested)
average individual ash-free dry wt. = (ash-free dry wt.)/number weighed,
where:
ash-free dry wt. = dry weight of organisms recovered on day 20 – ashed dry weight, in mg

Means and standard deviations for the biological endpoints described above, and for water quality data, were computed using Microsoft Excel 2010. The values for mortality and individual ash-free dry weight for the test sediment were statistically compared to the control sediment. Where appropriate, an arcsine square root transformation was performed on proportional mortality data before analysis. Following determination of normality and homogeneity of variances, a one-tailed Student T-test, Mann-Whitney or Approximate T test was conducted at the 0.05 level of significance. The statistical software used was BioStat (version Feb 9, 2006 (EXCEL)) bioassay software developed by the U.S. Army Corps of Engineers, Seattle District.

PROTOCOL DEVIATIONS

Beaker number 67 was inadvertently not inoculated with animals on day 0.

REFERENCE TOXICANT TEST

The reference toxicant test is a multi-concentration toxicity test using potassium chloride, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-3713
Reference Toxicant and Source: Potassium Chloride (KCl), Fisher Lot #147960.
Test Date: 9-22-17.
Dilution Water Used: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Result: 96-hr LC50, 2.46 g/L. This result is within the laboratory's control chart warning limits (1.52 –3.56 g/L).

TEST RESULTS

Observations of water quality in the overlying water throughout the test are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. The means and standard deviations of percent mortality and growth (ash-free dry wt.) of midges exposed for 20 days to sediments are summarized in Tables 2 and 3. Detailed data organized by sample and replicate, and summary statistics for these observations, are given in Appendix II.

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Ammonia-N in the overlying water ranged between <0.1 and 0.2 mg/L for all day 0 and day 20 measurements.

The test met the acceptability criteria specified in the SMS with 2.5% mean control mortality (≤32% required) and a control mean ash-free dry weight of 1.63 mg per larvae (≥0.60 mg required). The reference toxicant (positive control) EC50 result was within the laboratory's control chart limits (2.46 g/L; control chart mean ± 2 S.D. = 2.54 ± 1.02).

Interpretation was based on guidelines from the Washington State Sediment Management Standards (SMS) (Chapter 173-204 WAC, Last Update: 2/25/13). The SMS include Sediment Cleanup Objectives (SCO) and Cleanup Screening Levels (CSL) biological criteria. The Sediment Cleanup Objectives establish a no adverse effects level, including no acute or chronic adverse effect, to the benthic community. The Cleanup Screening Levels establish a minor adverse effects level, including acute or chronic effects, to the benthic community. To exceed the SCO criterion for mortality, the mean mortality in the test sediment must be greater than 15 percent over the mean control mortality and statistically different from the control ($p \leq 0.05$). For the growth endpoint, a mean reduction in the biomass that is greater than 25 percent over the control sediment response and statistically different from the control ($p \leq 0.05$) is an exceedance. For the CSL criteria, mean mortality in the test sediment must be greater than 25 percent over the mean control mortality and statistically different from the control ($p \leq 0.05$); for the growth endpoint, a mean reduction in the biomass that is greater than 40 percent from the control and statistically different from the control ($p \leq 0.05$) indicates an exceedance.

None of test sediments exhibited a mean mortality that was more than either 15% (SCO) or 25% (CSL) above the control mortality; therefore none of the sediments exceeded the SCO or CSL criteria for mortality. For the growth endpoint, eight of the test sediments were significantly lower than the control, but only one test sediment, OF1-3, exceeded limits under the SCO guidelines with an ash-free dry weight of 1.17 mg/individual, which was greater than a 25% reduction relative to the control. No sediment failed the CSL criterion for growth.

STUDY APPROVAL

10-30-17
Project Manager/Study Director Date

10-31-17
Assistant Laboratory Director Date
For Linda Nemeth

10-31-17
Quality Assurance Unit Date
For Julie Fiore

Exhibit 8 SHOR23-01

Table 1. Summary of water quality conditions during tests of the midge, *Chironomus dilutus*, exposed to freshwater sediments.

Water Quality Parameter	Mean ± S.D.	Minimum	Maximum	N
Temperature (°C)	22.7 ± 0.5	22.0	23.8	210
Dissolved oxygen (mg/L)	6.7 ± 0.8	4.4	8.2	100
Conductivity (µmhos/cm)	115 ± 5	104	134	50
pH	6.9 ± 0.3	6.3	7.5	100
Hardness (mg/L as $CaCO_3$)	18 ± 3	17	26	20
Alkalinity (mg/L as $CaCO_3$)	31 ± 3	30	40	20
Total ammonia (mg/L)	---	<0.1	0.2	20

Table 2. Mortality results of *Chironomus* toxicity test and data interpretation using guidelines from the Washington State SMS.

Sample description	Percent mortality (Mean ± SD)	Significantly higher than the control sediment at α=0.05?	Percent higher (absolute) than control sediment	Exceedance under SCO?[1]	Exceedance under one-test criteria for CSL[2]
Control (NAS# 5989G)	2.5 ± 4.6	---	---	---	---
OF1-1 (NAS# 5994G)	15.0 ± 14.1	Yes	12.5	No	No
OF1-2 (NAS# 5995G)	11.3 ± 14.6	No	8.8	No	No
OF1-3 (NAS# 5996G)	5.0 ± 7.6	No	2.5	No	No
OF1-4 (NAS# 5999G)	12.5 ± 11.6	Yes	10.0	No	No
OF2-1 (NAS# 5991G)	13.8 ± 13.0	Yes	11.3	No	No
OF2-2 (NAS# 5992G)	8.8 ± 8.3	No	6.3	No	No
OF2-3 (NAS# 5993G)	7.1 ± 7.6	No	4.6	No	No
OF2-4 (NAS# 5997G)	8.8 ± 6.4	Yes	6.3	No	No
OF2-5 (NAS# 5998G)	12.5 ± 12.8	Yes	10.0	No	No

[1] Sediment Cleanup Objectives (SCO) exceedance if the test sediment mean mortality is significantly higher (1-tailed t-test at P≤0.05) than the control sediment mean mortality and the absolute difference is >15%.

[2] Cleanup Screening Levels (CSL) exceedance if the test sediment mean mortality is significantly higher (1-tailed t-test at P≤0.05) than the control sediment mean mortality and the absolute difference is >25%.

Table 3. Growth results of *Chironomus* toxicity test and data interpretation using guidelines from the Washington State SMS.

Sample description	Average ash-free dry wt/midge (mg)* (Mean ± SD)	Statistically significantly lower than control sediment at α=0.05?	Percent lower than control sediment	Exceedance under SCO?[1] ((MIG_C-MIG_T)/MIG_C>0.25)	Exceedance under one-test criteria for CSL?[2] ((MIG_C-MIG_T)/MIG_C>0.40)
Control (NAS# 5989G)	1.63 ± 0.16	---	---	---	---
OF1-1 (NAS# 5994G)	1.35 ± 0.14	Yes	17.5	No	No
OF1-2 (NAS# 5995G)	1.24 ± 0.16	Yes	23.9	No	No
OF1-3 (NAS# 5996G)	1.17 ± 0.12	Yes	28.9	Yes	No
OF1-4 (NAS# 5999G)	1.32 ± 0.20	Yes	19.1	No	No
OF2-1 (NAS# 5991G)	1.51 ± 0.28	No	7.5	No	No
OF2-2 (NAS# 5992G)	1.35 ± 0.16	Yes	17.5	No	No
OF2-3 (NAS# 5993G)	1.32 ± 0.11	Yes	19.3	No	No
OF2-4 (NAS# 5997G)	1.49 ± 0.14	Yes	9.0	No	No
OF2-5 (NAS# 5998G)	1.43 ± 0.20	Yes	12.4	No	No

* Pupae were not included in the sample to estimate ash-free dry weight (as per EPA/600/R-99/064, p. 59, section 12.3.8.2)

[1] Sediment Cleanup Objectives (SCO) exceedance if the test sediment mean growth is significantly lower (1-tailed t-test at P≤0.05) than the control sediment mean growth, and the difference is >25%.

[2] Cleanup Screening Levels (CSL) exceedance (one-test criteria) if the test sediment mean individual growth in significantly lower (1-tailed t-test at P≤0.05) than the control sediment mean growth, and the difference is >40%.

APPENDIX I

PROTOCOL

TEST PROTOCOL
FRESHWATER MIDGE, *CHIRONOMUS TENTANS*, 20-DAY SEDIMENT TOXICITY TEST

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this study is to characterize the toxicity of freshwater sediments based on midge survival and growth using the midge, *Chironomus tentans*.

1.2 Referenced Method: This protocol is based on EPA Method 100.5 (EPA/600/R-99/064) and ASTM Method E 1706-00 (ASTM 2001).

1.3 Summary of Method: A summary of test conditions for the midge 20-day sediment toxicity test is tabulated below. The 20-day sediment toxicity test with *Chironomus tentans* is conducted at 23°C with a 16L:8D photoperiod at an illuminance of about 100-1000 lux. Test chambers are 300-mL high-form lipless beakers containing 100 mL of sediment and 175 mL of overlying water. Ten <24 hour-old (first-instar) midge larvae are used in each replicate. The number of replicates/treatment depends on the objective of the test. Eight replicates are recommended for routine testing. Midges in each test chamber are fed 1.5 mL (conatins 6.0 mg of dry solids) of fish food flakes suspension daily. Each chamber receives two volume additions per day of overlying water. Overlying water can be culture water, well water, surface water, site water, or reconstituted water. Test endpoints include survival and growth (dry weight or ash-free dry weight (AFDW)).

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
3814 Yaquina Bay Road, P.O. Box 1437
Newport, OR 97365.

2.4 Test Location: _____

2.5 Laboratory's Personnel to be Assigned to the Study:
Study Director: _____
Quality Assurance Unit: _____
Aquatic Toxicologist: _____
Aquatic Toxicologist: _____

2.6 Proposed Testing Schedule: Sediments should be tested sometime between sediment collection and 8 weeks storage. Sediments that contain high concentrations of labile chemicals such as ammonia and volatile organics should be tested as soon as possible after collection, but no later than within two weeks. A 96-hr, water-only reference toxicant test may be run concurrently, or periodic reference toxicant tests run on cultures may be used to assess organism sensitivity.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

3. TEST MATERIAL

The test materials are freshwater sediments. The control, reference, and test sediments are placed in solvent cleaned 1 L glass jars fitted with PTFE-lined screw caps. At the laboratory the samples are stored at 4°C in the dark. The original sealed containers may be stored for up to 8 weeks prior to testing, depending on the testing requirements. If jars are not full when received or if sediment is removed for testing, headspaces may be filled with nitrogen to retard deterioration, depending on testing requirements. A negative control sediment is collected from a clean site. In addition, a reference sediment, a clean sediment with physical characteristics similar to the test sediments, is normally employed as a comparison station. Test sediments should be homogenized before use in a test.

4. TEST WATER

Test water (overlying water) at NAS is normally *C. tentans* culture water, which is moderately hard synthetic water at a hardness of 80-100 mg/L as $CaCO_3$ and alkalinity of 60-70 mg/L as $CaCO_3$. Dilution water is prepared from Milli-Q reagent grade water and reagent grade chemicals. Test water may also be well water, surface water or site water depending on the study design.

5. TEST ORGANISMS

5.1 Species: midge, *Chironomus tentans*.

5.2 Source: Cultured at NAS (originally obtained from U.S. EPA Environmental Research Lab, Duluth, MN) or purchased from a reputable commercial supplier.

5.3 Age: < 24 hour-old (first instar) larvae

5.4 Acclimation and Pretest Observation: Cultures are maintained at approximately 23°C under a 16:8 L:D photoperiod. The culture water is moderately hard synthetic water. Midges are fed *Selenastrum* algae and finely ground Tetrafin flakes in suspension (10g Tetrafin in 100 mL Milli-Q water).

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are 300-mL high-form lipless glass beakers (Pyrex® 1040 or equivalent). Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or by placement in a temperature-controlled room. Aeration is not empolyed unless dissolved oxygen drops below 2.5 mg/L. The test is conducted under an illuminance of 100-1000 lux with a 16L:8D photoperiod.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027F. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The test involves exposure of midge larvae to test, control, and reference sediments. The sediments are placed on the bottom of the test containers and are overlain with test water. The test exposure is for 20 days. The renewal of overlying water consists of two volume additions per day, either continuous or intermittent. Each treatment consists of eight replicate test containers, each containing 10 organisms. Test chamber positions are completely randomized. Test organisms are randomly distributed to the test chambers. Blind testing is normally used.

7.2 Setup of Test Containers: Sediments are homogenized and placed in test chambers on the day before addition of test organisms. Sediment (100 ml) is placed into each of eight replicate beakers. After addition of the sediment, 175 ml of test water is gently added to each beaker in a manner to prevent resuspension. The overlying water is replaced twice daily. The test begins when midges are introduced to the test chambers. Initial water quality measurements are taken prior to the addition of test organisms.

7.3 Effect Criteria: The effect criteria used in the midge bioassay are survival (mortality) and growth. Mortality is defined as the lack of movement of body or appendages on response to tactile stimulation. Growth is determined by using either dry weight or ash-free dry weight measurements.

7.4 Test Conditions: No aeration is employed unless dissoved oxygen falls below 2.5 mg/L. The test temperature employed is 23°C (range of ± 1°C). A 16:8, L:D photoperiod is used. Illumination is supplied by daylight fluorescent lamps at 100-1000 lux. The overlying water is replaced twice daily.

7.5 Beginning the Test: The test is begun by adding the organisms to the equilibrated test containers as previously described.

7.6 Feeding: Midge larvae are fed 1.5 mL daily per test chamber (1.5 mL contains 6.0 mg of dry solids). A feeding may be skipped if there is a build up of excess food. However, all beakers must be treated similarly.

7.7 Test Duration, Type and Frequency of Observations, and Methods: The duration of the toxicity test is 20 days. The type and frequency of observations to be made are summarized as follows:

Type Of Observation	Times Of Observation
Biological Data	
Survival, growth	Day 20
Physical And Chemical Data	
Hardness, alkalinity, ammonia-N, conductivity, pH, dissolved oxygen, and temperature	Beginning and end of test in overlying water of one replicate beaker from each treatment.
Temperature	Daily
DO & pH	**3X/week**
Conductivity	Weekly

Dissolved oxygen is measured using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. The pH is measured using a pH probe and a properly calibrated meter with scale divisions of 0.1 pH units. Temperature is measured with a calibrated mercury thermometer or telethermometer. Conductivity is measured with a conductivity meter. Hardness and alkalinity are measured using titrometric methods. Ammonia-nitrogen is measured using the salicylate colerimetric method (Clin. Chim. Acta 14:403, 1996).

7.8 Growth Measurement: Growth is measured as ash-free dry weight (AFDW) of animals in a test replicate at the end of the test on day 10. Pooled animals from each test replicate are rinsed with deionized water, gently blotted and placed into tared aluminum weigh pans. The pans are dried at 60-90°C to constant weight. The dried organisms are placed into a dessicator and weighed as soon as possible to the nearest 0.01 mg (desirable to use 0.001 mg). The total weight of the dried midge in each pan is divided by the number of midge weighed to obtain an

average dry weight per midge. The dried larvae in the pan are then ashed at 550°C for two hours. The pan with tthe ashed larvae is then reweighed and the tissue mass of the larvae is determined as teh difference between the weight of the dried larvae plus pan and the weight of the ashed larvae plus pan. Pupae or adult organisms are not included in the sample to estimate AFDW.

8. CRITERIA OF TEST ACCEPTANCE

The test results are acceptable if the minimum survival of organisms in the control treatment at the end of the test is at least 70% and the average dry weight of *C. tentans* in the surviving controls is at least 0.6 mg (or 0.48mg/surviving organism as AFDW).

9. DATA ANALYSIS

The endpoints of the toxicity test are survival and growth. Survival is obtained as a direct count of living organisms in each test container at the end of the test. Average midge dry weight or ash-free dry weight, also measured at the end of the test, may be used to compare growth between treatment sediments and the control or reference sediment. Ordinarily the following data analysis is performed. Due to special requirements, alternative methods may be used. The means and standard deviations are calculated for each treatment level. Identification of toxic sediments is established by statistical comparison of test endpoints between test and control or reference sediments. Between treatment comparisons may be made using a Student's t-test or Wilcoxon's Two-Sample test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons.

10. REPORTING

The final report of the test results must include all of the following standard information at a minimum: name and identification of the test; the investigator and laboratory; date and time of test beginning and end; information on the test material; information on the source and quality of the overlying/test water; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including feeding, if any, and water quality; definition of the effect criteria and other observations; responses, if any, in the control treatment; tabulation and statistical analysis of measured responses and a summary table of endpoints; a description of the statistical methods used; any unusual information about the test or deviations from procedures; reference toxicant testing information.

11. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

12. REFERENCE TOXICANT

The reference toxicant test is a standard multi-concentration toxicity test using a specified chemical toxicant to evaluate the performance of test organisms used in the study. Reference toxicant tests are 96-hour, water only exposures, not 20-day sediment exposures. The reference toxicant test is normally run concurrently; however, for this 20-day test periodic reference toxicant tests run on the cultures may be used to evaluate organism sensitivity. Performance is evaluated by comparing the results of the reference toxicant test with historical results (e.g., control charts) obtained at the laboratory.

13. REFERENCED GUIDELINES

ASTM. 2001. Standard Test Methods for Measuring the Toxicity of Sediment-associated Contaminants with Freshwater Invertebrates. ASTM Standard Method No. E 1706-00. Am. Soc. Test. Mat., Philadelphia, PA.

U.S. EPA. 2000. Test Method 100.5, Life-cycle Test for measuring the Effects of Sediment-associated Contaminants on *Chironomus tentans*, pp. 84-91. In: Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. Second edition. EPA/600/R-99/064.

Weber, C.I. (Ed.) 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fourth Edition). EPA/600/4-90/027F.

14. APPROVALS

_____ for _____
Name Date

_____ for Northwestern Aquatic Sciences
Name Date

Appendix A
Test Conditions Summary

1. Test type	whole sediment toxicity test with renewal of overlying water
2. Test duration	20 days
3. Temperature	23 ± 1°C
4. Light quality	daylight flourescent light
5. Illuminance	100-1000 lux
6. Photoperiod	16L:8D
7. Test chamber size	300-mL high-form lipless beakers (Pyrex® 1040 or equivalent)
8. Sediment volume	100 mL
9. Overlying water volume	175 mL
10. Renewal overlying water	2 volume additions/day (continuous or intermittent)
11. Age of test organisms	< 24 hour-old (first instar) larvae
12. Organisms per test chamber	10
13. Replicates per treatment	8 recommended for routine testing (depends on design)
14. Organisms per treatment	80
15. Feeding regime	Fish food flakes, fed 1.5 mL daily/chamber (1.5 mL contains 6.0 mg of dry solids)
16. Aeration	None, unless DO falls below 2.5 mg/L
17. Overlying (test) water	Culture water, well water, surface water, site water or reconstituted water
18. Water quality	Hardness, alkalinity, conductivity, and ammonia-N beginning and end; temperature daily; dissolved oxygen, pH 3X/week and conductivity weekly
19. Endpoints	Survival and growth (ash-free dry weight.)
20. Test acceptability criteria	Minimum control survival of 70%; mean AFDW of surviving control organisms = 0.48 mg
21. Sample holding	up to 8 weeks at 4°C in the dark (14 days when volatiles in sediments)
22. Sample volume required	1L (800 mL per sediment)
23. Reference toxicant	KCl

APPENDIX II

RAW DATA

RAW DATA DIVIDER PAGE
Test No. 885-2

TEST DESCRIPTION, MONITORING, AND RESULTS BENCHSHEETS

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

REVIEWED PAGES 1-48 -68J

Test No. 885-2 Client ESA Investigator

STUDY MANAGEMENT

Client: Environmental Science Associates, 5309 Shilshole Ave. NW, Suite 200, Seattle, WA 98107

Client's Study Monitor: Mr. Jim Good

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. Irissarri GJI

QA Officer L.K. Nemeth

1. Yuri Nakagawa YN
2. GA Buhler GAB
3. J. Brown JB
4.
5.
6.
7.
8.

Study Schedule:

Test Beginning: 9-22-17 1400 Test Ending: 10-12-17 1130

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	5991G	5992G	5993G	5994G
Description:	OF2-1	OF2-2	OF2-3	OF1-1
Collection Date:	9/12/17	9/12/17	9/12/17	9/13/17
Receipt Date:	9/15/17	9/15/17	9/15/17	9/15/17
:				
NAS Sample No.:	5995G	5996G	5997G	5998G
Description:	OF1-2	OF1-3	OF2-4	OF2-5
Collection Date:	9/13/17	9/13/17	9/14/17	9/14/17
Receipt Date:	9/15/17	9/15/17	9/15/17	9/15/17
:				
NAS Sample No.:	5999G			
Description:	OF1-4			
Collection Date:	9/14/17			
Receipt Date:	9/15/17			
:				
NAS Sample No.:				
Description:				
Collection Date:				
Receipt Date:				
:				
NAS Sample No.:				
Description:				
Collection Date:				
Receipt Date:				
:				

Error codes: 1) correction of handwriting error
2) written in wrong location; entry deleted
3) wrong date deleted, replaced with correct date
4) error found in measurement; measurement repeated

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator [redacted]

SEDIMENT DESCRIPTIONS -- SUPPLEMENTAL NOTES

Sample No.	Description
5989G	FINE BLACK MUD
5991G	BROWN SAND W/ SMALL CLAMS & PLANT DEBIS
5992G	GRAY SAND W/ SMALL CLAMS & PLANT DEBRIS
5993G	BROWN SAND W/ SMALL CLAMS & PLANT DEBRIS
5994G	GRAY/BROWN SAND W/ SOME PLANT DEBRIS
5995G	GRAY/BROWN SAND W/ SMALL CLAMS & PLANT DEBRIS
5996G	BROWN SAND
5997G	BROWN SAND W/ SMALL CLAMS & PLANT DEBRIS
5998G	BROWN SAND W/ SMALL CLAM SHELLS & PLANT DEBRIS
5999G	GRAY SAND

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator [redacted]

TEST WATER

Source: Dechlorinated Newport, OR tap water

Date of Collection: 9-19-17, 10-1-17

pH 7.6, 7.2

Cond (umhos/cm2) 102, 104

Hardness (mg/L) 26, 17

Alkalinity (mg/L) 30, 30

Total Chlorine (mg/L) <0.02, <0.02

Treatments:

TEST ORGANISMS

Species: *Chironomus dilutus* Age: < 24 HRS 1st instar

Source: NAS CULTURES Date received: N/A

Acclimation Data:

Date	Temp. (deg.C)	pH	DO (mg/L)	Cond. umhos/cm	Hardness (mg/L)	Alkalinity (mg/L)	Feeding	Water changes
9-20-17	22.7	7.5	8.5	135	26	40	None	–
9-21-17	19.0	7.8	8.7	180	–	–	↓	–
9-22-17	21.9	7.5	8.4	171	34	40	↓	–
Mean	21.2	7.6	8.5	162	30	40		
S.D.	1.9	0.2	0.2	24	–	–		
(N)	3	3	3	3	3	3		

Photoperiod during acclimation: 16:8, L:D

TEST PROCEDURES AND CONDITIONS

Test chambers: 300 ml glass beakers

Test volumes: 100 ml of test sediment; 275 ml total volume

Replicates/treatment: (8) 8 Organisms/treatment: (80) 80 (10/REP)

Test water changes: Twice daily

Aeration: only if DO falls below 2.5 mg/L

Feeding: everyday beginning with day zero

Test temperature (°C): 23 ± 1

Beaker placement: Total randomization

Photoperiod: 16:8, L:D

Control Sediment:

Source: From an area approximately one mile east of the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR.

Date collected: 9/13/17

Sieved through 0.5 -mm screen

Storage: 4°C in the dark in closed containers. NAS# 5989G

MISCELLANEOUS NOTES

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator _____

Test conducted in (circle one): (room 1) room 2 trailer water bath other:_____

Randomization chart:

6								78	
5								77	
4							→	76	
3								75	
2								74	80
1								73	79

FRONT - TOP SHELF

Randomization chart:

Randomization chart:

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

DAILY RECORD SHEET

Day 0 (9/22/17) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness* (mg/L)	Alkalinity* (mg/L)	NH3* (ppm)	Comments
4	22.4	8.2	113	7.4	17	30		Each beaker fed 1.5 ml
21	22.1	8.2	112	7.5	17	30		Tetra Fin suspension
29	22.4	8.2	118	7.2	26	30		Initials:
49	22.2	7.6	134	7.1	17	30		
53	22.3	8.1	114	7.4	26	30		
58	22.2	8.2	112	7.3	17	30		
65	22.4	8.0	114	7.2	17	30		
66	22.8	8.0	118	7.2	26	30		
78	23.1	8.1	121	7.3	17	30		Water changed in all
80	23.2	7.8	119	7.3	17	30		beakers.
								Time: 0610
								Initials: GJ
								Water changed in all
								beakers.
								Time: —
								Initials: —

*Water quality measurements to be taken.

Day 1 (9/23/17) GJS

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	23.3							Each beaker fed 1.5 ml
21	22.0							Tetra Fin suspension
29	22.2							Initials: GJS
49	22.3							
53	22.6							
58	22.5							
65	22.6							
66	23.1							
78	23.4							Water changed in all
80	23.2							beakers.
								Time: 6550
								Initials: GJS
								Water changed in all
								beakers.
								Time: 1800
								Initials: YC

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

DAILY RECORD SHEET

Day 2 (9/24/17) GJ

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.1							Each beaker fed 1.5 ml
21	22.0							Tetra Fin suspension
29	22.3							Initials: GJ
49	22.2							
53	22.4							
58	22.3							
65	22.5							
66	22.8							
78	23.1							Water changed in all
80	22.9							beakers.
								Time: 0555
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1825
								Initials:

*Water quality measurements to be taken.

Day 3 (9/25/17) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.5	7.4		7.0				Each beaker fed 1.5 ml
21	22.3	7.3		7.1				Tetra Fin suspension
29	22.7	7.1		6.9				Initials: GJ
49	22.5	7.2		7.0				
53	22.7	7.2		7.1				
58	22.6	7.2		7.0				
65	22.8	7.1		7.0				
66	23.2	7.1		7.0				
78	23.6	7.2		7.1				Water changed in all
80	23.4	7.1		7.1				beakers.
								Time: 0600
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1745
								Initials:

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

DAILY RECORD SHEET

Day 4 (9/26/17) GJ

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.8							Each beaker fed 1.5 ml
21	22.8							Tetra Fin suspension
29	23.1							Initials: GJS
49	22.9							
53	23.2							
58	23.0							
65	23.2							
66	23.6							
78	23.8							Water changed in all
80	23.7							beakers.
								Time: 0550
								Initials: GJS
								Water changed in all
								beakers.
								Time: 1725
								Initials: JL

*Water quality measurements to be taken.

Day 5 (9/27/17) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.9	6.8	116	6.9				Each beaker fed 1.5 ml
21	22.7	6.7	117	6.8				Tetra Fin suspension
29	23.0	6.6	122	6.8				Initials: GJ
49	22.9	6.7	123	6.9				
53	23.1	6.6	118	6.9				
58	23.0	6.4	117	6.8				
65	23.2	6.4	121	6.9				
66	23.6	6.1	125	7.0				
78	23.8	6.4	121	7.0				Water changed in all
80	23.6	6.5	123	7.0				beakers.
								Time: 0605
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1715
								Initials: JL

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator _____

DAILY RECORD SHEET

Day 6 (9/28/17) OFS

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.8							Each beaker fed 1.5 ml
21	22.6							Tetra Fin suspension
29	22.9							Initials: 0600 OFS
49	22.8							
53	22.9							
58	22.9							
65	23.0							
66	23.3							
78	23.5							Water changed in all
80	23.4							beakers.
								Time: 0600
								Initials: OFS
								Water changed in all
								beakers.
								Time: 1715
								Initials: IN

*Water quality measurements to be taken.

Day 7 (9/29/17) OFS

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.7	7.5		6.4				Each beaker fed 1.5 ml
21	22.6	7.4		6.4				Tetra Fin suspension
29	22.9	7.2		6.4				Initials: OFS
49	22.8	7.1		6.5				
53	23.0	7.2		6.4				
58	22.9	6.9		6.4				
65	23.1	7.0		6.4				
66	23.3	7.1		6.3				
78	23.6	7.1		6.4				Water changed in all
80	23.5	7.2		6.4				beakers.
								Time: 0555
								Initials: OFS
								Water changed in all
								beakers.
								Time: 1730
								Initials: [illegible]

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c
CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

DAILY RECORD SHEET

10-1-17 ③ 632

Day 8 (9/30/17) CB

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.8							Each beaker fed 1.5 ml
21	22.7							Tetra Fin suspension
29	22.9							Initials: CB
49	22.8							
53	22.9							
58	22.9							
65	23.0							
66	23.4							
78	23.7							Water changed in all
80	23.4							beakers.
								Time: 0550
								Initials: CB
								Water changed in all
								beakers.
								Time: 1715
								Initials:

*Water quality measurements to be taken.

③ 632 10-1-17

Day 9 (10/1/17) 632

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.7							Each beaker fed 1.5 ml
21	22.6							Tetra Fin suspension
29	23.0							Initials: 632
49	22.8							
53	23.0							
58	22.9							
65	23.1							
66	23.3							
78	23.6							Water changed in all
80	23.4							beakers.
								Time: 0610
								Initials: 632
								Water changed in all
								beakers.
								Time: 1830
								Initials:

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator _____

DAILY RECORD SHEET

Day 10 (10/2/17) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.5	7.2		7.3				Each beaker fed 1.5 ml
21	22.3	7.1		7.2				Tetra Fin suspension
29	22.6	6.6		7.1				Initials: GJ
49	22.4	6.4		7.5				
53	22.6	6.8		7.2				
58	22.6	6.8		7.2				
65	22.8	6.5		7.1				
66	23.2	6.5		7.1				
78	23.5	6.7		7.2				Water changed in all
80	23.3	6.5		7.2				beakers.
								Time: 0605
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1720
								Initials:

*Water quality measurements to be taken.

Day 11 (10/3/17)

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.3							Each beaker fed 1.5 ml
21	22.0							Tetra Fin suspension
29	22.3							Initials: GJ
49	22.0							
53	22.3							
58	22.2							
65	22.4							
66	22.8							
78	23.3							Water changed in all
80	23.0							beakers.
								Time: 0605
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1800
								Initials:

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c
CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator [redacted]

DAILY RECORD SHEET

Day 12 (10/4/17) CAB

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.0	7.6	110	7.1				Each beaker fed 1.5 ml
21	22.0	7.4	109	7.0				Tetra Fin suspension
29	22.1	7.3	112	7.0				Initials: CAB
49	22.0	7.2	122	7.0				
53	22.1	7.1	110	6.8				
58	22.0	7.3	110	6.7				
65	22.2	7.5	111	6.8				
66	22.6	7.4	114	6.8				
78	22.9	7.5	117	6.7				Water changed in all
80	22.6	7.5	104	6.6				beakers.
								Time: 0600
								Initials: CAB
								Water changed in all
								beakers.
								Time: 1715
								Initials: [redacted]

*Water quality measurements to be taken.

Day 13 (10/5/17) CAB

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.3							Each beaker fed 1.5 ml
21	22.1							Tetra Fin suspension
29	22.2							Initials: CAB
49	22.0							
53	22.2							
58	22.2							
65	22.4							
66	22.9							
78	23.2							Water changed in all
80	23.0							beakers.
								Time: 0550
								Initials: CAB
								Water changed in all
								beakers.
								Time: 1715
								Initials: [redacted]

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES
PROTOCOL NO. NAS-XXX-CT4c
CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator _____

DAILY RECORD SHEET

Day 14 (10/16/17) 0D

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.5	7.3		6.8				Each beaker fed 1.5 ml
21	22.1	7.2		6.7				Tetra Fin suspension
29	22.2	7.2		6.7				Initials: GD
49	22.0	7.1		6.6				
53	22.3	7.2		6.7				
58	22.2	7.0		6.6				
65	22.4	7.3		6.6				
66	22.8	7.0		6.7				
78	23.1	7.2		6.6				Water changed in all
80	22.9	7.1		6.6				beakers.
								Time: 0550
								Initials: UB
								Water changed in all
								beakers.
								Time: 1705
								Initials: TA

*Water quality measurements to be taken.

Day 15 (10/17/17) 0D

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.9							Each beaker fed 1.5 ml
21	22.6							Tetra Fin suspension
29	22.7							Initials: GD
49	22.7							
53	22.9							
58	22.9							
65	23.0							
66	23.4							
78	23.8							Water changed in all
80	23.6							beakers.
								Time: 0550
								Initials: GD
								Water changed in all
								beakers.
								Time: 1705
								Initials: GD

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c
CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

DAILY RECORD SHEET

Day 16 (10 / 8 /17) GJL

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.2							Each beaker fed 1.5 ml
21	22.0							Tetra Fin suspension
29	22.3							Initials: GJL
49	22.0							
53	22.3							
58	22.2							
65	22.4							
66	22.9							
78	23.4							Water changed in all
80	23.0							beakers.
								Time: 0605
								Initials: GJL
								Water changed in all
								beakers.
								Time: 1710
								Initials: GJL

*Water quality measurements to be taken.

Day 17 (10 /9 /17) GJL

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.3	6.1		6.5				Each beaker fed 1.5 ml
21	22.0	6.3		6.6				Tetra Fin suspension
29	22.3	6.3		6.6				Initials: GJL
49	22.1	5.8		6.7				
53	22.3	5.9		6.6				
58	22.2	5.7		6.7				
65	22.4	5.0		6.6				
66	22.8	5.3		6.6				
78	23.3	4.8		6.7				Water changed in all
80	23.0	4.4		6.7				beakers.
								Time: 0600
								Initials: GJL
								Water changed in all
								beakers.
								Time: 1720
								Initials: YC

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c
CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

DAILY RECORD SHEET

Day 18 (10/10/17) GAS

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.1							Each beaker fed 1.5 ml
21	22.1							Tetra Fin suspension
29	22.3							Initials: GAS
49	22.0							
53	22.2							
58	22.2							
65	22.4							
66	22.8							
78	22.9							Water changed in all
80	22.8							beakers.
								Time: 0550
								Initials: GAS
								Water changed in all
								beakers.
								Time: 1815
								Initials:

*Water quality measurements to be taken.

Day 19 (10/11/17) GJ1

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
4	22.1	5.9	114	6.6				Each beaker fed 1.5 ml
21	22.0	5.7	114	6.6				Tetra Fin suspension
29	22.2	5.7	118	6.7				Initials: GJ1
49	22.1	5.4	115	6.6				
53	22.2	5.6	113	6.6				
58	22.1	5.8	114	6.7				
65	22.3	5.3	114	6.6				
66	22.7	5.4	115	6.6				
78	23.1	6.2	116	6.8				Water changed in all
80	22.8	5.8	116	6.7				beakers.
								Time: 0555
								Initials: GJ1
								Water changed in all
								beakers.
								Time: 1705
								Initials: GJ1

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

DAILY RECORD SHEET

Day 20 (10/ 2 /17) GB

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness* (mg/L)	Alkalinity* (mg/L)	NH3* (ppm)	Comments
4	22.4	6.2	110	7.2	17	30		
21	22.0	5.6	109	6.9	17	40		
29	22.3	5.7	112	7.0	17	30		
49	22.1	5.3	111	6.9	17	30		
53	22.4	5.5	111	6.9	17	30		
58	22.3	5.7	111	7.0	17	30		
65	22.5	5.4	110	6.9	17	30		
66	22.9	5.6	110	6.9	17	30		
78	23.3	6.1	115	7.2	17	30		Water changed in all
80	23.1	6.0	111	7.1	17	40		beakers.
								Time: 0550
								Initials: GB

*Water quality measurements to be taken.

Day (/ /)

Beaker No.	Temp. (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
								Each beaker fed 1.5 ml
								Tetra Fin suspension
								Initials:
								Water changed in all
								beakers.
								Time:
								Initials:
								Water changed in all
								beakers.
								Time:
								Initials:

*Water quality measurements to be taken.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator _____

DAY 20 TEST TERMINATION SHEET

Beaker No.	Number of survivors	Initials	
1	10	GJL	
2	8	GJL	2 PUPA
3	9	GJL	
4	10	GJL	
5	6	GJL	3 PUPA
6	10	GJL	
7	7	GJL	2 PUPA
8	6	GJL	
9	10	GJL	
10	9	GJL	
11	10	GJL	
12	6	GJL	3 PUPA
13	9	GJL	1 PUPA
14	8	GJL	2 PUPA
15	10	GAB	
16	10	GAB	
17	9	GJL	
18	9	GJL	
19	7	GB	2 PUPA
GJL ② 10-12-17 20	~~6~~ 9	GJL GB	1 PUPA
21	6	GJL	
22	9	GJL	
23	8	GAB	
24	4	GB	3 PUPA
25	8	GJL	1 PUPA
26	8	GJL	
27	6	GJL	1 PUPA
28	10	GJL	
29	7	GB	1 PUPA
30	7	GB	2 PUPA
31	10	GJL	
32	10	GJL	
33	9	GAB	1 PUPA
34	10	GB	
35	9	GJL	
36	9	GJL	1 PUPA
37	5	GB	4 PUPA
38	9	GB	1 PUPA
39	9	GJL	1 PUPA
40	6	GJL	1 PUPA
41	7	GB	2 PUPA
42	7	GAB	
43	9	GJL	
44	10	GJL	
45	7	GJL	

Beaker No.	Number of survivors	Initials	
46	6	GJL	2 PUPA
47	7	GB	2 PUPA
48	4	GB	3 PUPA
49	9	GAB	
50	7	GAB	
51	8	GJL	2 PUPA
52	5	GJL	3 PUPA
53	10	GB	
54	10	GAB	
55	7	GJL	1 PUPA
56	9	GJL	1 PUPA
57	9	GAB	1 PUPA
58	9	GAB	
59	9	GJL	
60	5	GJL	3 PUPA
61	10	GB	
62	9	GAB	1 PUPA
63	9	GJL	
64	8	GJL	1 PUPA
65	8	GAB	
66	4	GB	5 PUPA
67	8	GJL	
68	9	GJL	
69	10	GAB	
② GJL 10-12-17 70	~~10~~ 7	GJL	3 PUPA
71	10	GJL	
72	9	GJL	1 PUPAE
73	8	GB	1 PUPA
74	7	GAB	1 PUPA
75	10	GJL	
76	8	GJL	
77	7	GB	1 PUPA
78	9	GAB	
79	10	GAB	
80	7	GB	2 PUPA

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

WEIGHING DATA SHEET

Tare:	Date 10-2-17	Oven temp (C.) 550	Drying time (hr.) 2	Initials JDF
	Standard Weights:	10 mg: 10.004	100mg: 100.003	
Final #1:	Date 10-16-17	Oven temp (C.) 62	Drying time (hr.) 24	Initials GJL
	Standard Weights:	10 mg: 10.006	100mg: 100.010	
Final #2:	Date 10-17-17	Oven temp (C.) 65	Drying time (hr.) 24	Initials GJL
	Standard Weights:	10 mg: 10.007	100mg: 100.010	
Final #3:	Date 10-18-17	Oven temp (C.) 550	Drying time (hr.) 2	Initials JDF
	Standard Weights:	10 mg: 10.006	100mg: 100.016	

Equip. used: Oven BLUE M #2, FISHER ISOTEMP MUFFLE FURNACE Balance SARTORIUS M3P

(Dry overnight at 60-90 degrees C) **(Final ashing is at 550 degrees C for 2 hours)**

Bkr. #	Pan #	Tare wt. (mg)	Dry total wt. (mg) 1	Dry total wt. (mg) 2	no. weighed	put into pans-initials	Ash weight (mg)	
1	1	103.44	124.60	124.46	10	~~83~~	113.91	
2	2	97.85	117.43	117.21	8		102.22	
3	3	95.97	116.57	116.41	9		104.47	
4	4	101.20	115.88	115.74	10		105.53	
5	5	93.44	104.88	104.78	6		97.11	
6	6	97.24	118.00	119.86	~~10~~ 9		105.71	① 10-12-17 83
7	7	93.55	107.10	106.99	7		97.73	
8	8	95.77	111.50	111.37	6		100.67	
9	9	95.87	117.89	117.71	10		102.36	
10	10	95.33	119.06	118.90	9		103.18	
11	11	92.09	110.78	110.63	10		98.62	
12	12	93.78	104.55	104.45	6		96.91	
13	13	103.08	119.94	119.81	9		108.72	
14	14	90.04	107.72	107.60	8		96.22	
15	15	94.56	114.28	114.15	10		100.81	
16	16	92.32	108.95	108.85	10		97.68	
17	17	84.87	106.65	106.55	9		93.58	
18	18	96.29	116.49	116.40	9		104.61	
19	19	97.59	111.03	110.95	7		102.26	
20	20	96.20	117.32	117.14	9		101.81	
21	21	95.11	106.20	106.11	6		97.36	
22	22	91.64	107.11	107.02	9		95.77	
23	23	95.15	117.78	117.55	8		104.77	
24	24	91.89	104.97	104.91	4		97.13	
25	25	85.76	101.29	101.24	8		90.85	
26	26	98.76	115.29	115.20	8		104.90	
27	27	98.43	114.01	113.94	6		104.37	
28	28	94.79	115.07	114.92	10		102.31	
29	29	98.08	120.95	120.76	7		107.43	
30	30	91.73	101.84	101.73	7		94.06	
31	31	91.07	105.77	105.65	10		95.21	
32	32	93.18	113.48	113.32	10		100.76	
33	33	100.40	120.28	120.14	9 ~~8~~	✓	108.84	① 10-12-17 83

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

WEIGHING DATA SHEET

See page _____ for information on drying times and temperatures, standard weights,etc.

Bkr. #	Pan #	Tare wt. (mg)	Total wt. (mg) 1	Total wt. (mg) 2	no. weighed	put into pans-initials	Ash weight (mg)	
34	34	99.33	115.10	114.97	10	BB	103.92	
35	35	101.76	122.22	122.09	9		109.99	
36	36	92.66	110.20	110.04	9		96.48	
37	37	95.10	107.81	107.73	5		100.37	
38	38	90.59	114.02	113.87	9		99.23	
39	39	91.92	113.45	113.29	10		97.75	
40	40	96.14	111.99	111.90	6		102.08	
41	41	87.23	101.05	101.03	7		92.34	
42	42	97.02	114.38	114.34	7		103.96	
43	43	92.34	108.17	108.12	9		97.39	
44	44	93.56	~~101.05~~ 111.24	111.16	10		99.10	
45	45	93.96	112.70	112.58	7		100.25	
46	46	90.54	103.97	103.93	6		95.48	
47	47	93.77	111.89	111.85	7		100.84	
48	48	94.02	102.25	102.21	4		96.12	
49	49	96.05	115.43	115.31	8		100.98	
50	50	105.84	119.27	119.20	7		108.72	
51	51	94.48	111.32	111.28	8		101.35	
52	52	90.67	100.39	100.35	5		93.39	
53	53	94.76	111.34	111.28	10		99.05	
54	54	105.45	125.01	124.96	10		112.74	
55	55	~~89.70~~	102.35	102.30	7		92.41	
56	56	92.74	110.71	110.64	9		99.23	
57	57	101.85	124.07	124.02	9		111.38	
58	58	~~93~~ 93.06	109.16	109.13	9		97.99	
59	59	95.96	113.32	113.28	9		102.38	
60	60	89.51	99.72	99.69	5		92.49	
61	61	94.90	111.42	111.34	10		~~97.37~~ 100.58	
62	62	96.35	114.68	114.59	9		102.93	
63	63	96.57	117.67	117.52	9		102.30	
64	64	93.17	111.85	111.75	8		100.28	
65	65	87.79	107.38	107.29	8		95.55	
66	66	95.20	104.53	104.48	4		98.62	
67	67	90.54	—	—	0		—	
68	68	101.57	121.34	121.22	9		107.71	
69	69	89.44	109.37	109.31	10		98.26	
70	70	96.63	111.61	111.56	7		102.21	
71	71	101.25	121.18	121.05	10		106.94	
72	72	90.79	108.87	108.82	9		98.42	
73	73	96.90	114.62	114.56	8		103.42	
74	74	88.51	101.20	101.14	7		91.45	
75	75	98.66	114.80	114.72	10		103.57	
76	76	97.06	115.77	115.73	8		105.00	

10-16-17 (2) 632

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4c

CHIRONOMUS DILUTUS 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 885-2 Client ESA Investigator

WEIGHING DATA SHEET

See page _____ for information on drying times and temperatures, standard weights,etc.

Bkr. #	Pan #	Tare wt. (mg)	Total wt. (mg) 1	Total wt. (mg) 2	no. weighed	put into pans-initials	Ash weight (mg)	
77	77	96.45	111.30	111.26	7		101.34	
78	78	91.14	113.53	113.48	9		100.81	
79	79	98.80	120.63	120.56	10		107.65	
80	80	97.46	111.50	111.46	7		102.76	

RAW DATA DIVIDER PAGE
Test No. 885-2

TEST DATA ANALYSIS RECORDS

Test Number: 885-2

Freshwater Sediment Test
20-Day Chironomus dilutus

data entry verified against laboratory bench sheets 10/3/13 JTF

Endpoints Data Entry and Calculations File

BKR=beaker number
INIT=initial number
SURV=number survivors
MORT=number dead=INIT-SURV
PSURV=%survival=100(SURV/INIT)
PMORT=%mortality=100(MORT/INIT)

TARE WT= ashed weight of pan used for that replicate at test termination (mg), or dry weight of pan if ash-free dry weight is not an endpoint
WT COUNT= number of test organisms weighed at test end
DRY WT= TARE WT + dry weight of test organisms recovered at test termination (mg)
TWT=total biomass=DRY WT-TARE WT
WT=average individual biomass=TWT/WT COUNT

ASHED DRY WT= weight of ashed pan + weight of ashed test organisms recovered at test termination
TAFDW=DRY WT - ASHED DRY WT= total ash-free organism weight for given replicate
AFDW=average individual ash-free biomass=TAFDW/WT COUNT

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL		INIT	SURV	MORT	PSURV	PMORT	TARE WT (mg)	WT COUNT	DRY WT (mg)	ASHED DRY WT (mg)	TWT (mg)	WT (mg)	TAFDW (mg)	AFDW (mg)		SURV	MORT	PSURV	PMORT	WT	AFDW
1	71	5989G	Control	1		10	10	0	100.0	0.0	101.25	10	121.05	106.94	19.80	1.98	14.11	1.41							
2	9	5989G	Control	2		10	10	0	100.0	0.0	95.87	10	117.71	102.36	21.84	2.18	15.35	1.54							
3	2	5989G	Control	3		10	10	0	100.0	0.0	97.85	8	117.21	102.22	19.36	2.42	14.99	1.87							
4	20	5989G	Control	4		10	10	0	100.0	0.0	96.20	9	117.14	101.61	20.94	2.33	15.33	1.70							
5	63	5989G	Control	5		10	9	1	90.0	10.0	96.57	9	117.52	102.30	20.95	2.33	15.22	1.69	Mean	9.8	0.3	97.5	2.5	2.21	1.63
6	39	5989G	Control	6		10	10	0	100.0	0.0	91.92	10	113.29	97.75	21.37	2.14	15.54	1.55	SD	0.5	0.5	4.6	4.6	0.19	0.16
7	38	5989G	Control	7		10	10	0	100.0	0.0	92.66	9	110.04	98.48	17.38	1.93	13.56	1.51	n	8	8	8	8	8	8
8	49	5989G	Control	8	wq replicate	10	9	1	90.0	10.0	96.05	8	115.31	100.99	19.26	2.41	14.33	1.79							
9	40	5991G	OF2-1	1		10	7	3	70.0	30.0	96.14	8	111.90	102.08	15.76	2.63	9.82	1.64							
10	78	5991G	OF2-1	2		10	8	2	80.0	20.0	97.06	8	115.73	105.00	18.67	2.33	10.73	1.34							
11	24	5991G	OF2-1	3		10	7	3	70.0	30.0	91.89	4	104.91	97.13	13.02	3.26	7.76	1.95							
12	32	5991G	OF2-1	4		10	10	0	100.0	0.0	93.18	10	113.32	100.76	20.14	2.01	12.56	1.26							
13	57	5991G	OF2-1	5		10	10	0	100.0	0.0	101.85	9	124.02	111.38	22.17	2.46	12.64	1.40	Mean	8.6	1.4	86.3	13.8	2.54	1.51
14	79	5991G	OF2-1	6		10	10	0	100.0	0.0	98.60	10	120.56	107.85	21.76	2.18	12.91	1.29	SD	1.3	1.3	13.0	13.0	0.47	0.28
15	18	5991G	OF2-1	7		10	9	1	90.0	10.0	96.29	9	116.40	104.61	20.11	2.23	11.79	1.31	n	8	8	8	8	8	8
16	29	5991G	OF2-1	8	wq replicate	10	8	2	80.0	20.0	98.08	7	120.76	107.43	22.68	3.24	13.33	1.90							
17	8	5992G	OF2-2	1		10	10	0	100.0	0.0	97.24	10	117.86	105.71	20.62	2.06	12.15	1.22							
18	12	5992G	OF2-2	2		10	9	1	90.0	10.0	93.78	6	104.45	96.91	10.67	1.78	7.54	1.26							
19	23	5992G	OF2-2	3		10	8	2	80.0	20.0	95.15	8	117.55	104.77	22.40	2.80	12.78	1.60							
20	46	5992G	OF2-2	4		10	8	2	80.0	20.0	90.54	6	103.93	95.48	13.39	2.23	8.45	1.41							
21	33	5992G	OF2-2	5		10	10	0	100.0	0.0	100.40	9	120.14	108.84	19.74	2.19	11.30	1.26	Mean	9.1	0.9	91.3	8.8	2.24	1.35
22	69	5992G	OF2-2	6		10	10	0	100.0	0.0	89.44	10	109.31	98.26	19.87	1.99	11.05	1.11	SD	0.8	0.8	8.3	8.3	0.32	0.16
23	37	5992G	OF2-2	7		10	9	1	90.0	10.0	85.10	5	107.73	100.37	12.63	2.53	7.36	1.47	n	8	8	8	8	8	8
24	66	5992G	OF2-2	8	wq replicate	10	9	1	90.0	10.0	95.20	4	104.48	98.62	9.28	2.32	5.86	1.47							
25	14	5993G	OF2-3	1		10	10	0	100.0	0.0	90.04	8	107.60	98.22	17.56	2.20	11.38	1.42							
26	67	5993G	OF2-3*	2																					
27	54	5993G	OF2-3	3		10	10	0	100.0	0.0	105.45	10	124.96	112.74	19.51	1.95	12.22	1.22							
28	77	5993G	OF2-3	4		10	8	2	80.0	20.0	98.45	7	111.26	101.34	14.81	2.12	9.92	1.42							
29	3	5993G	OF2-3	5		10	9	1	90.0	10.0	95.97	9	116.41	104.47	20.44	2.27	11.94	1.33	Mean	9.3	0.7	92.9	7.1	2.14	1.32
30	72	5993G	OF2-3	6		10	10	0	100.0	0.0	90.79	9	108.82	98.42	18.03	2.00	10.40	1.16	SD	0.8	0.8	7.8	7.8	0.17	0.11
31	17	5993G	OF2-3	7		10	9	1	90.0	10.0	84.87	9	106.55	93.58	21.68	2.41	12.97	1.44	n	7	7	7	7	7	7
32	80	5993G	OF2-3	8	wq replicate	10	9	1	90.0	10.0	97.46	7	111.46	102.78	14.00	2.00	8.70	1.24							
33	42	5994G	OF1-1	1		10	7	3	70.0	30.0	97.02	7	114.34	103.86	17.32	2.47	10.38	1.48							
34	48	5994G	OF1-1	2		10	7	3	70.0	30.0	94.02	4	102.21	96.12	8.19	2.05	6.09	1.52							
35	22	5994G	OF1-1	3		10	9	1	90.0	10.0	91.84	9	107.02	95.77	15.38	1.71	11.25	1.25							
36	11	5994G	OF1-1	4		10	10	0	100.0	0.0	92.09	10	110.63	98.62	18.54	1.85	12.01	1.20							
37	52	5994G	OF1-1	5		10	8	2	80.0	20.0	90.67	5	100.35	93.39	9.68	1.94	6.96	1.39	Mean	8.5	1.5	85.0	15.0	1.92	1.35
38	50	5994G	OF1-1	6		10	7	3	70.0	30.0	105.84	7	119.20	108.72	13.36	1.91	10.48	1.50	SD	1.4	1.4	14.1	14.1	0.26	0.14
39	44	5994G	OF1-1	7		10	10	0	100.0	0.0	93.56	10	111.16	99.10	17.60	1.76	12.06	1.21	n	8	8	8	8	8	8
40	53	5994G	OF1-1	8	wq replicate	10	10	0	100.0	0.0	84.76	10	111.28	99.05	16.52	1.65	12.23	1.22							
41	74	5995G	OF1-2	1		10	8	2	80.0	20.0	88.51	7	101.14	91.45	12.63	1.80	9.69	1.38							
42	16	5995G	OF1-2	2		10	10	0	100.0	0.0	92.32	10	108.85	97.68	16.53	1.65	11.17	1.12							
43	55	5995G	OF1-2	3		10	8	2	80.0	20.0	89.70	7	102.30	92.41	12.60	1.80	9.89	1.41							
44	34	5995G	OF1-2	4		10	10	0	100.0	0.0	99.33	10	114.97	103.92	15.64	1.56	11.05	1.11							
45	43	5995G	OF1-2	5		10	9	1	90.0	10.0	92.34	9	108.12	97.39	15.78	1.75	10.73	1.19	Mean	8.9	1.1	88.8	11.3	1.72	1.24
46	13	5995G	OF1-2	6		10	10	0	100.0	0.0	103.08	9	119.81	108.72	16.73	1.86	11.09	1.23	SD	1.5	1.5	14.8	14.8	0.14	0.16
47	31	5995G	OF1-2	7		10	10	0	100.0	0.0	91.07	10	105.65	95.21	14.58	1.46	10.44	1.04	n	8	8	8	8	8	8
48	21	5995G	OF1-2	8	wq replicate	10	6	4	60.0	40.0	95.11	8	108.11	97.36	11.00	1.63	8.75	1.46							

Test Number: 885-2

Freshwater Sediment Test
20-Day Chironomus dilutus

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL		INIT	SURV	MORT	PSURV	PMORT	TARE WT (mg)	WT COUNT	DRY WT (mg)	ASHED DRY WT (mg)	TWT (mg)	WT (mg)	TAFDW (mg)	AFDW (mg)		SURV	MORT	PSURV	PMORT	WT	AFDW
49	25	5996G	OF1-3	1		10	9	1	90.0	10.0	85.76	8	101.24	90.85	15.48	1.94	10.39	1.30							
50	62	5996G	OF1-3	2		10	10	0	100.0	0.0	96.35	9	114.59	102.93	18.24	2.03	11.66	1.30							
51	41	5996G	OF1-3	3		10	9	1	90.0	10.0	87.23	7	101.03	92.34	13.80	1.97	8.69	1.24							
52	75	5996G	OF1-3	4		10	10	0	100.0	0.0	98.86	10	114.72	103.57	16.06	1.61	11.15	1.12							
53	1	5996G	OF1-3	5		10	10	0	100.0	0.0	103.44	10	124.46	113.91	21.02	2.10	10.55	1.06	Mean	9.5	0.5	95.0	5.0	1.85	1.17
54	26	5996G	OF1-3	6		10	8	2	80.0	20.0	98.76	8	115.20	104.90	16.44	2.06	10.30	1.29	SD	0.8	0.8	7.6	7.6	0.24	0.12
55	61	5996G	OF1-3	7		10	10	0	100.0	0.0	94.80	10	111.34	100.58	16.44	1.64	10.76	1.08	n	8	8	8	8	8	8
56	4	5996G	OF1-3	8	wq replicate	10	10	0	100.0	0.0	101.20	10	115.74	105.53	14.54	1.45	10.21	1.02							
57	64	5997G	OF2-4	1		10	9	1	90.0	10.0	93.17	8	111.75	100.28	18.58	2.32	11.47	1.43							
58	68	5997G	OF2-4	2		10	9	1	90.0	10.0	101.57	9	121.22	107.71	19.65	2.18	13.51	1.50							
59	70	5997G	OF2-4	3		10	10	0	100.0	0.0	96.83	7	111.56	102.21	14.93	2.13	9.35	1.34							
60	80	5997G	OF2-4	4		10	8	2	80.0	20.0	89.51	5	99.69	92.49	10.18	2.04	7.20	1.44							
61	73	5997G	OF2-4	5		10	9	1	90.0	10.0	96.90	8	114.56	103.42	17.66	2.21	11.14	1.39	Mean	9.1	0.9	91.3	8.8	2.32	1.49
62	38	5997G	OF2-4	6		10	10	0	100.0	0.0	90.59	9	113.87	99.23	23.28	2.59	14.64	1.63	SD	0.8	0.8	8.4	8.4	0.22	0.14
63	10	5997G	OF2-4	7		10	9	1	90.0	10.0	95.33	9	116.90	103.18	23.57	2.62	15.72	1.75	n	8	8	8	8	8	8
64	78	5997G	OF2-4	8	wq replicate	10	9	1	90.0	10.0	91.14	9	113.48	100.81	22.34	2.48	12.67	1.41							
65	47	5998G	OF2-5	1		10	9	1	90.0	10.0	93.77	7	111.85	100.84	18.08	2.58	11.01	1.57							
66	27	5998G	OF2-5	2		10	7	3	70.0	30.0	98.43	8	113.94	104.37	15.51	2.59	9.57	1.60							
67	56	5998G	OF2-5	3		10	10	0	100.0	0.0	92.74	9	110.64	99.23	17.90	1.99	11.41	1.27							
68	45	5998G	OF2-5	4		10	7	3	70.0	30.0	93.86	7	112.58	100.25	18.62	2.66	12.33	1.76							
69	51	5998G	OF2-5	5		10	10	0	100.0	0.0	94.48	8	111.28	101.35	16.80	2.10	9.93	1.24	Mean	8.8	1.3	87.5	12.5	2.26	1.43
70	28	5998G	OF2-5	6		10	10	0	100.0	0.0	94.79	10	114.92	102.31	20.13	2.01	12.61	1.26	SD	1.3	1.3	12.8	12.8	0.31	0.20
71	5	5998G	OF2-5	7		10	9	1	90.0	10.0	93.44	8	104.78	97.11	11.34	1.89	7.87	1.28	n	8	8	8	8	8	8
72	65	5998G	OF2-5	8	wq replicate	10	8	2	80.0	20.0	87.79	8	107.29	95.55	19.50	2.44	11.74	1.47							
73	7	5999G	OF1-4	1		10	9	1	90.0	10.0	93.55	7	106.99	97.73	13.44	1.92	9.26	1.32							
74	19	5999G	OF1-4	2		10	9	1	90.0	10.0	97.59	7	110.95	102.26	13.36	1.91	8.69	1.24							
75	15	5999G	OF1-4	3		10	10	0	100.0	0.0	94.56	10	114.15	100.81	19.59	1.96	13.34	1.33							
76	35	5999G	OF1-4	4		10	9	1	90.0	10.0	101.76	9	122.09	109.99	20.33	2.26	12.10	1.34							
77	8	5999G	OF1-4	5		10	6	4	60.0	40.0	95.77	6	111.37	100.67	15.6	2.60	10.70	1.78	Mean	8.8	1.3	87.5	12.5	1.97	1.32
78	59	5999G	OF1-4	6		10	9	1	90.0	10.0	95.96	9	113.28	102.38	17.32	1.92	10.90	1.21	SD	1.2	1.2	11.6	11.6	0.34	0.20
79	30	5999G	OF1-4	7		10	9	1	90.0	10.0	91.73	7	101.73	94.08	10	1.43	7.87	1.10	n	8	8	8	8	8	8
80	58	5999G	OF1-4	8	wq replicate	10	9	1	90.0	10.0	93.06	9	109.13	97.99	16.07	1.79	11.14	1.24							

*Animals inadvertently not added to beaker on day 0

PAGE 21 OF 49

Project Name: P885-2 Chironomus % Mortality

Sample:	x1
Samp ID:	OF2-1
Alias:	NAS #5991G
Replicates:	8
Mean:	13.75
SD:	13.025
Tr Mean:	13.75
Trans SD:	13.025

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	2.5
SD:	4.629
Tr Mean:	2.5
Trans SD:	4.629

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	8.39
SS:	1337.5
K:	8
b:	34.722
Alpha Level:	0.05
Calculated Value:	0.9014
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	11.25
Test Residual SD:	5
Ref. Residual Mean:	3.75
Ref. Residual SD:	2.315
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	3.8501
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	9
Experimental Alpha Level:	0.05
Calculated Value:	2.302
Critical Value:	>= 1.833
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	30	30	0	0	16.25	2.5			-13.75
2	20	20	0	0	6.25	2.5			-13.75
3	30	30	0	0	16.25	2.5			-13.75
4	0	0	0	0	13.75	2.5			-3.75
5	0	0	10	10	13.75	7.5			-2.5
6	0	0	0	0	13.75	2.5			-2.5
7	10	10	0	0	3.75	2.5			-2.5
8	20	20	10	10	6.25	7.5			-2.5
9									-2.5
10									-2.5
11									6.25
12									6.25
13									7.5
14									7.5
15									16.25
16									16.25

The percent mortality in OF2-1 was significantly higher than that of the Control at α=0.05. -6J1

Project Name: P885-2 Chironomus % Mortality

Sample:	x1
Samp ID:	OF2-2
Alias:	NAS #5992G
Replicates:	8
Mean:	8.75
SD:	8.345
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	2.5
SD:	4.629
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	8.799
SS:	1470.95
K:	8
b:	35.855
Alpha Level:	0.05
Calculated Value:	0.874
Critical Value:	<= 0.887
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	10.166
Test Residual SD:	4.382
Ref. Residual Mean:	6.913
Ref. Residual SD:	4.267
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	1.5041
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	8
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	46
Critical Value:	>= 49.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	5	0	5	13.554	4.609	5		-13.554
2	10	12	0	5	4.881	4.609	5		-13.554
3	20	15.5	0	5	13.011	4.609	5		-13.554
4	20	15.5	0	5	13.011	4.609	5		-4.609
5	0	5	10	12	13.554	13.826	5		-4.609
6	0	5	0	5	13.554	4.609	5		-4.609
7	10	12	0	5	4.881	4.609	5		-4.609
8	10	12	10	12	4.881	13.826	5		-4.609
9							5		-4.609
10							12		4.881
11							12		4.881
12							12		4.881
13							12		13.011
14							12		13.011
15							15.5		13.826
16							15.5		13.826

The percent mortality in OF2-2 was not significantly higher than that of the Control at α=0.05. -GJL

Project Name: P885-2 Chironomus % Mortality

Sample:	x1
Samp ID:	OF2-3
Alias:	NAS #5993G
Replicates:	7
Mean:	7.143
SD:	7.559
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	2.5
SD:	4.629
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	8.2
SS:	1277.489
K:	7
b:	33.151
Alpha Level:	0.05
Calculated Value:	0.8603
Critical Value:	<= 0.881
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	10.025
Test Residual SD:	3.272
Ref. Residual Mean:	6.913
Ref. Residual SD:	4.267
Deg. of Freedom:	13
Alpha Level:	0.1
Calculated Value:	1.5658
Critical Value:	>= 1.771
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	7
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	38
Critical Value:	>= 43.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	5	0	5	11.696	4.609	5		-11.696
2	0	5	0	5	11.696	4.609	5		-11.696
3	20	15	0	5	14.869	4.609	5		-11.696
4	10	12	0	5	6.739	4.609	5		-4.609
5	0	5	10	12	11.696	13.826	5		-4.609
6	10	12	0	5	6.739	4.609	5		-4.609
7	10	12	0	5	6.739	4.609	5		-4.609
8			10	12		13.826	5		-4.609
9							5		-4.609
10							12		6.739
11							12		6.739
12							12		6.739
13							12		13.826
14							12		13.826
15							15		14.869

The percent mortality in OF2-3 was not significantly higher than that of the Control at α=0.05. -631

Project Name: P885-2 Chironomus % Mortality

Sample:	x1
Samp ID:	OF1-1
Alias:	NAS #5994G
Replicates:	8
Mean:	15
SD:	14.142
Tr Mean:	15
Trans SD:	14.142

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	2.5
SD:	4.629
Tr Mean:	2.5
Trans SD:	4.629

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	9.032
SS:	1550
K:	8
b:	37.226
Alpha Level:	0.05
Calculated Value:	0.894
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	12.5
Test Residual SD:	4.629
Ref. Residual Mean:	3.75
Ref. Residual SD:	2.315
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	4.7819
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	2.376
Critical Value:	>= 1.860
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	30	30	0	0	15	2.5			-15
2	30	30	0	0	15	2.5			-15
3	10	10	0	0	5	2.5			-15
4	0	0	0	0	15	2.5			-5
5	20	20	10	10	5	7.5			-2.5
6	30	30	0	0	15	2.5			-2.5
7	0	0	0	0	15	2.5			-2.5
8	0	0	10	10	15	7.5			-2.5
9									-2.5
10									-2.5
11									5
12									7.5
13									7.5
14									15
15									15
16									15

The percent mortality in OF1-1 was significantly higher than that of the Control at α=0.05. -631

Project Name: P885-2 Chironomus % Mortality

Sample:	x1
Samp ID:	OF1-2
Alias:	NAS #5995G
Replicates:	8
Mean:	11.25
SD:	14.577
Tr Mean:	0.289
Trans SD:	0.979

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	2.5
SD:	4.629
Tr Mean:	-0.289
Trans SD:	0.534

Shapiro-Wilk Results:

Residual Mean:	
Residual SD:	
SS:	
K:	
b:	
Alpha Level:	N/A
Calculated Value:	N/A
Critical Value:	N/A
Normally Distributed:	N/A
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	0.866
Test Residual SD:	0.318
Ref. Residual Mean:	0.433
Ref. Residual SD:	0.267
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	2.9498
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	Rankits

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	11
Experimental Alpha Level:	0.05
Calculated Value:	1.4648
Critical Value:	>= 1.796
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	20	1.138	0	-0.577	0.849	0.288		-0.577	
2	0	-0.577	0	-0.577	0.866	0.288		-0.577	
3	20	1.138	0	-0.577	0.849	0.288		-0.577	
4	0	-0.577	0	-0.577	0.866	0.288		-0.577	
5	10	0.576	10	0.576	0.288	0.865		-0.577	
6	0	-0.577	0	-0.577	0.866	0.288		-0.577	
7	0	-0.577	0	-0.577	0.866	0.288		-0.577	
8	40	1.766	10	0.576	1.477	0.865		-0.577	
9								-0.577	
10								-0.577	
11								0.576	
12								0.576	
13								0.576	
14								1.138	
15								1.138	
16								1.766	

The percent mortality in OF1-2 was not significantly higher than that of the Control at α=0.05. —631

Project Name: P885-2 Chironomus % Mortality

Sample:	x1
Samp ID:	OF1-3
Alias:	NAS #5996G
Replicates:	8
Mean:	5
SD:	7.559
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	2.5
SD:	4.629
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	8.56
SS:	1392.169
K:	8
b:	32.316
Alpha Level:	0.05
Calculated Value:	0.7501
Critical Value:	<= 0.887
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	9.912
Test Residual SD:	3.712
Ref. Residual Mean:	6.913
Ref. Residual SD:	4.267
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	1.4996
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	8
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	37
Critical Value:	>= 49.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10	13.5	0	6	10.506	4.609	6		-7.929
2	0	6	0	6	7.929	4.609	6		-7.929
3	10	13.5	0	6	10.506	4.609	6		-7.929
4	0	6	0	6	7.929	4.609	6		-7.929
5	0	6	10	13.5	7.929	13.826	6		-7.929
6	20	16	0	6	18.636	4.609	6		-4.609
7	0	6	0	6	7.929	4.609	6		-4.609
8	0	6	10	13.5	7.929	13.826	6		-4.609
9							6		-4.609
10							6		-4.609
11							6		-4.609
12							13.5		10.506
13							13.5		10.506
14							13.5		13.826
15							13.5		13.826
16							16		18.636

The percent mortality in OF1-3 was not significantly higher than that of the Control at α=0.05. -631

Project Name: P885-2 Chironomus % Mortality

Sample:	x1
Samp ID:	OF2-4
Alias:	NAS #5997G
Replicates:	8
Mean:	8.75
SD:	6.409
Tr Mean:	14.842
Trans SD:	9.581

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989C
Replicates:	8
Mean:	2.5
SD:	4.629
Tr Mean:	4.609
Trans SD:	8.534

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	7.788
SS:	1152.317
K:	8
b:	32.292
Alpha Level:	0.05
Calculated Value:	0.9049
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.421
Test Residual SD:	5.371
Ref. Residual Mean:	6.913
Ref. Residual SD:	4.267
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.2095
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	2.256
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10	18.435	0	0	3.592	4.609			-14.842
2	10	18.435	0	0	3.592	4.609			-14.842
3	0	0	0	0	14.842	4.609			-4.609
4	20	26.565	0	0	11.723	4.609			-4.609
5	10	18.435	10	18.435	3.592	13.826			-4.609
6	0	0	0	0	14.842	4.609			-4.609
7	10	18.435	0	0	3.592	4.609			-4.609
8	10	18.435	10	18.435	3.592	13.826			-4.609
9									3.592
10									3.592
11									3.592
12									3.592
13									3.592
14									11.723
15									13.826
16									13.826

The percent mortality in OF2-4 was significantly higher than that of the Control at α=0.05. -CJ1

Project Name: P885-2 Chironomus % Mortality

Sample:	x1
Samp ID:	OF2-5
Alias:	NAS #5998G
Replicates:	8
Mean:	12.5
SD:	12.817
Tr Mean:	16.232
Trans SD:	14.558

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	2.5
SD:	4.629
Tr Mean:	4.609
Trans SD:	8.534

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	10.242
SS:	1993.249
K:	8
b:	42.121
Alpha Level:	0.05
Calculated Value:	0.8901
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	12.174
Test Residual SD:	6.523
Ref. Residual Mean:	6.913
Ref. Residual SD:	4.267
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	1.9091
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	ArcSin

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	11
Experimental Alpha Level:	0.05
Calculated Value:	1.9483
Critical Value:	>= 1.796
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10	18.435	0	0	2.203	4.609			-16.232
2	30	33.211	0	0	16.979	4.609			-16.232
3	0	0	0	0	16.232	4.609			-16.232
4	30	33.211	0	0	16.979	4.609			-4.609
5	0	0	10	18.435	16.232	13.826			-4.609
6	0	0	0	0	16.232	4.609			-4.609
7	10	18.435	0	0	2.203	4.609			-4.609
8	20	26.565	10	18.435	10.333	13.826			-4.609
9									-4.609
10									2.203
11									2.203
12									10.333
13									13.826
14									13.826
15									16.979
16									16.979

The percent mortality in OF2-5 was significantly higher than that of the Control at α=0.05. -6.51

Project Name: P885-2 Chironomus % Mortality

Sample:	x1
Samp ID:	OF1-4
Alias:	NAS #5999G
Replicates:	8
Mean:	12.5
SD:	11.65
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	2.5
SD:	4.629
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	8.212
SS:	1281.419
K:	8
b:	32.698
Alpha Level:	0.05
Calculated Value:	0.8343
Critical Value:	<= 0.887
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	5.125
Test Residual SD:	8.956
Ref. Residual Mean:	6.913
Ref. Residual SD:	4.267
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.5097
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1:	8
Mann-Whitney N2:	8
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	53
Critical Value:	>= 49.000
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Ranks	Shipiro-Wilk Residuals
1	10	11.5	0	4	0.295	4.609	4		-18.73
2	10	11.5	0	4	0.295	4.609	4		-4.609
3	0	4	0	4	18.73	4.609	4		-4.609
4	10	11.5	0	4	0.295	4.609	4		-4.609
5	40	16	10	11.5	20.501	13.826	4		-4.609
6	10	11.5	0	4	0.295	4.609	4		-4.609
7	10	11.5	0	4	0.295	4.609	4		-4.609
8	10	11.5	10	11.5	0.295	13.826	11.5		-0.295
9							11.5		-0.295
10							11.5		-0.295
11							11.5		-0.295
12							11.5		-0.295
13							11.5		-0.295
14							11.5		13.826
15							11.5		13.826
16							16		20.501

The percent mortality in OF1-4 was significantly higher than that of the Control at α=0.05. -GSI

Project Name: P885-2 Chironomus Growth (AFDW)

Sample:	x1
Samp ID:	OF2-1
Alias:	NAS #5991G
Replicates:	8
Mean:	1.511
SD:	0.281
Tr Mean:	1.511
Trans SD:	0.281

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	1.633
SD:	0.155
Tr Mean:	1.633
Trans SD:	0.155

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.195
SS:	0.723
K:	8
b:	0.808
Alpha Level:	0.05
Calculated Value:	0.9022
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.239
Test Residual SD:	0.118
Ref. Residual Mean:	0.13
Ref. Residual SD:	0.069
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	2.2547
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	11
Experimental Alpha Level:	0.05
Calculated Value:	1.0668
Critical Value:	>= 1.796
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.64	1.64	1.41	1.41	0.129	0.223			-0.251
2	1.34	1.34	1.54	1.54	0.171	0.093			-0.223
3	1.95	1.95	1.87	1.87	0.439	0.238			-0.221
4	1.26	1.26	1.7	1.7	0.251	0.067			-0.201
5	1.4	1.4	1.69	1.69	0.111	0.057			-0.171
6	1.29	1.29	1.55	1.55	0.221	0.083			-0.123
7	1.31	1.31	1.51	1.51	0.201	0.123			-0.111
8	1.9	1.9	1.79	1.79	0.389	0.158			-0.093
9									-0.083
10									0.057
11									0.067
12									0.129
13									0.158
14									0.238
15									0.389
16									0.439

Average individual ash-free dry weight in test sediment OF2-1 is not significantly less than that in the control sediment at α=0.05. -631

Project Name: P885-2 Chironomus Growth (AFDW)

Sample:	x1
Samp ID:	OF2-2
Alias:	NAS #5992G
Replicates:	8
Mean:	1.35
SD:	0.163
Tr Mean:	1.35
Trans SD:	0.163

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	1.633
SD:	0.155
Tr Mean:	1.633
Trans SD:	0.155

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.137
SS:	0.355
K:	8
b:	0.577
Alpha Level:	0.05
Calculated Value:	0.9384
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.138
Test Residual SD:	0.07
Ref. Residual Mean:	0.13
Ref. Residual SD:	0.069
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.2151
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	3.5504
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.22	1.22	1.41	1.41	0.13	0.223			-0.24
2	1.26	1.26	1.54	1.54	0.09	0.093			-0.223
3	1.6	1.6	1.87	1.87	0.25	0.238			-0.13
4	1.41	1.41	1.7	1.7	0.06	0.067			-0.123
5	1.26	1.26	1.69	1.69	0.09	0.057			-0.093
6	1.11	1.11	1.55	1.55	0.24	0.083			-0.09
7	1.47	1.47	1.51	1.51	0.12	0.123			-0.09
8	1.47	1.47	1.79	1.79	0.12	0.158			-0.083
9									0.057
10									0.06
11									0.067
12									0.12
13									0.12
14									0.158
15									0.238
16									0.25

Average individual ash-free dry weight in test sediment OF2-2 is significantly less than that in the control sediment at α=0.05. -631

Project Name: P885-2 Chironomus Growth (AFDW)

Sample:	x1
Samp ID:	OF2-3
Alias:	NAS #5993G
Replicates:	7
Mean:	1.319
SD:	0.113
Tr Mean:	1.319
Trans SD:	0.113

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	1.633
SD:	0.155
Tr Mean:	1.633
Trans SD:	0.155

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.114
SS:	0.245
K:	7
b:	0.485
Alpha Level:	0.05
Calculated Value:	0.959
Critical Value:	<= 0.881
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.096
Test Residual SD:	0.045
Ref. Residual Mean:	0.13
Ref. Residual SD:	0.069
Deg. of Freedom:	13
Alpha Level:	0.1
Calculated Value:	1.109
Critical Value:	>= 1.771
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	13
Experimental Alpha Level:	0.05
Calculated Value:	4.4145
Critical Value:	>= 1.771
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.42	1.42	1.41	1.41	0.101	0.223			-0.223
2	1.22	1.22	1.54	1.54	0.099	0.093			-0.159
3	1.42	1.42	1.87	1.87	0.101	0.238			-0.123
4	1.33	1.33	1.7	1.7	0.011	0.067			-0.099
5	1.16	1.16	1.69	1.69	0.159	0.057			-0.093
6	1.44	1.44	1.55	1.55	0.121	0.083			-0.083
7	1.24	1.24	1.51	1.51	0.079	0.123			-0.079
8			1.79	1.79		0.158			0.011
9									0.057
10									0.067
11									0.101
12									0.101
13									0.121
14									0.158
15									0.238

Average individual ash-free dry weight in test sediment OF2-3 is significantly less than that in the control sediment at α=0.05. – 631

Project Name: P885-2 Chironomus Growth (AFDW)

Sample:	x1
Samp ID:	OF1-1
Alias:	NAS #5994G
Replicates:	8
Mean:	1.346
SD:	0.141
Tr Mean:	1.346
Trans SD:	0.141

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	1.633
SD:	0.155
Tr Mean:	1.633
Trans SD:	0.155

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.127
SS:	0.308
K:	8
b:	0.531
Alpha Level:	0.05
Calculated Value:	0.9166
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.126
Test Residual SD:	0.04
Ref. Residual Mean:	0.13
Ref. Residual SD:	0.069
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.1323
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	3.8614
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.48	1.48	1.41	1.41	0.134	0.223			-0.223
2	1.52	1.52	1.54	1.54	0.174	0.093			-0.146
3	1.25	1.25	1.87	1.87	0.096	0.238			-0.136
4	1.2	1.2	1.7	1.7	0.146	0.067			-0.126
5	1.39	1.39	1.69	1.69	0.044	0.057			-0.123
6	1.5	1.5	1.55	1.55	0.154	0.083			-0.096
7	1.21	1.21	1.51	1.51	0.136	0.123			-0.093
8	1.22	1.22	1.79	1.79	0.126	0.158			-0.083
9									0.044
10									0.057
11									0.067
12									0.134
13									0.154
14									0.158
15									0.174
16									0.238

Average individual ash-free dry weight in test sediment OF1-1 is significantly less than that in the control sediment at α=0.05. -631

Project Name: P885-2 Chironomus Growth (AFDW)

Sample:	x1
Samp ID:	OF1-2
Alias:	NAS #5995G
Replicates:	8
Mean:	1.243
SD:	0.156
Tr Mean:	1.243
Trans SD:	0.156

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	1.633
SD:	0.155
Tr Mean:	1.633
Trans SD:	0.155

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.134
SS:	0.34
K:	8
b:	0.563
Alpha Level:	0.05
Calculated Value:	0.9346
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.131
Test Residual SD:	0.07
Ref. Residual Mean:	0.13
Ref. Residual SD:	0.069
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.0179
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	5.0074
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.38	1.38	1.41	1.41	0.138	0.223			-0.223
2	1.12	1.12	1.54	1.54	0.123	0.093			-0.203
3	1.41	1.41	1.87	1.87	0.168	0.238			-0.133
4	1.11	1.11	1.7	1.7	0.133	0.067			-0.123
5	1.19	1.19	1.69	1.69	0.053	0.057			-0.123
6	1.23	1.23	1.55	1.55	0.013	0.083			-0.093
7	1.04	1.04	1.51	1.51	0.203	0.123			-0.083
8	1.46	1.46	1.79	1.79	0.218	0.158			-0.053
9									-0.013
10									0.057
11									0.067
12									0.138
13									0.158
14									0.168
15									0.218
16									0.238

Average individual ash-free dry weight in test sediment OF1-2 is significantly less than that in the control sediment at α=0.05. ~631

Project Name: P885-2 Chironomus Growth (AFDW)

Sample:	x1
Samp ID:	OF1-3
Alias:	NAS #5996G
Replicates:	8
Mean:	1.176
SD:	0.118
Tr Mean:	1.176
Trans SD:	0.118

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	1.633
SD:	0.155
Tr Mean:	1.633
Trans SD:	0.155

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.119
SS:	0.267
K:	8
b:	0.502
Alpha Level:	0.05
Calculated Value:	0.9432
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.106
Test Residual SD:	0.033
Ref. Residual Mean:	0.13
Ref. Residual SD:	0.069
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.8732
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	6.6083
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.3	1.3	1.41	1.41	0.124	0.223			-0.223
2	1.3	1.3	1.54	1.54	0.124	0.093			-0.156
3	1.24	1.24	1.87	1.87	0.064	0.238			-0.123
4	1.12	1.12	1.7	1.7	0.056	0.067			-0.116
5	1.06	1.06	1.69	1.69	0.116	0.057			-0.096
6	1.29	1.29	1.55	1.55	0.114	0.083			-0.093
7	1.08	1.08	1.51	1.51	0.096	0.123			-0.083
8	1.02	1.02	1.79	1.79	0.156	0.158			-0.056
9									0.057
10									0.064
11									0.067
12									0.114
13									0.124
14									0.124
15									0.158
16									0.238

Average individual ash-free dry weight in test sediment OF1-3 is significantly less than that in the control sediment at α=0.05. −651

Project Name: P885-2 Chironomus Growth (AFDW)

Sample:	x1
Samp ID:	OF2-4
Alias:	NAS #5997G
Replicates:	8
Mean:	1.486
SD:	0.137
Tr Mean:	1.486
Trans SD:	0.137

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	1.633
SD:	0.155
Tr Mean:	1.633
Trans SD:	0.155

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.126
SS:	0.301
K:	8
b:	0.532
Alpha Level:	0.05
Calculated Value:	0.9398
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.105
Test Residual SD:	0.079
Ref. Residual Mean:	0.13
Ref. Residual SD:	0.069
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.6649
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	1.9944
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.43	1.43	1.41	1.41	0.056	0.223			-0.223
2	1.5	1.5	1.54	1.54	0.014	0.093			-0.146
3	1.34	1.34	1.87	1.87	0.146	0.238			-0.123
4	1.44	1.44	1.7	1.7	0.046	0.067			-0.096
5	1.39	1.39	1.69	1.69	0.096	0.057			-0.093
6	1.63	1.63	1.55	1.55	0.144	0.083			-0.083
7	1.75	1.75	1.51	1.51	0.264	0.123			-0.076
8	1.41	1.41	1.79	1.79	0.076	0.158			-0.056
9									-0.046
10									0.014
11									0.057
12									0.067
13									0.144
14									0.158
15									0.238
16									0.264

Average individual ash-free dry weight in test sediment OF2-4 is significantly less than that in the control sediment at α=0.05. −651

Project Name: P885-2 Chironomus Growth (AFDW)

Sample:	x1
Samp ID:	OF2-5
Alias:	NAS #5998G
Replicates:	8
Mean:	1.431
SD:	0.197
Tr Mean:	1.431
Trans SD:	0.197

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	1.633
SD:	0.155
Tr Mean:	1.633
Trans SD:	0.155

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.152
SS:	0.441
K:	8
b:	0.64
Alpha Level:	0.05
Calculated Value:	0.9276
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.169
Test Residual SD:	0.08
Ref. Residual Mean:	0.13
Ref. Residual SD:	0.069
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	1.0381
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	2.2677
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.57	1.57	1.41	1.41	0.139	0.223			-0.223
2	1.6	1.6	1.54	1.54	0.169	0.093			-0.191
3	1.27	1.27	1.87	1.87	0.161	0.238			-0.171
4	1.76	1.76	1.7	1.7	0.329	0.067			-0.161
5	1.24	1.24	1.69	1.69	0.191	0.057			-0.151
6	1.26	1.26	1.55	1.55	0.171	0.083			-0.123
7	1.28	1.28	1.51	1.51	0.151	0.123			-0.093
8	1.47	1.47	1.79	1.79	0.039	0.158			-0.083
9									0.039
10									0.057
11									0.067
12									0.139
13									0.158
14									0.169
15									0.238
16									0.329

Average individual ash-free dry weight in test sediment OF2-5 is significantly less than that in the control sediment at α=0.05. -631

Project Name: P885-2 Chironomus Growth (AFDW)

Sample:	x1
Samp ID:	OF1-4
Alias:	NAS #5999G
Replicates:	8
Mean:	1.32
SD:	0.202
Tr Mean:	1.32
Trans SD:	0.202

Ref Samp:	x2
Ref ID:	Control
Alias:	NAS#5989G
Replicates:	8
Mean:	1.633
SD:	0.155
Tr Mean:	1.633
Trans SD:	0.155

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.155
SS:	0.454
K:	8
b:	0.64
Alpha Level:	0.05
Calculated Value:	0.9001
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.123
Test Residual SD:	0.154
Ref. Residual Mean:	0.13
Ref. Residual SD:	0.069
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.1258
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	3.4694
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.32	1.32	1.41	1.41	0	0.223			-0.223
2	1.24	1.24	1.54	1.54	0.08	0.093			-0.22
3	1.33	1.33	1.87	1.87	0.01	0.238			-0.123
4	1.34	1.34	1.7	1.7	0.02	0.067			-0.11
5	1.78	1.78	1.69	1.69	0.46	0.057			-0.093
6	1.21	1.21	1.55	1.55	0.11	0.083			-0.083
7	1.1	1.1	1.51	1.51	0.22	0.123			-0.08
8	1.24	1.24	1.79	1.79	0.08	0.158			-0.08
9									0
10									0.01
11									0.02
12									0.057
13									0.067
14									0.158
15									0.238
16									0.46

Average individual ash-free dry weight in test sediment OF1-4 is significantly less than that in the control sediment at α=0.05. – 631

Test Number: 885-2

Freshwater Sediment Test
20-Day Chironomus dilutus

data entry verified against laboratory bench sheets 10.19.17 JDF

Water Quality Data

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	Overlying water TEMP	DO	COND	pH	NH3	HARD	ALK
4	5996G	OF1-3	8	0	22.4	8.2	113	7.4	<0.1	17	30
21	5995G	OF1-2	8	0	22.1	8.2	112	7.5	<0.1	17	30
29	5991G	OF2-1	8	0	22.4	8.2	118	7.2	<0.1	26	30
49	5989G	Control	8	0	22.2	7.6	134	7.1	<0.1	17	30
53	5994G	OF1-1	8	0	22.3	8.1	114	7.4	<0.1	26	30
58	5999G	OF1-4	8	0	22.2	8.2	112	7.3	<0.1	17	30
65	5998G	OF2-5	8	0	22.4	8.0	114	7.2	<0.1	17	30
66	5992G	OF2-2	8	0	22.8	8.0	118	7.2	<0.1	26	30
78	5997G	OF2-4	8	0	23.1	8.1	121	7.3	<0.1	17	30
80	5993G	OF2-3	8	0	23.2	7.8	119	7.3	<0.1	17	30
4	5996G	OF1-3	8	1	22.3						
21	5995G	OF1-2	8	1	22.0						
29	5991G	OF2-1	8	1	22.2						
49	5989G	Control	8	1	22.3						
53	5994G	OF1-1	8	1	22.6						
58	5999G	OF1-4	8	1	22.5						
65	5998G	OF2-5	8	1	22.6						
66	5992G	OF2-2	8	1	23.1						
78	5997G	OF2-4	8	1	23.4						
80	5993G	OF2-3	8	1	23.2						
4	5996G	OF1-3	8	2	22.1						
21	5995G	OF1-2	8	2	22.0						
29	5991G	OF2-1	8	2	22.3						
49	5989G	Control	8	2	22.2						
53	5994G	OF1-1	8	2	22.4						
58	5999G	OF1-4	8	2	22.3						
65	5998G	OF2-5	8	2	22.5						
66	5992G	OF2-2	8	2	22.8						
78	5997G	OF2-4	8	2	23.1						
80	5993G	OF2-3	8	2	22.9						
4	5996G	OF1-3	8	3	22.5	7.4		7.0			
21	5995G	OF1-2	8	3	22.3	7.3		7.1			
29	5991G	OF2-1	8	3	22.7	7.1		6.9			
49	5989G	Control	8	3	22.5	7.2		7.0			
53	5994G	OF1-1	8	3	22.7	7.2		7.1			
58	5999G	OF1-4	8	3	22.6	7.2		7.0			
65	5998G	OF2-5	8	3	22.8	7.1		7.0			
66	5992G	OF2-2	8	3	23.2	7.1		7.0			
78	5997G	OF2-4	8	3	23.6	7.2		7.1			
80	5993G	OF2-3	8	3	23.4	7.1		7.1			
4	5996G	OF1-3	8	4	22.8						
21	5995G	OF1-2	8	4	22.8						
29	5991G	OF2-1	8	4	23.1						
49	5989G	Control	8	4	22.9						
53	5994G	OF1-1	8	4	23.2						
58	5999G	OF1-4	8	4	23.0						
65	5998G	OF2-5	8	4	23.2						
66	5992G	OF2-2	8	4	23.6						
78	5997G	OF2-4	8	4	23.8						

Test Number: 885-2

Freshwater Sediment Test
20-Day Chironomus dilutus

80	5993G	OF2-3	8	4	23.7			
4	5996G	OF1-3	8	5	22.9	6.8	116	6.9
21	5995G	OF1-2	8	5	22.7	6.7	117	6.8
29	5991G	OF2-1	8	5	23.0	6.6	122	6.8
49	5989G	Control	8	5	22.9	6.7	123	6.9
53	5994G	OF1-1	8	5	23.1	6.6	118	6.9
58	5999G	OF1-4	8	5	23.0	6.4	117	6.8
65	5998G	OF2-5	8	5	23.2	6.4	121	6.9
66	5992G	OF2-2	8	5	23.6	6.1	125	7.0
78	5997G	OF2-4	8	5	23.8	6.4	121	7.0
80	5993G	OF2-3	8	5	23.6	6.5	123	7.0
4	5996G	OF1-3	8	6	22.8			
21	5995G	OF1-2	8	6	22.6			
29	5991G	OF2-1	8	6	22.9			
49	5989G	Control	8	6	22.8			
53	5994G	OF1-1	8	6	22.9			
58	5999G	OF1-4	8	6	22.9			
65	5998G	OF2-5	8	6	23.0			
66	5992G	OF2-2	8	6	23.3			
78	5997G	OF2-4	8	6	23.5			
80	5993G	OF2-3	8	6	23.4			
4	5996G	OF1-3	8	7	22.7	7.5		6.4
21	5995G	OF1-2	8	7	22.6	7.4		6.4
29	5991G	OF2-1	8	7	22.9	7.2		6.4
49	5989G	Control	8	7	22.8	7.1		6.5
53	5994G	OF1-1	8	7	23.0	7.2		6.4
58	5999G	OF1-4	8	7	22.9	6.9		6.4
65	5998G	OF2-5	8	7	23.1	7.0		6.4
66	5992G	OF2-2	8	7	23.3	7.1		6.3
78	5997G	OF2-4	8	7	23.6	7.1		6.4
80	5993G	OF2-3	8	7	23.5	7.2		6.4
4	5996G	OF1-3	8	8	22.8			
21	5995G	OF1-2	8	8	22.7			
29	5991G	OF2-1	8	8	22.9			
49	5989G	Control	8	8	22.8			
53	5994G	OF1-1	8	8	22.9			
58	5999G	OF1-4	8	8	22.9			
65	5998G	OF2-5	8	8	23.0			
66	5992G	OF2-2	8	8	23.4			
78	5997G	OF2-4	8	8	23.7			
80	5993G	OF2-3	8	8	23.4			
4	5996G	OF1-3	8	9	22.7			
21	5995G	OF1-2	8	9	22.6			
29	5991G	OF2-1	8	9	23.0			
49	5989G	Control	8	9	22.8			
53	5994G	OF1-1	8	9	23.0			
58	5999G	OF1-4	8	9	22.9			
65	5998G	OF2-5	8	9	23.1			
66	5992G	OF2-2	8	9	23.3			
78	5997G	OF2-4	8	9	23.6			
80	5993G	OF2-3	8	9	23.4			
4	5996G	OF1-3	8	10	22.5	7.2		7.3

Test Number: 885-2

Freshwater Sediment Test
20-Day Chironomus dilutus

21	5995G	OF1-2	8	10	22.3	7.1		7.2
29	5991G	OF2-1	8	10	22.6	6.6		7.1
49	5989G	Control	8	10	22.4	6.4		7.5
53	5994G	OF1-1	8	10	22.6	6.8		7.2
58	5999G	OF1-4	8	10	22.6	6.8		7.2
65	5998G	OF2-5	8	10	22.8	6.5		7.1
66	5992G	OF2-2	8	10	23.2	6.5		7.1
78	5997G	OF2-4	8	10	23.5	6.7		7.2
80	5993G	OF2-3	8	10	23.3	6.5		7.2
4	5996G	OF1-3	8	11	22.3			
21	5995G	OF1-2	8	11	22.0			
29	5991G	OF2-1	8	11	22.3			
49	5989G	Control	8	11	22.0			
53	5994G	OF1-1	8	11	22.3			
58	5999G	OF1-4	8	11	22.2			
65	5998G	OF2-5	8	11	22.4			
66	5992G	OF2-2	8	11	22.8			
78	5997G	OF2-4	8	11	23.3			
80	5993G	OF2-3	8	11	23.0			
4	5996G	OF1-3	8	12	22.0	7.6	110	7.1
21	5995G	OF1-2	8	12	22.0	7.4	109	7.0
29	5991G	OF2-1	8	12	22.1	7.3	112	7.0
49	5989G	Control	8	12	22.0	7.2	122	7.0
53	5994G	OF1-1	8	12	22.1	7.1	110	6.8
58	5999G	OF1-4	8	12	22.0	7.3	110	6.7
65	5998G	OF2-5	8	12	22.2	7.5	111	6.8
66	5992G	OF2-2	8	12	22.6	7.4	114	6.8
78	5997G	OF2-4	8	12	22.9	7.5	117	6.7
80	5993G	OF2-3	8	12	22.6	7.5	104	6.6
4	5996G	OF1-3	8	13	22.3			
21	5995G	OF1-2	8	13	22.1			
29	5991G	OF2-1	8	13	22.2			
49	5989G	Control	8	13	22.0			
53	5994G	OF1-1	8	13	22.2			
58	5999G	OF1-4	8	13	22.2			
65	5998G	OF2-5	8	13	22.4			
66	5992G	OF2-2	8	13	22.9			
78	5997G	OF2-4	8	13	23.2			
80	5993G	OF2-3	8	13	23.0			
4	5996G	OF1-3	8	14	22.5	7.3		6.8
21	5995G	OF1-2	8	14	22.1	7.2		6.7
29	5991G	OF2-1	8	14	22.2	7.2		6.7
49	5989G	Control	8	14	22.0	7.1		6.6
53	5994G	OF1-1	8	14	22.3	7.2		6.7
58	5999G	OF1-4	8	14	22.2	7.0		6.6
65	5998G	OF2-5	8	14	22.4	7.3		6.6
66	5992G	OF2-2	8	14	22.8	7.0		6.7
78	5997G	OF2-4	8	14	23.1	7.2		6.6
80	5993G	OF2-3	8	14	22.9	7.1		6.6
4	5996G	OF1-3	8	15	22.9			
21	5995G	OF1-2	8	15	22.6			
29	5991G	OF2-1	8	15	22.7			

Test Number: 885-2

Freshwater Sediment Test
20-Day Chironomus dilutus

49	5989G	Control	8	15	22.7						
53	5994G	OF1-1	8	15	22.9						
58	5999G	OF1-4	8	15	22.9						
65	5998G	OF2-5	8	15	23.0						
66	5992G	OF2-2	8	15	23.4						
78	5997G	OF2-4	8	15	23.8						
80	5993G	OF2-3	8	15	23.6						
4	5996G	OF1-3	8	16	22.2						
21	5995G	OF1-2	8	16	22.0						
29	5991G	OF2-1	8	16	22.3						
49	5989G	Control	8	16	22.0						
53	5994G	OF1-1	8	16	22.3						
58	5999G	OF1-4	8	16	22.2						
65	5998G	OF2-5	8	16	22.4						
66	5992G	OF2-2	8	16	22.9						
78	5997G	OF2-4	8	16	23.4						
80	5993G	OF2-3	8	16	23.0						
4	5996G	OF1-3	8	17	22.3	6.1		6.5			
21	5995G	OF1-2	8	17	22.0	6.3		6.6			
29	5991G	OF2-1	8	17	22.3	6.3		6.6			
49	5989G	Control	8	17	22.1	5.8		6.7			
53	5994G	OF1-1	8	17	22.3	5.9		6.6			
58	5999G	OF1-4	8	17	22.2	5.7		6.7			
65	5998G	OF2-5	8	17	22.4	5.0		6.6			
66	5992G	OF2-2	8	17	22.8	5.3		6.6			
78	5997G	OF2-4	8	17	23.3	4.8		6.7			
80	5993G	OF2-3	8	17	23.0	4.4		6.7			
4	5996G	OF1-3	8	18	22.1						
21	5995G	OF1-2	8	18	22.1						
29	5991G	OF2-1	8	18	22.3						
49	5989G	Control	8	18	22.0						
53	5994G	OF1-1	8	18	22.2						
58	5999G	OF1-4	8	18	22.2						
65	5998G	OF2-5	8	18	22.4						
66	5992G	OF2-2	8	18	22.8						
78	5997G	OF2-4	8	18	22.9						
80	5993G	OF2-3	8	18	22.8						
4	5996G	OF1-3	8	19	22.1	5.9	114	6.6			
21	5995G	OF1-2	8	19	22.0	5.7	114	6.6			
29	5991G	OF2-1	8	19	22.2	5.7	118	6.7			
49	5989G	Control	8	19	22.1	5.4	115	6.6			
53	5994G	OF1-1	8	19	22.2	5.6	113	6.6			
58	5999G	OF1-4	8	19	22.1	5.8	114	6.7			
65	5998G	OF2-5	8	19	22.3	5.3	114	6.6			
66	5992G	OF2-2	8	19	22.7	5.4	115	6.6			
78	5997G	OF2-4	8	19	23.1	6.2	116	6.8			
80	5993G	OF2-3	8	19	22.8	5.8	116	6.7			
4	5996G	OF1-3	8	20	22.4	6.2	110	7.2	<0.1	17	30
21	5995G	OF1-2	8	20	22.0	5.6	109	6.9	<0.1	17	40
29	5991G	OF2-1	8	20	22.3	5.7	112	7.0	<0.1	17	30
49	5989G	Control	8	20	22.1	5.3	111	6.9	0.1	17	30
53	5994G	OF1-1	8	20	22.4	5.5	111	6.9	<0.1	17	30

Test Number: 885-2

Freshwater Sediment Test
20-Day Chironomus dilutus

58	5999G	OF1-4	8	20	22.3	5.7	111	7.0	0.2	17	30
65	5998G	OF2-5	8	20	22.5	5.4	110	6.9	<0.1	17	30
66	5992G	OF2-2	8	20	22.9	5.6	110	6.9	<0.1	17	30
78	5997G	OF2-4	8	20	23.3	6.1	115	7.2	<0.1	17	30
80	5993G	OF2-3	8	20	23.1	6.0	111	7.1	<0.1	17	40
				Mean	22.7	6.7	115	6.9	—	18	31
				SD	0.5	0.8	5	0.3	—	3	3
				n	210	100	50	100	20	20	20
				Min	22.0	4.4	104	6.3	<0.1	17	30
				Max	23.8	8.2	134	7.5	0.2	26	40

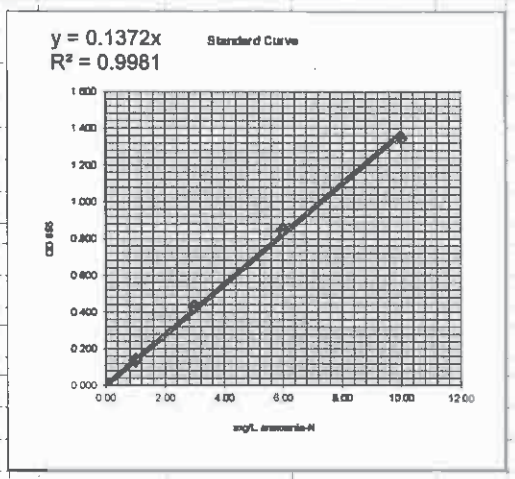
RAW DATA DIVIDER PAGE
Test No. 885-2

AMMONIA EXPOSURE BENCHSHEETS AND ANALYSIS

Total Ammonia-N in Sediment Pore Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD_{655}	NH_3-N (mg/L)	pH	Salinity (ppt)
	Blank	-----	-----	-----		
	1.0 mg/L NH_3-N Std.	----	0.139	1.00		
	3.0 mg/L NH_3-N Std.	-----	0.431	3.00		
	6.0 mg/L NH_3-N Std.	----	0.850	6.00		
	10.0 mg/L NH_3-N Std.	----	1.350	10.00		
	3.0 mg/L spike	----	0.433	3.15		
	3.0 mg/L spike dupl.	-----	0.435	3.17		
	5.0 mg/L 2nd source		0.620	4.52		
1	Day 0 (9-22-17)					
2	4	1	0.003	ND		
3	21	1	0.002	ND		
4	29	1	0.001	ND		
5	49	1	0.008	ND		
6	53	1	0.000	ND		
7	58	1	0.001	ND		
8	65	1	0.001	ND		
9	66	1	0.000	ND		
10	78	1	0.000	ND		
11	80	1	0.002	ND		
12						
13	Day 20 (10-12-17)					
14	4	1	0.002	ND		
15	21	1	0.002	ND		
16	29	1	0.000	ND		
17	49	1	0.018	0.13		
18	53	1	0.000	ND		
19	58	1	0.020	0.15		
20	65	1	0.000	ND		
21	66	1	0.000	ND		
22	78	1	0.000	ND		
23	80	1	0.000	ND		
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						



Reporting limit (mg/L) =	0.10
Recovery (%) =	105.4
Precision (RPD) =	-0.46
2nd source (%) =	90.3
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Test No.: 885-2
Test Day: 0 & 20
Species: *Chironomus*

Sample Type (check)

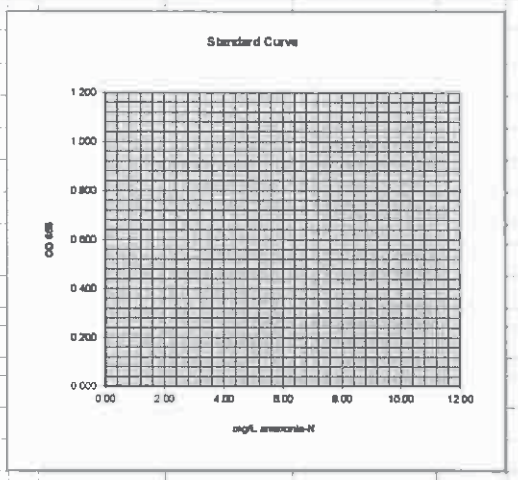
	Bulk Sediment Porewaters
	Test Beaker Porewaters
X	Overlying Water

Analyst: JB
Date analyzed: 10/13/2017

Total Ammonia-N in Sediment Pore Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD655	NH3-N (mg/L)	pH	Salinity (ppt)
	Blank	-----	----	----		
	1.0 mg/L NH3-N Std.	----	0.139	1.00		
	3.0 mg/L NH3-N Std.	-----	0.431	3.00		
	6.0 mg/L NH3-N Std.	----	0.850	6.00		
	10.0 mg/L NH3-N Std.	----	1.350	10.00		
	3.0 mg/L spike	----	0.433			
	3.0 mg/L spike dupl.	-----	0.435			
	5.0 mg/L 2nd source		0.620			
1	Day 0 (9-22-17)					
2	4	1	0.003			
3	21	1	0.002			
4	29	1	0.001			
5	49	1	0.008			
6	53	1	0.000			
7	58	1	0.001			
8	65	1	0.001			
9	66	1	0.000			
10	78	1	0.000			
11	80	1	0.002			
12						
13	Day 20 (10-12-17)					
14	4	1	0.002			
15	21	1	0.002			
16	29	1	0.000			
17	49	1	0.018			
18	53	1	0.000			
19	58	1	0.020			
20	65	1	0.000			
21	66	1	0.000			
22	78	1	0.000			
23	80	1	0.000			
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						



Reporting limit (mg/L) = 0.10

Recovery (%) = #VALUE!
Precision (RPD) = #VALUE!
2nd source (%) = #VALUE!

Sample volume (ml): 0.50
Dilution factor 1

Sample Set Description:
- Test No.: 885-2
- Test Day: 0 & 20
- Species: *Chironomus*

Sample Type (check)
- Bulk Sediment Porewaters
- Test Beaker Porewaters
- X Overlying Water

Analyst: JB
Date analyzed: 10/13/2017

RAW DATA DIVIDER PAGE
Test No. 885-2

CHAIN-OF-CUSTODY RECORDS

CHAIN OF CUSTODY RECORD

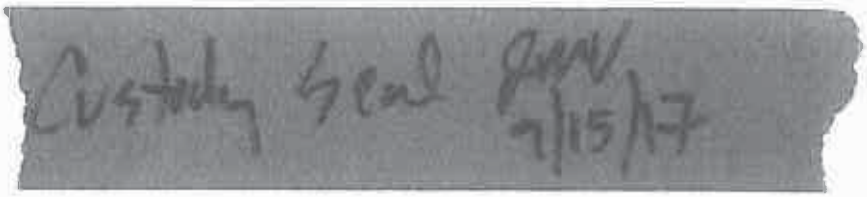
Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information	Testing Required					
Environmental Science Associates (ESA)	D160430	Carrier:	H. azteca 10-day mortality	C. dilutus 20-day survival/growth				
Address: 5309 Shilshole Ave. NW, Suite 200	Phone No.: 206-204-6960	Airbill No.						
City, State, Zip code: Seattle, WA 98107	Report Attention: Jim Good							

Lab Sample No.	Date Sampled	Time Sampled	Sampled by: J. Vlastelicia, C. French Sample Description	Number of Containers	H. azteca 10-day mortality	C. dilutus 20-day survival/growth				Comments
59916	9/12/17	1345	Camas Slough Sediment; OF2-1	6	X	X				
59926	9/12/17	1530	Camas Slough Sediment; OF2-2	6	X	X				
59936	9/12/17	1700	Camas Slough Sediment; OF2-3	6	X	X				
59946	9/13/17	1300	Columbia River Sediment; OF1-1	6	X	X				
59956	9/13/17	1505	Columbia River Sediment; OF1-2	6	X	X				
59966	9/13/17	1825	Columbia River Sediment; OF1-3	6	X	X				only 5 Jars
59976	9/14/17	1129	Camas Slough Sediment; OF2-4	3	X	X				
59986	9/14/17	1330	Camas Slough Sediment; OF2-5	3	X	X				
59996	9/14/17	1655	Columbia River Sediment; OF1-4	3	X	X				

Signature	Print Name	Company	Date	Time	
Relinquished by	John Vlastelicia	ESA	9/15/17	1040	Custody Seal: Present / Not Present Cooler: Intact / Not Intact
Received by	Luke Johnson	NSA	9/15/17	1040	
Relinquished by	Luke Johnson	ESA	9/15/17	14:19	Internal Cooler Temperature Upon Lab Receipt (°C) All coolers 0.5°C.
Received by laboratory	Gary Buhler	NAS	9/15/17	14:19	

Custody Seal
9/15/17


Custody Seal
9/15/17

Custody Seal
9/15/17

Custody Seal
9/15/17

APPENDIX III

RAW DATA – REFERENCE TOXICANT TEST

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS- _____

ACUTE TOXICITY TEST (ALL SPECIES)

REVIEWED PAGES 1-7 -ESL

Test No. 999-3713 Client: QC Test Investigator _____

Test Type (rangefinding/definitive) Definitive Test Length (hr) 96

Species *Chironomus dilutus*

STUDY MANAGEMENT

Client: QC test

Client's Study Monitor: QC test

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. IRISSARRI GJI

QA Officer L. K. Nemeth

1. Yves Katalayer 2. GA Ulster GAU

3. _____ 4. _____

Study Schedule:

Test Beginning: 9-22-17 1520 Test Ending: 9-26-17 1330

TEST MATERIAL

Description: Potassium Chloride Crystals - Lot No.: 147960

NAS Sample No.				
Date of Collection:				
Date of Receipt:				
Temperature (deg C):				
Dissolved oxygen (mg/L):				
pH:				
Conductivity (umhos/cm):				
Hardness (mg/L):				
Alkalinity (mg/L):				
Salinity (ppt):				
Total chlorine (mg/L):				
Total ammonia-N (mg/L):				
_____:				

DILUTION WATER

Description: Moderately hard synthetic water

Date of Preparation/Collection: 9-14-17

Water Quality: Cond. (umhos/cm): 309 Salinity (ppt): _____ pH 8.0

Hardness (mg/L as $CaCO_3$): 94 Alkalinity (mg/L as $CaCO_3$): 70

Treatments: Aerated ≥ 24 hrs

TEST LOCATION

Test conducted in (circle one): (room 1) room 2 trailer water bath other: _____

Randomization chart:

Ø	10	5	10	2.5	2.5	5	10	2.5	1.25
5	2.5	2.5	1.25	5	10	10	5	10	10
2.5	Ø	10	Ø	1.25	Ø	0.63	Ø	0.63	2.5
1.25	5	0.63	2.5	Ø	1.25	2.5	1.25	1.25	5
0.63	0.63	Ø	0.63	0.63	0.63	1.25	0.63	5	Ø
10	1.25	1.25	5	10	5	Ø	2.5	Ø	0.63

Error codes: 1) Correction of handwriting error
2) Written in wrong location; entry deleted
3) Wrong date deleted; replaced with correct date
4) Error found in measurement; measurement repeated

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-_____

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-3713 Client QC Test Investigator _____

TEST ORGANISMS

Species: *Chironomus dilutus* Age: 424 HRS Size: 1st instar

Source: ~~Aquatic BioSystems, FT. Collins, CO~~ NAS CULTURES

Acclimation Data:

Date	Temp. (deg.C)	pH	DO (mg/L)	Cond umhos/cm	Feeding amount	Feeding description	Water changes	Hardness (mg/L)	Alkalinity (mg/L)
9-20-17	22.7	7.5	8.5	135	NONE		—	26	40
9-21-17	19.0	7.8	8.7	190		"	—	—	—
9-22-17	21.9	7.5	8.4	171		"	—	34	40
Mean	21.2	7.6	8.5	162				30	40
S.D.	1.9	0.2	0.2	24				—	—
(N)	3	3	3	3				3	3

Photoperiod during acclimation: 16:8, L:D

TEST PROCEDURES AND CONDITIONS

Test concentrations (50% series recommended): 10, 5, 2.5, 1.25, 0.63, 0 g/L

Test chamber: 30 ml plastic cups Test volume: 20 ml

Replicates/treatment: 10 Organisms/treatment: 10 (1/rep)

Test water changes: None Aeration during test: None

Feeding: 0.25 ml Tetra Fin (4g/L) suspension per cup on days 0 and 2

Duration: 24-hr, 48-hr, (96-hr) Test temperature (deg.C): 23 ± 1

Beaker placement: Stratified randomization Photoperiod: 16:8, L:D

MISCELLANEOUS NOTES

Test solution preparation:

Working stock: Dissolve 5g KCl crystals in dilution water and dilute to 500 mL.
Final conc.: 10 g/L.

Test concentration (g/L)	KCl working stock (ml/200ml)	ml of dilution water per 200 ml
10	200	0
5	100	100
2.5	50	150
1.25	25	175
0.63	12.5	187.5
0	0	0

9-22-17 WL

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-_____

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-3713 Client _____ QC Test

DAILY RECORD SHEET

Day 0 (9/22/17) GSL Temp Beaker (°C): 23.3

Conc. (g/L)	Temp. (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	Comments
1. 10	22.8	7.8	10670	8.0	94	70	
2. 5	22.8	7.7	6470	8.0			
3. 2.5	22.9	7.7	3710	8.0			
4. 1.25	22.9	7.6	2230	7.9			
5. 0.63	22.9	7.6	1336	7.9			
6. 0	23.1	7.7	321	7.9	94	70	
Each replicate fed 0.25 ml Tetra Fin suspension. Initials: GSL							

GSL ① 9-22-17

Day 1 (9/23/17) GSL Temp Beaker (°C): 23.6

Conc. (g/L)	Temp. (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	Comments
1. 10							
2. 5							
3. 2.5							
4. 1.25							
5. 0.63							
6. 0							

Day 2 (9/24/17) GSL Temp Beaker (°C): 23.6

Conc. (g/L)	Temp. (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	Comments
1. 10							
2. 5							
3. 2.5							
4. 1.25							
5. 0.63							
6. 0							
Each replicate fed 0.25 ml Tetra Fin suspension. Initials: GSL							

Day 3 (9/25/17) GSL Temp Beaker (°C): 23.8

Conc. (g/L)	Temp. (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	Comments
1. 10							
2. 5							
3. 2.5							
4. 1.25							
5. 0.63							
6. 0							

Day 4 (9/26/17) GSL Temp Beaker (°C): 23.8

Conc. (g/L)	Temp. (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	Comments
1. 10	—	—	—	—	—	—	
2. 5	23.7	7.7	6510	7.8			
3. 2.5	23.8	7.9	3860	7.7			
4. 1.25	23.7	7.7	2350	7.7			
5. 0.63	23.7	7.8	1413	7.7			
6. 0	23.6	7.9	362	7.6	94	80	
Mean	23.3	7.7	control 342	7.8	94	73	
SD	0.4	0.1	—	0.1	0	6	
n	11	11	2	11	3	3	

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-_____

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-3713 Client QC Test Investigator _____

DAILY RECORD SHEET - Survivors

Day 0 (9/22/17) 632

Conc. (g/L)	Survivors in Replicate: 1	2	3	4	5	6	7	8	9	10	Total
1. 10	1	1	1	1	1	1	1	1	1	1	10
2. 5	1	1	1	1	1	1	1	1	1	1	10
3. 2.5	1	1	1	1	1	1	1	1	1	1	10
4. 1.25	1	1	1	1	1	1	1	1	1	1	10
5. 0.63	1	1	1	1	1	1	1	1	1	1	10
6. 0	1	1	1	1	1	1	1	1	1	1	10

Day 1 (9/23/17) 0837

Conc. (g/L)	Survivors in Replicate: 1	2	3	4	5	6	7	8	9	10	Total
1. 10	1	1	1	1	1	1	1	1	1	1	10
2. 5	1	1	1	1	1	1	1	1	1	1	10
3. 2.5	1	1	1	1	1	1	1	1	1	1	10
4. 1.25	1	1	1	1	1	1	1	1	1	1	10
5. 0.63	1	1	1	1	1	1	1	1	1	1	10
6. 0	1	1	1	1	1	1	1	1	1	1	10

Day 2 (9/24/17) 631

Conc. (g/L)	Survivors in Replicate: 1	2	3	4	5	6	7	8	9	10	Total
1. 10	0	0	0	0	0	0	0	0	0	0	0 (10D)
2. 5	1	1	1	1	1	0	0	0	0	1	4 (4D)
3. 2.5	1	1	1	1	1	1	1	1	1	1	10
4. 1.25	1	1	1	1	1	1	1	1	1	1	10
5. 0.63	1	1	1	1	1	1	1	1	1	1	10
6. 0	1	1	1	1	1	1	1	1	1	1	10

Day 3 (9/25/17) 631

Conc. (g/L)	Survivors in Replicate: 1	2	3	4	5	6	7	8	9	10	Total
1. 10	0	0	0	0	0	0	0	0	0	0	0
2. 5	1	1	1	1	0	0	0	0	0	1	5 (1D)
3. 2.5	1	1	1	1	0	0	1	1	1	1	8 (2D)
4. 1.25	1	1	1	1	1	1	1	1	1	1	10
5. 0.63	1	1	0	1	1	1	1	1	1	1	9 (1D)
6. 0	1	1	1	1	1	1	1	1	1	1	10

Day 4 (9/26/17) 631

Conc. (g/L)	Survivors in Replicate: 1	2	3	4	5	6	7	8	9	10	Total
1. 10	0	0	0	0	0	0	0	0	0	0	0
2. 5	0	0	0	0	0	0	0	0	0	0	0 (5D)
3. 2.5	1	0	1	1	0	0	1	0	1	0	5 (3D)
4. 1.25	1	1	1	1	1	1	1	1	1	1	10
5. 0.63	1	1	0	1	1	1	1	1	1	1	9
6. 0	1	1	1	1	1	1	1	1	1	1	10

Acute 96-hr Toxicity Test-96 Hr Survival

Start Date:	9/22/2017 15:20	Test ID:	999-3713	Sample ID:	REF-Ref Toxicant
End Date:	9/26/2017 13:30	Lab ID:	ORNAS-Northwestern Aquati	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CT-Chironomus dilutus
Comments:					

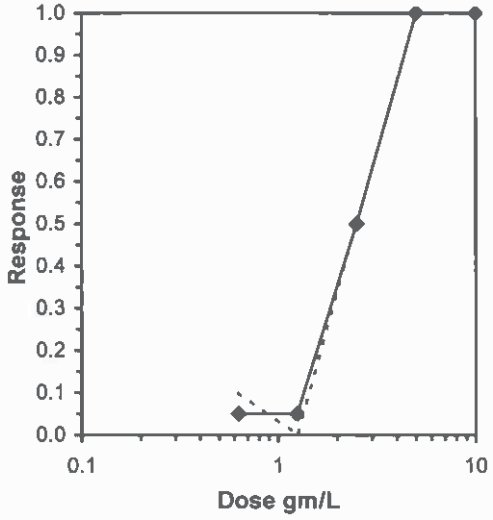
Conc-gm/L	1
D-Control	1.0000
0.63	0.9000
1.25	1.0000
2.5	0.5000
5	0.0000
10	0.0000

Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	1			0	10
0.63	0.9000	0.9000	1	9	10	1	0.5000	0.0500	1	10
1.25	1.0000	1.0000	0	10	10	1	1.0000	0.0500	0	10
*2.5	0.5000	0.5000	5	5	10	1	0.0163	0.0500	5	10
*5	0.0000	0.0000	10	0	10	1	0.0000	0.0500	10	10
*10	0.0000	0.0000	10	0	10	1	0.0000	0.0500	10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1.25	2.5	1.76777	

Trimmed Spearman-Karber

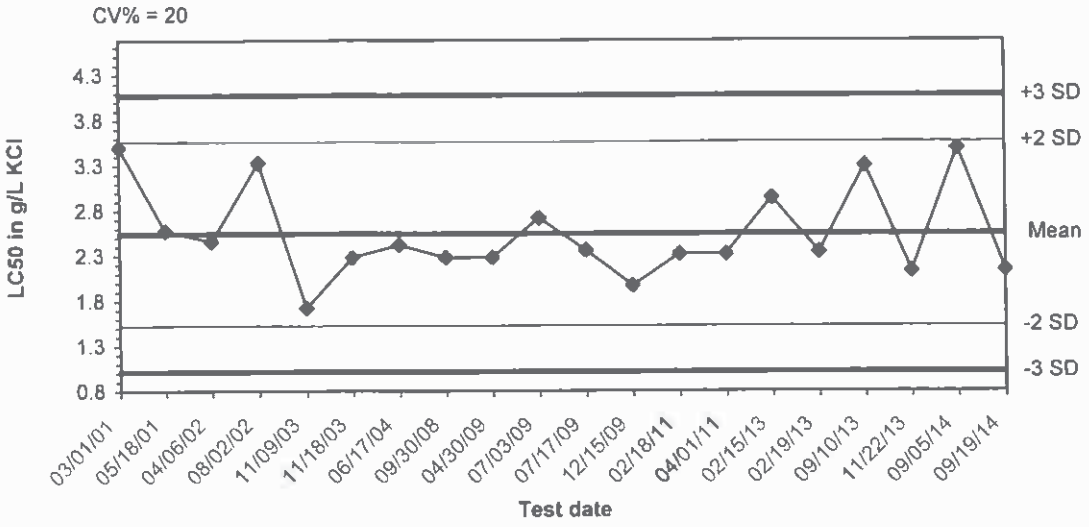
Trim Level	EC50	95% CL	
0.0%			
5.0%	2.4571	1.9172	3.1488
10.0%	2.4618	1.8712	3.2387
20.0%	2.4713	1.7274	3.5356
Auto-5.0%	2.4571	1.9172	3.1488



Test: AT-Acute 96-hr Toxicity Test						Test ID: 999-3713			
Species: CT-Chironomus dilutus						Protocol: EPAF 91-EPA Freshwater			
Sample ID: REF-Ref Toxicant						Sample Type: KCL-Potassium chloride			
Start Date: 9/22/2017 15:20			End Date: 9/26/2017 13:3			Lab ID: ORNAS-Northwestern Aquatic Sciences			
Pos	ID	Rep	Group	Start	24 Hr	48 Hr	72 Hr	96 Hr	Notes
	1	1	D-Control	10				10	
	2	1	0.630	10				9	
	3	1	1.250	10				10	
	4	1	2.500	10				5	
	5	1	5.000	10				0	
	6	1	10.000	10				0	

Comments: data entry verified against laboratory bench sheets 10-5-17 JRF

First instar midge larvae, Chironomus dilutus, acute reference toxicant test



Dates	Values	Mean	-2 SD	-3 SD	+2 SD	+3 SD
03/01/01	3.5000	2.5440	1.5244	1.0147	3.5636	4.0733
05/18/01	2.5800	2.5440	1.5244	1.0147	3.5636	4.0733
04/06/02	2.4600	2.5440	1.5244	1.0147	3.5636	4.0733
08/02/02	3.3300	2.5440	1.5244	1.0147	3.5636	4.0733
11/09/03	1.7200	2.5440	1.5244	1.0147	3.5636	4.0733
11/18/03	2.2800	2.5440	1.5244	1.0147	3.5636	4.0733
06/17/04	2.4200	2.5440	1.5244	1.0147	3.5636	4.0733
09/30/08	2.2800	2.5440	1.5244	1.0147	3.5636	4.0733
04/30/09	2.2800	2.5440	1.5244	1.0147	3.5636	4.0733
07/03/09	2.7200	2.5440	1.5244	1.0147	3.5636	4.0733
07/17/09	2.3600	2.5440	1.5244	1.0147	3.5636	4.0733
12/15/09	1.9700	2.5440	1.5244	1.0147	3.5636	4.0733
02/18/11	2.3200	2.5440	1.5244	1.0147	3.5636	4.0733
04/01/11	2.3200	2.5440	1.5244	1.0147	3.5636	4.0733
02/15/13	2.9400	2.5440	1.5244	1.0147	3.5636	4.0733
02/19/13	2.3400	2.5440	1.5244	1.0147	3.5636	4.0733
09/10/13	3.3000	2.5440	1.5244	1.0147	3.5636	4.0733
11/22/13	2.1300	2.5440	1.5244	1.0147	3.5636	4.0733
09/05/14	3.4900	2.5440	1.5244	1.0147	3.5636	4.0733
09/19/14	2.1400	2.5440	1.5244	1.0147	3.5636	4.0733

Appendix C
Quality Assurance 1 Memorandum

ESA

5309 Shilshole Avenue, NW
Suite 200
Seattle, WA 98107
206.789.9658 phone
206.789.9684 fax

www.esassoc.com

memorandum

date January 3, 2018

to Project file D160430.00

from Jim Good

subject QA1 review of sediment chemistry and bioassay data

This quality assurance report documents a QA1 review of sediment quality data collected in the Columbia River and Camas Slough offshore from the Georgia-Pacific Camas facility. The sediment quality data were collected in accordance with the Sediment Sampling and Analysis Plan (SSAP) to meet requirements of NPDES Waste Discharge Permit No. WQ0000256. Surficial sediment samples were collected from 9 sampling stations on September 12, 13 and 14. Water temperature measurements were also taken one foot off the bottom using a YSI pH 100 meter or YSI 556 sonde. This QA1 review includes the evaluations specified in the Sediment Cleanup User's Manual II (SCUM II, Ecology 2017).

Field Sample Collection and Handling The ESA field team performed a reconnaissance of the two outfall areas on August 2, 2017, and found that shallow water in Camas Slough would prevent access by boat to some of the sampling stations identified in the approved SSAP. After notifying Ecology on August 23, the following day Ecology provided suggested coordinates for moving the sampling stations near Outfall 002. These suggested coordinates became the targeted locations for sediment sampling.

After efforts to collect samples in the Outfall 002 area on the morning of September 12, ESA notified Ecology by email that the field team had encountered very coarse substrate and no fine sediments that could be sampled at the target locations. Gravel was observed in exposed and shallow areas along the shore during low tide. Ecology agreed with the approach to document attempts to sample at the suggested locations, and then move farther offshore to find sand and silt that could be sampled. This approach yielded samples that afternoon from three alternate stations where sand was first encountered, offset approximately 140 to 190 feet south of the target locations. Samples from two additional stations were collected in Camas Slough on September 14. In summary, sediment samples were successfully collected from five sampling stations in Camas Slough, all of which were offset from the target locations to avoid coarse gravel and cobble substrate.

Sampling in the Outfall 001 area started at the upriver end of the transect on September 13, and the first three stations were successfully sampled. Sufficient sediment was collected at the fourth Outfall 001 area station on September 14, but rock and strong current prevented successful sampling at the two downstream-most stations.

This is an area of fast-moving current between rock outcroppings on Lady Island and Ione Reef, and rock outcroppings were observed on sonar imagery. In summary sediment samples were successfully collected from four of the target sampling locations near Outfall 001; however, rock outcroppings prevented collection of sediments from the two downstream-most target locations.

Sample collection activities were thoroughly documented in a field logbook and field sample forms were used to record information on each individual sediment grab that was homogenized for filling sample jars. Station positioning, sampling equipment decontamination, sample collection using a Ponar grab sampler, water temperature and pH measurements, sample compositing and subsampling, sample container labeling, and field documentation all followed procedures described in the SSAP. Subsamples for total sulfides and ammonia were collected from the final grab at each station before sediment was homogenized, and total sulfides samples were preserved with zinc acetate. Communications between the Field Team Leader and TestAmerica confirmed that one unpreserved jar of sediment from OF1-1 was mislabeled as OF2-6, and this error was corrected at the lab.

Sample storage, chain-of-custody, and sample delivery also followed procedures described in the SSAP. Samples stored on ice in coolers for sediment chemistry and conventional analyses were picked up from the ESA Portland office by a TestAmerica representative each day following sample collection. TestAmerica reported that coolers were received at temperatures ranging from 1.7 to 3.1 °C. Samples shipped from TestAmerica to Maxxam for analysis of dioxins and furans were received at temperatures ranging from 3.8 to 4.8 °C. No action was taken to qualify dioxin and furan results that were received slightly above the recommended maximum 4.0 °C holding temperature. Samples for bioassay tests were hand-delivered by ESA to the Northwestern Aquatic Sciences (NAS) laboratory in Newport, Oregon, on September 15, the day after sample collection was completed. NAS reported that all coolers were received at 0.5 °C.

Completeness As described under Field Sample Collection and Handling, coarse substrate or submerged rock outcroppings prevented sampling at all 12 sampling stations; therefore samples were collected from a total of 9 sampling stations, or 75% of the number of stations planned for sample collection. There was no breakage of sample jars and 100% of the planned laboratory analyses were completed for stations sampled. Measurements of water temperature and pH were collected from approximately one meter above the sediment surface for a completeness of 100% for water quality measurements.

Field Duplicates Although not required in the SSAP, the field crew collected a set of duplicate samples for chemistry analyses and conventional parameters at station OF2-5, labeled OF2-5D. Duplicates were not collected for analysis of sulfides, and dioxins and furans. Results of field duplicates generally are not used to qualify sample results, but provide indications of overall precision in the sampling and analysis program and can include variability from uneven distribution of constituents in the material sampled, uneven homogenization of sample material from multiple grabs, and precision in laboratory analyses. Some differences were observed in the J-qualified estimates for Motor Oil and for SVOCs in the re-analysis of these samples; however, these results were all well below the SCO concentrations and already qualified as estimates by the laboratory. Other duplicate sample results were in very close agreement, including the results for grain size and TOC that indicated thorough homogenization of sample material.

Data Presentation TestAmerica provided three complete laboratory data reports, one for each batch of samples from the previous field sampling day. These reports were identified by Job ID 580-71236-1, 580-71266-1, and 580-71299-1. Each report includes a case narrative that summarizes sample receipt and quality control

results, results for client samples and laboratory QC samples, a lab chronicle, chain-of-custody forms, and sample receipt checklists.

NAS provided a single report for Test No. 885-1 & 2. The NAS report includes an executive summary of sediment bioassays, and report sections for the amphipod 10-day survival test and midge 20-day survival and growth tests. Each report section includes appendices for test protocols, and raw data for client samples (including test descriptions, test monitoring, results benchsheets, test data analysis records, ammonia exposure benchsheets and analyses, and chain-of-custody records), and raw data for reference toxicant tests.

Data packages from both laboratories were considered complete.

Sediment Chemistry and Conventional Analytes Data Packages

Reporting Limits Reporting limits were generally below the Sediment Cleanup Objective (SCO) concentrations from the Sediment Management Standards that are listed in Table VI of SCUM II. The laboratory case narratives reported that in the initial analysis of SVOCs by Method 8270D, samples were diluted due to the nature of the sample matrix and elevated reporting limits were provided. The TestAmerica laboratory inadvertently did not prepare 20 grams of sediment sample to a final volume of 2 ml for low-level reporting limits for semi-volatile organic compounds (SVOCs); thus, the initial reporting of several SVOCs (i.e., benzoic acid, bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, di-n-octyl phthalate, and phenol) showed non-detects at reporting limits higher than the SCO concentrations. No sample volume was frozen upon receipt at the laboratory, so non-frozen sample material was re-extracted for low-level analyses and results were qualified (H) as analyzed beyond the specified holding time. Reporting limits for the low-level re-analysis of SVOCs were all below SCO concentrations. The laboratory case narratives also reported that samples were diluted due to extract color in the analysis of organochlorine pesticides by Method 8081B, thus elevated reporting limits were provided. However, the reporting limits for these compounds were well below SCO concentrations. Reporting limits for dioxins and furans were below those listed in Table 5-6 of SCUM II.

Sample Holding Times Sample holding times generally complied with the maximum holding times identified in the SSAP.

- As described above under Reporting Limits, SVOCs were re-extracted for low-level analysis of five compounds that were not detected in the original analysis at concentrations higher than SCOs. These re-extractions were performed 57 to 84 days after sample collection; therefore, those sample results were qualified (H) as outside of the specified holding time (14 days). Sample material archived at NAS was shipped to TestAmerica for re-extraction and analysis of SVOCs in samples OF1-1, OF1-2, and OF1-3.

- Organotins were re-extracted and re-analyzed after the initial analysis found laboratory control sample results to be outside control limits for monobutyltin and tetra-n-butyltin. Re-extraction of organotins occurred 22 to 24 days after sample collection; therefore, those sample results were also qualified (H) as outside the specified holding time (14 days).

- Samples were analyzed for total organic carbon (TOC) 23 to 25 days after sample collection due to an instrument breakdown; therefore, those sample results were qualified (H) as outside the PSEP-specified holding time (14 days).

- Dioxins and furans from two of the three sample batches (samples OF1-1 through OF1-4, OF2-4, and OF2-5) were analyzed by Maxxam on October 8, ten to 11 days past the recommended maximum holding time of 14 days. An H qualifier has been added to dioxin and furan results that were outside the specified holding times.

Acceptability of Laboratory Quality Control Results Laboratory data packages from TestAmerica and Maxxam included sections on QC Sample Results where data were presented for method blank analyses, laboratory control samples (LCS) recoveries, LCS duplicate recoveries, relative percent differences (RPDs) between LCS and LCS duplicate samples, matrix spike (MS) and matrix spike duplicate (MSD) recoveries, RPDs between MS and MSD results, analytical duplicate and triplicate RPDs, and surrogate compound recoveries. The case narratives summarize many of the circumstances where quality control analyses were outside of control limits, including the resulting data qualifiers or re-analyses. The following quality control results led to the laboratory assigning qualifiers to sample results:

- Monobutyltin and tetra-n-butyltin LCS recoveries were outside of control limits and all of the original non-detect sample results were qualified with an asterisk. The surrogate recovery was also low. Organotins were re-analyzed with acceptable LCS and surrogate recoveries, and all of the re-analysis sample results were qualified as beyond the specified holding time (H).

- The LCS recovery exceeded the control limit for di-n-octyl phthalate, indicating a potential high bias, and initial sample results for OF2-1, OF2-2, OF2-3, OF1-1, OF1-2, and OF1-3 were qualified with an asterisk. However, this compound was not detected in the samples and the data were reported as usable.

- The LCS recovery was below the control limit for pentachlorophenol, indicating a potential low bias, and the re-analysis results for OF2-1, OF2-2, and OF2-3 were qualified with an asterisk. However, the original unqualified result for pentachlorophenol met reporting limit requirements and was submitted in the sediment data report.

- Except for sample OF1-4, results for all motor oil (i.e., TPH – Residual) sample analyses were qualified with a J to indicate the result is less than the reporting limit (RL) but greater than or equal to the method detection limit (MDL), thus the concentration is an approximate value. Most sample results for silver and many of the sample results for mercury were similarly J-qualified. The following SVOC and organochlorine pesticide compounds also were J-qualified in one or more sample: benzo(a) anthracene, benzo(a) pyrene, benzofluoranthene, bis(2-ethylhexyl) phthalate, indeno(1,2,3-cd) pyrene, pyrene, chrysene, fluoranthene, pentachlorophenol, 4,4'-DDE, beta-hexachlorocyclohexane

- TOC samples were qualified with a B to indicate that TOC was found in the method blank as well as the sample. Many of the TOC samples were also qualified with a J to indicate the result is less than the reporting limit (RL) but greater than or equal to the method detection limit (MDL), thus the concentration is an approximate value.

- The laboratory assigned a qualifier (p) to results for 4,4'-DDD, 4,4'-DDE, dieldrin, and endrin keytone in one or more sample from the Outfall 001 area. This qualifier indicates that the % RPD between the primary and confirmation column/detector is >40 %, and the lower value has been reported. These results were either detected or not detected at reporting limits that were far below SCO concentrations; therefore, the data qualifiers were not a concern for interpreting results.

- The laboratory assigned a qualifier (F1) to sample OF1-1 results for dieldrin and beta-hexachlorocyclohexane, due to MS and/or MSD recoveries outside of acceptance limits. Similarly, the F1 qualifier was assigned to results for benzo(g,h,i)perylene, dibenz(a,h,)anthracene, di-n-ocytl phthalate, and indeno(1,2,3-cd)pyrene in samples OF1-3; and benzoic acid in the original analysis of sample OF2-4. The F1 qualifier was also assigned to many of the SVOCs in the reanalysis of sample OF1-1. These results were non-detect at reporting limits more than one order of magnitude below SCO concentrations; therefore, the data qualifiers were not a concern for interpreting results.

- The laboratory assigned a qualifier (F2) to sample results due to the MS/MSD RPD exceeding control limits. This applied to several non-detect results for SVOCs in samples OF1-3 and OF2-4, low-level detections of SVOCs in the re-analysis of sample OF2-4, non-detect results for the original or re-analysis of organotins in samples OF2-4 and OF1-4, and the re-analysis of many SVOCs in sample OF-1. These data qualifiers did not affect comparisons to SCO concentrations.

- The chromium results for samples OF1-4, OF2-4, OF2-5, and OF2-5D were qualified with a B to indicate that chromium was found in the method blank as well as the sample. This indicator of potential positive bias in the sample results was not a concern because the reported concentrations were well below the SCO concentration.

- The laboratory assigned a qualifier (F1) to sample OF2-4 results for chromium and copper due to MS and/or MSD recoveries outside of acceptance limits. The high recoveries indicating potential positive bias in the sample results were not a concern because the reported concentrations were well below the SCO concentrations.

- Maxxam assigned a J qualifier to estimated concentrations between the Estimated Detection Limit (EDL) and Reportable Detection Limit (RDL). A U qualifier was used to indicate where the analyte was undetected at the limit of quantitation.

Sediment Bioassay Data Package

Both the amphipod 10-day sediment bioassay and the midge 20-day sediment bioassays were started on September 22, eight to ten days following sample collection, within the 2-week holding time recommended by Ecology. In addition, NAS collected a negative control sediment sample on September 13 from Beaver Creek near Newport, Oregon. The test data were reviewed by the NAS Quality Assurance Unit to assure that the studies were performed in accordance with the protocols and standard operating procedures.

All water quality observations during bioassay tests were within the protocol-specified ranges, and all other applicable acceptability criteria were met. Although the reference toxicant LC50 result for the amphipod test was slightly outside the laboratory's control chart action limits, a review of test organisms and test conditions and procedures indicated that there were no unusual circumstances that may have affected the test results. The amphipod test met the acceptability criteria specified in the SMS with 1.4% mean control mortality. The midge test met the acceptability criteria specified in the SMS with 2.5% mean control mortality and a control mean ash-free dry weight of 1.63 mg per larvae. The reference toxicant EC50 result for the midge test was within the laboratory's control chart limits. In summary, this data quality review found all of the bioassay test results to be acceptable.