

SUBMITTED TO:
Earle M. Jorgensen
Company
10650 S. Alameda Street
Lynwood, CA 90262

Part 5 of 5
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Important Information

BY:
Shannon & Wilson
400 N. 34th Street, Suite 100
Seattle, WA 98103

(206) 632-8020
www.shannonwilson.com

DRAFT FOR PUBLIC
COMMENT

REMEDIAL INVESTIGATION REPORT
**Jorgensen Forge Corporation
Property**
TUKWILA, WASHINGTON

Appendix E

Data Quality Summary Reports

CONTENTS

- Data Quality Summary Report – November 2020 Remedial Investigation
- Data Quality Summary - 2021 Q1 through Q4 Site Investigation
- Laboratory Analytical Reports

Laboratory Analytical Reports List

Sampling Event	Work Order Number	Laboratory
November 2020		
First Soil Sampling Mobilization	20K0101	Analytical Resources, Inc
First Soil Sampling Mobilization	20K0117	Analytical Resources, Inc
First Soil Sampling Mobilization	20K0152	Analytical Resources, Inc
First Soil Sampling Mobilization	20L0098	Analytical Resources, Inc
First Soil Sampling Mobilization	20L0100	Analytical Resources, Inc
First Soil Sampling Mobilization	20L0286	Analytical Resources, Inc
First Soil Sampling Mobilization	20L0436	Analytical Resources, Inc
First Soil Sampling Mobilization	20L0437	Analytical Resources, Inc
First Quarter 2021		
Second Soil Sampling Mobilization	21A0352	Analytical Resources, Inc
Second Soil Sampling Mobilization	21A0376	Analytical Resources, Inc
Second Soil Sampling Mobilization	21B0005	Analytical Resources, Inc
Second Soil Sampling Mobilization	21B0081	Analytical Resources, Inc
Second Soil Sampling Mobilization	21B0087	Analytical Resources, Inc
Second Soil Sampling Mobilization	21B0101	Analytical Resources, Inc
Second Soil Sampling Mobilization	21B0126	Analytical Resources, Inc
Second Soil Sampling Mobilization	21D0061	Analytical Resources, Inc
1Q Groundwater Sampling	21B0160	Analytical Resources, Inc
1Q Groundwater Sampling	21B0174	Analytical Resources, Inc
1Q Groundwater Sampling	21B0192	Analytical Resources, Inc
1Q Groundwater Sampling	21B0227	Analytical Resources, Inc
1Q Groundwater Sampling	21B0239	Analytical Resources, Inc
1Q Groundwater Sampling	21B0255	Analytical Resources, Inc
1Q Groundwater Sampling	21B0272	Analytical Resources, Inc
1Q Groundwater Sampling	21B0296	Analytical Resources, Inc
1Q Groundwater Sampling	21B0309	Analytical Resources, Inc
1Q Groundwater Sampling	21B0322	Analytical Resources, Inc
1Q Groundwater Sampling	21B0344	Analytical Resources, Inc
1Q Groundwater Sampling	21D0265	Analytical Resources, Inc
1Q Groundwater Sampling	J70313-1	Eurofins/Test America
Lab Omissions from 1Q Sampling Events	21G0121	Analytical Resources, Inc
Second Quarter 2021		
2Q Groundwater Sampling	21E0174	Analytical Resources, Inc
2Q Groundwater Sampling	21E0190	Analytical Resources, Inc
2Q Groundwater Sampling	21E0194	Analytical Resources, Inc
2Q Groundwater Sampling	21E0206	Analytical Resources, Inc
2Q Groundwater Sampling	21E0213	Analytical Resources, Inc
2Q Groundwater Sampling	21E0244	Analytical Resources, Inc
2Q Groundwater Sampling	21E0260	Analytical Resources, Inc
2Q Groundwater Sampling	21E0290	Analytical Resources, Inc
2Q Groundwater Sampling	21E0302	Analytical Resources, Inc
2Q Groundwater Sampling	21E0323	Analytical Resources, Inc
2Q Groundwater Sampling	21E0352	Analytical Resources, Inc
2Q Groundwater Sampling	21E0361	Analytical Resources, Inc

Laboratory Analytical Reports List

Sampling Event	Work Order Number	Laboratory
Third Quarter 2021		
3Q Groundwater Sampling	21H0207	Analytical Resources, Inc
3Q Groundwater Sampling	21H0209	Analytical Resources, Inc
3Q Groundwater Sampling	21H0210	Analytical Resources, Inc
3Q Groundwater Sampling	21H0222	Analytical Resources, Inc
3Q Groundwater Sampling	21H0230	Analytical Resources, Inc
3Q Groundwater Sampling	21H0248	Analytical Resources, Inc
3Q Groundwater Sampling	21H0282	Analytical Resources, Inc
3Q Groundwater Sampling	21H0291	Analytical Resources, Inc
3Q Groundwater Sampling	21H0304	Analytical Resources, Inc
3Q Groundwater Sampling	21H0320	Analytical Resources, Inc
3Q Groundwater Sampling	21H0341	Analytical Resources, Inc
3Q Groundwater Sampling	21H0367	Analytical Resources, Inc
3Q Groundwater Sampling	21I0001	Analytical Resources, Inc
3Q Groundwater Sampling	21I0012	Analytical Resources, Inc
3Q Groundwater Sampling	21I0040	Analytical Resources, Inc
Fourth Quarter 2021		
Follow-Up Soil Sampling	21J0060	Analytical Resources, Inc
Follow-Up Soil Sampling-IDW	21L0122	Analytical Resources, Inc
4Q Groundwater Sampling	21K0165	Analytical Resources, Inc
4Q Groundwater Sampling	21K0213	Analytical Resources, Inc
4Q Groundwater Sampling	21K0240	Analytical Resources, Inc
4Q Groundwater Sampling	21K0245	Analytical Resources, Inc
4Q Groundwater Sampling	21K0284	Analytical Resources, Inc
4Q Groundwater Sampling	21K0303	Analytical Resources, Inc
4Q Groundwater Sampling	21K0322	Analytical Resources, Inc
4Q Groundwater Sampling	21K0343	Analytical Resources, Inc
4Q Groundwater Sampling	21K0367	Analytical Resources, Inc
4Q Groundwater Sampling	21K0382	Analytical Resources, Inc
4Q Groundwater Sampling	21K0419	Analytical Resources, Inc
4Q Groundwater Sampling	21K0444	Analytical Resources, Inc
4Q Groundwater Sampling	21L0003	Analytical Resources, Inc
4Q Groundwater Sampling	21L0031	Analytical Resources, Inc
4Q Groundwater Sampling	21L0046	Analytical Resources, Inc
4Q Groundwater Sampling	21L0078	Analytical Resources, Inc
4Q Groundwater Sampling	J81991-1	Eurofins/Test America
4Q Groundwater Sampling	J82516-1	Eurofins/Test America
4Q Groundwater Sampling-IDW	J83346-1	Eurofins/Test America

NOTES:

1Q, 2Q, 3Q, and 4Q refer to the first, second, third, and fourth quarters of 2021.

IDW = investigation-derived waste



Analytical Resources, LLC
Analytical Chemists and Consultants

16 December 2021

Meg Strong
Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle, WA 98103-8636

RE: Lower Duwamish Q4

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)
21K0444

Associated SDG ID(s)
N/A

Digitally signed by
Shelly Fishel
Shelly Fishel
Date: 2021.12.16
12:59:41 -08'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

Shelly Fishel, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 211604414		Turn-around Requested: Standard		Page: 1 of 1													
ARI Client Company: Shannon & Wilson		Phone:		Date:	Ice Present?												
Client Contact: Shoshana Howard		No. of Coolers:		Cooler Temps: 39.15													
Client Project Name: LDW		Analysis Requested				Notes/Comments											
Client Project #: 21-1-12596	Samplers: DES BMV		TPH-G	TPH-Dx	BTEX	THVOCs	MTBE	PAHs (Aroclors)	Full SVOCs	Limited SVOCs	PCBs	Metals	Hex. Chrome	N.A.P		① As, Ba, Cr, Mn, Mn, Ni, Co, Cu, Fe, Pb, Hg, Se, Ag, V, Zn ② As, Cr, Mn, Ni, Zn	
Sample ID	Date	Time	Matrix	No. Containers													
MW-72-20213011	11/30	0929	GW	2					X								
MW-70-20213011	11/30	1012	GW	15	X	X	X	X	X		X	①					
MW-39-20213011	11/30	1050	GW	14	X	X	X	X			X	②	X				
MW-59-20213011	11/30	1315	GW	11		X	X	X	X			①					
TB-13-20213011	11/30	1230	W	5		X	X										
Comments/Special Instructions • metals are not field filtered • reference project for detection limits		Relinquished by: (Signature) <i>[Signature]</i>		Received by: (Signature) <i>[Signature]</i>		Relinquished by: (Signature)		Received by: (Signature)		Relinquished by: (Signature)		Received by: (Signature)		Relinquished by: (Signature)		Received by: (Signature)	
		Printed Name: Rose Vogt		Printed Name: D. L. [Signature]		Printed Name:		Printed Name:		Printed Name:		Printed Name:		Printed Name:		Printed Name:	
		Company: Shannon & Wilson		Company: ARI		Company:		Company:		Company:		Company:		Company:		Company:	
		Date & Time: 11/19 11/30/21		Date & Time: 11/30/21 1419		Date & Time:		Date & Time:		Date & Time:		Date & Time:		Date & Time:		Date & Time:	

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

RE: LDW Q4 Receiving Documentation 21K0444

Shoshana Howard <Shoshana.Howard@shanwil.com>

Wed 12/1/2021 1:40 PM

To: Meg Strong <Meg.Strong@shanwil.com>; Shelly Fishel <shelly.fishel@arilabs.com>

Hi Shelly,

Went through this one a bit more. Can you add Cobalt to the metals lists for MW-70 and MW-59? Those should have been the whole list, but somehow Mn was listed twice and Co was omitted.

Thanks!

Shoshana Howard, PE

SENIOR ENGINEER

SHANNON & WILSON

400 N 34th Street, Suite 100

Seattle, WA 98103

shannonwilson.com

Phone: **(206) 632-8020**

Direct: **(206) 695-6811**

Mobile: **(206) 900-2720**

Shoshana.Howard@shanwil.com

Please note, my email address has been updated. You can still reach me at the old address.

From: Meg Strong <Meg.Strong@shanwil.com>

Sent: Wednesday, December 1, 2021 11:35 AM

To: Shelly Fishel <shelly.fishel@arilabs.com>; Shoshana Howard <Shoshana.Howard@shanwil.com>

Subject: RE: LDW Q4 Receiving Documentation 21K0444

Hi Shelly

Please score through the aroclor word and proceed with PAH analysis for that column.

Thanks for checking.

With regards, Meg

From: Shelly Fishel <shelly.fishel@arilabs.com>
Sent: Wednesday, December 1, 2021 9:15 AM
To: Shoshana Howard <Shoshana.Howard@shanwil.com>; Meg Strong <Meg.Strong@shanwil.com>
Subject: LDW Q4 Receiving Documentation 21K0444

Hello Shoshana and Meg,

ARI received four monitoring well samples and a trip blank that were logged in under work order 21K0444. Receiving documents are attached. The samples were intact and within temperature compliance. Please note that we are a bit confused by the column headers. PAH is listed with (Aroclors) and then another column is PCBs. There are two samples which only have one requested. please confirm we have accurately selected the analyses. Also noted that the trip blank does not request THP-Gx. Is this intentional or an omission? Gx has not been logged.

Be safe and stay healthy!

Regards,

Shelly L Fishel, *Project Manager*

She/Her/Hers

Analytical Resources, LLC

Analytical Chemists and Consultants

4611 South 134th Place, Suite 100

Tukwila, WA 98168

(206) 695-6210 office

Email: shelly.fishel@arilabs.com

I will be out of the office December 30th.



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-72-20213011	21K0444-01	Water	30-Nov-2021 09:29	30-Nov-2021 14:19
MW-70-20213011	21K0444-02	Water	30-Nov-2021 10:12	30-Nov-2021 14:19
MW-70-20213011	21K0444-03	Water	30-Nov-2021 10:12	30-Nov-2021 14:19
MW-39-20213011	21K0444-04	Water	30-Nov-2021 10:50	30-Nov-2021 14:19
MW-39-20213011	21K0444-05	Water	30-Nov-2021 10:50	30-Nov-2021 14:19
MW-59-20213011	21K0444-06	Water	30-Nov-2021 13:15	30-Nov-2021 14:19
MW-59-20213011	21K0444-07	Water	30-Nov-2021 13:15	30-Nov-2021 14:19
TB-13-20213011	21K0444-08	Water	30-Nov-2021 12:30	30-Nov-2021 14:19



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Work Order Case Narrative

Client: Shannon & Wilson, Inc
Project: Lower Duwamish Q4
Work Order: 21K0444

Sample receipt

Samples as listed on the preceding page were received 30-Nov-2021 14:19 under ARI work order 21K0444. For details regarding sample receipt, please refer to the Cooler Receipt Form.

PCB Aroclors - EPA Method SW8082A

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Gasoline by NWTPH-g (GC/MS)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements except second source calibration verification SJK0348-SCV1 which was out of control low.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method SW8260D



Analytical Report

Shannon & Wilson, Inc
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Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method 8260D-SIM (Selected Ion Monitoring)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements except Vinyl Chloride which was out of control low in the second source calibration verification SJK0392-SCV1.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits except 1,2-Dichloroethane-d4 which was out of control high in sample 21K0444-06 and has been flagged.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Semivolatiles - EPA Method SW8270E

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements except as follows. 2,4-Dinitrophenol, Benzoic Acid and Hexachlorocyclopentadiene which were out of control low and Butylbenzylphthalate which was out of control high in the initial calibration verification SJL0168-ICV1. All samples which contain analyte have been flagged with a "Q" qualifier.

2,4-Dichlorophenol, 4,6-Dinitro-2-methylphenol, 4-Nitrophenol, Benzoic Acid, Benzyl Alcohol, Hexachlorocyclopentadiene and Pentachlorophenol which were out of control low in the low concentration calibration verification SJL0168-LCV1.

2,4-Dichlorophenol, 4,6-Dinitro-2-methylphenol, Benzoic Acid, Hexachlorocyclopentadiene and Pentachlorophenol which were out of control low in the low concentration calibration verification SJL0168-LCV2.

Internal standard areas were within limits.



Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

The surrogate percent recoveries were within control limits except Phenol-d5 which was out of control low in the method blank BJL0109-BLK1.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Polynuclear Aromatic Hydrocarbons (PAH) - EPA Method SW8270E-SIM

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Total and Dissolved Metals - EPA Method 6020B

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Wet Chemistry

The sample(s) were prepared and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21K0444-04 in Hexavalent Chromium batch BJK0745. The



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

matrix spike (MS) percent recoveries and the duplicate (DUP) relative percent difference (RPD) were within advisory control limits.

Total and Dissolved Mercury - EPA Method 7470/7471

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21K0444-02 in Total Mercury batch B JL0219 and in association with sample 21K0444-03RE1 in Dissolved Mercury batch B JL0271. The matrix spike and matrix spike duplicate (MS/MSD) spike recoveries and relative percent difference (RPD) were within control limits. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits.

Diesel/Heavy Oil Range Organics - WA-Ecology Method NW-TPHDx

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

**WORK ORDER**

21K0444

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc**Project Manager:** Shelly Fishel**Project:** Lower Duwamish Q4**Project Number:** 21-1-12596-012**Preservation Confirmation**

Container ID	Container Type	pH
21K0444-01 A	Glass NM, Amber, 500 mL	
21K0444-02 A	Glass NM, Amber, 1000 mL	
21K0444-02 B	Glass NM, Amber, 1000 mL	
21K0444-02 C	HDPE NM, 500 mL, 1:1 HNO ₃	<2 Pass
21K0444-02 D	Glass NM, Amber, 500 mL	
21K0444-02 E	Glass NM, Amber, 500 mL	
21K0444-02 F	Glass NM, Amber, 500 mL	
21K0444-02 G	Glass NM, Amber, 500 mL	
21K0444-02 H	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 I	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 J	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 K	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 L	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 M	VOA Vial, Clear, 40 mL, HCL	
21K0444-03 A	HDPE NM, 500 mL	>2 Fail
21K0444-04 A	Glass NM, Amber, 1000 mL	
21K0444-04 B	Glass NM, Amber, 1000 mL	
21K0444-04 C	HDPE NM, 500 mL, 1:1 HNO ₃	<2 Pass
21K0444-04 D	Glass NM, Amber, 500 mL	
21K0444-04 E	Glass NM, Amber, 500 mL	
21K0444-04 F	Glass NM, Amber, 250 mL	
21K0444-04 G	VOA Vial, Clear, 40 mL, HCL	
21K0444-04 H	VOA Vial, Clear, 40 mL, HCL	
21K0444-04 I	VOA Vial, Clear, 40 mL, HCL	
21K0444-04 J	VOA Vial, Clear, 40 mL, HCL	
21K0444-04 K	VOA Vial, Clear, 40 mL, HCL	
21K0444-05 A	HDPE NM, 500 mL	>2 Fail
21K0444-06 A	HDPE NM, 500 mL, 1:1 HNO ₃	<2 Pass
21K0444-06 B	Glass NM, Amber, 500 mL	
21K0444-06 C	Glass NM, Amber, 500 mL	
21K0444-06 D	Glass NM, Amber, 500 mL	
21K0444-06 E	Glass NM, Amber, 500 mL	
21K0444-06 F	VOA Vial, Clear, 40 mL, HCL	
21K0444-06 G	VOA Vial, Clear, 40 mL, HCL	

Reviewed By _____

Date _____



Analytical Resources, LLC
Analytical Chemists and Consultants

Printed: 11/30/2021 03:47:21PM

WORK ORDER

21K0444

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21K0444-06 H	VOA Vial, Clear, 40 mL, HCL
21K0444-06 I	VOA Vial, Clear, 40 mL, HCL
21K0444-06 J	VOA Vial, Clear, 40 mL, HCL
21K0444-07 A	HDPE NM, 500 mL
21K0444-08 A	VOA Vial, Clear, 40 mL, HCL
21K0444-08 B	VOA Vial, Clear, 40 mL, HCL
21K0444-08 C	VOA Vial, Clear, 40 mL, HCL
21K0444-08 D	VOA Vial, Clear, 40 mL, HCL
21K0444-08 E	VOA Vial, Clear, 40 mL, HCL

>2 Fail

DL
Preservation Confirmed By

11/30/21
Date

Reviewed By

Date



Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Shannon & Wilson

Project Name: IDW

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 21K0444

Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES NO
 Were custody papers included with the cooler? YES NO
 Were custody papers properly filled out (ink, signed, etc.) YES NO
 Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) YES NO

Time 1419

3.9 1.5

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: DOO

Cooler Accepted by: DL Date: 11/30/21 Time: 1419

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES NO
 What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: YES NO
 Was sufficient ice used (if appropriate)? NA YES NO
 How were bottles sealed in plastic bags? Individually Grouped Not
 Did all bottles arrive in good condition (unbroken)? YES NO
 Were all bottle labels complete and legible? YES NO
 Did the number of containers listed on COC match with the number of containers received? YES NO
 Did all bottle labels and tags agree with custody papers? YES NO
 Were all bottles used correct for the requested analyses? YES NO
 Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... NA YES NO
 Were all VOC vials free of air bubbles? NA YES NO
 Was sufficient amount of sample sent in each bottle? NA YES NO
 Date VOC Trip Blank was made at ARI NA YES NO
 Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: DL Date: 11/30/21 Time: 1515 Labels checked by: _____

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____ Date: _____



Analytical Resources, LLC
Analytical Chemists and Consultants

Printed: 11/30/2021 03:47:21PM

WORK ORDER

21K0444

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Preservation Confirmation

Container ID	Container Type	pH
21K0444-01 A	Glass NM, Amber, 500 mL	
21K0444-02 A	Glass NM, Amber, 1000 mL	
21K0444-02 B	Glass NM, Amber, 1000 mL	
21K0444-02 C	HDPE NM, 500 mL, 1:1 HNO3	22 Pass
21K0444-02 D	Glass NM, Amber, 500 mL	
21K0444-02 E	Glass NM, Amber, 500 mL	
21K0444-02 F	Glass NM, Amber, 500 mL	
21K0444-02 G	Glass NM, Amber, 500 mL	
21K0444-02 H	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 I	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 J	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 K	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 L	VOA Vial, Clear, 40 mL, HCL	
21K0444-02 M	VOA Vial, Clear, 40 mL, HCL	
21K0444-03 A	HDPE NM, 500 mL	22 Fail (b)
21K0444-04 A	Glass NM, Amber, 1000 mL	
21K0444-04 B	Glass NM, Amber, 1000 mL	
21K0444-04 C	HDPE NM, 500 mL, 1:1 HNO3	22 Pass
21K0444-04 D	Glass NM, Amber, 500 mL	
21K0444-04 E	Glass NM, Amber, 500 mL	
21K0444-04 F	Glass NM, Amber, 250 mL	
21K0444-04 G	VOA Vial, Clear, 40 mL, HCL	
21K0444-04 H	VOA Vial, Clear, 40 mL, HCL	
21K0444-04 I	VOA Vial, Clear, 40 mL, HCL	
21K0444-04 J	VOA Vial, Clear, 40 mL, HCL	
21K0444-04 K	VOA Vial, Clear, 40 mL, HCL	
21K0444-05 A	HDPE NM, 500 mL	22 Fail (b)
21K0444-06 A	HDPE NM, 500 mL, 1:1 HNO3	22 Pass
21K0444-06 B	Glass NM, Amber, 500 mL	
21K0444-06 C	Glass NM, Amber, 500 mL	
21K0444-06 D	Glass NM, Amber, 500 mL	
21K0444-06 E	Glass NM, Amber, 500 mL	
21K0444-06 F	VOA Vial, Clear, 40 mL, HCL	
21K0444-06 G	VOA Vial, Clear, 40 mL, HCL	



WORK ORDER

21K0444

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21K0444-06 H VOA Vial, Clear, 40 mL, HCL

21K0444-06 I VOA Vial, Clear, 40 mL, HCL

21K0444-06 J VOA Vial, Clear, 40 mL, HCL

21K0444-07 A HDPE NM, 500 mL

>2 Fail

(1)

21K0444-08 A VOA Vial, Clear, 40 mL, HCL

21K0444-08 B VOA Vial, Clear, 40 mL, HCL

21K0444-08 C VOA Vial, Clear, 40 mL, HCL

21K0444-08 D VOA Vial, Clear, 40 mL, HCL

21K0444-08 E VOA Vial, Clear, 40 mL, HCL

DL

Preservation Confirmed By

11/30/21

Date

(1) filtered at 0.45 microns
& preserved to pH 2 with
0.75 MLC 84C. HNO₃ (510414)
12/1/21 MM



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-72-20213011

21K0444-01 (Water)

Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 11/30/2021 09:29

Instrument: NT10 Analyst: VTS

Analyzed: 12/10/2021 21:28

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJL0109
Prepared: 12/07/2021

Sample Size: 1000 mL
Final Volume: 1 mL

Extract ID: 21K0444-01 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Phenol	108-95-2	1	0.01	0.2	ND	ug/L	U
bis(2-chloroethyl) ether	111-44-4	1	0.03	0.2	ND	ug/L	U
2-Chlorophenol	95-57-8	1	0.03	0.2	ND	ug/L	U
1,3-Dichlorobenzene	541-73-1	1	0.03	0.2	ND	ug/L	U
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	ND	ug/L	U
Benzyl Alcohol	100-51-6	1	0.02	0.2	ND	ug/L	U
2,2'-Oxybis(1-chloropropane)	108-60-1	1	0.03	0.2	ND	ug/L	U
2-Methylphenol	95-48-7	1	0.03	0.2	ND	ug/L	U
Hexachloroethane	67-72-1	1	0.04	0.2	ND	ug/L	U
N-Nitroso-di-n-Propylamine	621-64-7	1	0.04	0.2	ND	ug/L	U
4-Methylphenol	106-44-5	1	0.03	0.2	ND	ug/L	U
Nitrobenzene	98-95-3	1	0.03	0.2	ND	ug/L	U
Isophorone	78-59-1	1	0.03	0.2	ND	ug/L	U
2-Nitrophenol	88-75-5	1	0.04	1.0	ND	ug/L	U
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Bis(2-Chloroethoxy)methane	111-91-1	1	0.03	0.2	ND	ug/L	U
2,4-Dichlorophenol	120-83-2	1	0.1	1.0	ND	ug/L	U
1,2,4-Trichlorobenzene	120-82-1	1	0.03	0.2	ND	ug/L	U
Naphthalene	91-20-3	1	0.03	0.2	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
4-Chloroaniline	106-47-8	1	0.04	1.0	ND	ug/L	U
Hexachlorobutadiene	87-68-3	1	0.04	0.2	ND	ug/L	U
4-Chloro-3-Methylphenol	59-50-7	1	0.1	1.0	ND	ug/L	U
2-Methylnaphthalene	91-57-6	1	0.03	0.2	ND	ug/L	U
Hexachlorocyclopentadiene	77-47-4	1	0.1	1.0	ND	ug/L	U
2,4,6-Trichlorophenol	88-06-2	1	0.2	1.0	ND	ug/L	U
2,4,5-Trichlorophenol	95-95-4	1	0.1	1.0	ND	ug/L	U
2-Chloronaphthalene	91-58-7	1	0.03	0.2	ND	ug/L	U
2-Nitroaniline	88-74-4	1	0.2	1.0	ND	ug/L	U
Acenaphthylene	208-96-8	1	0.02	0.2	ND	ug/L	U
Dimethylphthalate	131-11-3	1	0.04	0.2	ND	ug/L	U
2,6-Dinitrotoluene	606-20-2	1	0.2	1.0	ND	ug/L	U
Acenaphthene	83-32-9	1	0.03	0.2	ND	ug/L	U



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-72-20213011

21K0444-01 (Water)

Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 11/30/2021 09:29

Instrument: NT10 Analyst: VTS

Analyzed: 12/10/2021 21:28

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
3-Nitroaniline	99-09-2	1	0.2	1.0	ND	ug/L	U
2,4-Dinitrophenol	51-28-5	1	0.2	2.0	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.02	0.2	ND	ug/L	U
4-Nitrophenol	100-02-7	1	0.06	1.0	ND	ug/L	U
2,4-Dinitrotoluene	121-14-2	1	0.1	1.0	ND	ug/L	U
Fluorene	86-73-7	1	0.02	0.2	ND	ug/L	U
4-Chlorophenylphenyl ether	7005-72-3	1	0.02	0.2	ND	ug/L	U
Diethyl phthalate	84-66-2	1	0.06	0.2	ND	ug/L	U
4-Nitroaniline	100-01-6	1	0.2	1.0	ND	ug/L	U
4,6-Dinitro-2-methylphenol	534-52-1	1	0.4	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
4-Bromophenyl phenyl ether	101-55-3	1	0.02	0.2	ND	ug/L	U
Hexachlorobenzene	118-74-1	1	0.04	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Phenanthrene	85-01-8	1	0.02	0.2	ND	ug/L	U
Anthracene	120-12-7	1	0.03	0.2	ND	ug/L	U
Carbazole	86-74-8	1	0.04	0.2	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Fluoranthene	206-44-0	1	0.03	0.2	ND	ug/L	U
Pyrene	129-00-0	1	0.03	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
Benzo(a)anthracene	56-55-3	1	0.04	0.2	ND	ug/L	U
3,3'-Dichlorobenzidine	91-94-1	1	0.3	1.0	ND	ug/L	U
Chrysene	218-01-9	1	0.04	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U
Di-n-Octylphthalate	117-84-0	1	0.05	0.2	ND	ug/L	U
Benzo(a)fluoranthene, Total		1	0.08	0.4	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.05	0.2	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.06	0.2	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.07	0.2	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.04	0.2	ND	ug/L	U
1-Methylnaphthalene	90-12-0	1	0.03	0.2	ND	ug/L	U
Surrogate: 2-Fluorophenol				30-160 %	55.4	%	
Surrogate: Phenol-d5				30-160 %	30.0	%	
Surrogate: 2-Chlorophenol-d4				30-160 %	92.3	%	
Surrogate: 1,2-Dichlorobenzene-d4				30-160 %	81.0	%	
Surrogate: Nitrobenzene-d5				30-160 %	89.1	%	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-72-20213011

21K0444-01 (Water)

Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 11/30/2021 09:29

Instrument: NT10 Analyst: VTS

Analyzed: 12/10/2021 21:28

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Recovery	Recovery	Units	Notes
		Limits			
<i>Surrogate: 2-Fluorobiphenyl</i>		30-160 %	83.0	%	
<i>Surrogate: 2,4,6-Tribromophenol</i>		30-160 %	85.4	%	
<i>Surrogate: p-Terphenyl-d14</i>		30-160 %	91.5	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

MW-70-20213011
21K0444-02 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 11/30/2021 10:12

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 14:20

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-02 H

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	0.45	ug/L	
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	9.38	ug/L	
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	0.73	ug/L	
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					<i>80-129 %</i>	<i>119 %</i>	
<i>Surrogate: Toluene-d8</i>					<i>80-120 %</i>	<i>101 %</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>					<i>80-120 %</i>	<i>93.5 %</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					<i>80-120 %</i>	<i>102 %</i>	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-70-20213011

21K0444-02 (Water)

Volatile Organic Compounds

Method: NWTPHg

Sampled: 11/30/2021 10:12

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 14:20

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-02 H

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
<i>Surrogate: Toluene-d8</i>			80-120 %	101	%	
<i>Surrogate: 4-Bromofluorobenzene</i>			80-120 %	93.5	%	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-70-20213011

21K0444-02 (Water)

Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 11/30/2021 10:12

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 16:48

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-02 J

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>128</i>	<i>%</i>	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

MW-70-20213011
21K0444-02 (Water)
Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 11/30/2021 10:12

Instrument: NT11 Analyst: VTS

Analyzed: 12/11/2021 20:28

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF	Sample Size: 500 mL	Extract ID: 21K0444-02 F 01
	Preparation Batch: BJL0007	Final Volume: 0.5 mL	
	Prepared: 12/07/2021		
Sample Cleanup:	Cleanup Method: Silica Gel	Initial Volume: 0.5 mL	Extract ID: 21K0444-02 F 01
	Cleanup Batch: CJL0064	Final Volume: 0.5 mL	
	Cleaned: 08-Dec-2021		

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.003	ug/L	J
2-Methylnaphthalene	91-57-6	1	0.001	0.010	0.002	ug/L	J
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	0.001	ug/L	J
Acenaphthylene	208-96-8	1	0.002	0.010	ND	ug/L	U
Acenaphthene	83-32-9	1	0.003	0.010	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.002	0.010	0.002	ug/L	J
Fluorene	86-73-7	1	0.002	0.010	ND	ug/L	U
Phenanthrene	85-01-8	1	0.001	0.010	0.002	ug/L	J
Anthracene	120-12-7	1	0.001	0.010	0.002	ug/L	J
Carbazole	86-74-8	1	0.001	0.010	ND	ug/L	U
Fluoranthene	206-44-0	1	0.002	0.010	ND	ug/L	U
Pyrene	129-00-0	1	0.001	0.010	0.003	ug/L	J
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	ND	ug/L	U
Chrysene	218-01-9	1	0.0009	0.010	0.002	ug/L	J
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	ND	ug/L	U
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.002	0.010	ND	ug/L	U
Perylene	1985-5-0	1	0.006	0.010	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	ND	ug/L	U
<i>Surrogate: 2-Methylnaphthalene-d10</i>					42-120 %	81.8 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					29-120 %	85.1 %	
<i>Surrogate: Fluoranthene-d10</i>					57-120 %	94.2 %	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-70-20213011

21K0444-02 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 11/30/2021 10:12

Instrument: FID4 Analyst: TWC

Analyzed: 12/03/2021 18:44

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21K0444-02 D 01

Preparation Batch: BJL0006

Sample Size: 500 mL

Prepared: 12/02/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			<i>50-150 %</i>	<i>108</i>	<i>%</i>	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-70-20213011

21K0444-02 (Water)

Aroclor PCB

Method: EPA 8082A

Sampled: 11/30/2021 10:12

Instrument: ECD7 Analyst: JGR

Analyzed: 12/06/2021 18:27

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0034 Prepared: 12/02/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21K0444-02 A 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0045 Cleaned: 06-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21K0444-02 A 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0043 Cleaned: 06-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21K0444-02 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0044 Cleaned: 06-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21K0444-02 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
Surrogate: Decachlorobiphenyl				29-120 %	77.3	%	
Surrogate: Tetrachlorometaxylene				32-120 %	73.6	%	
Surrogate: Decachlorobiphenyl [2C]				29-120 %	82.9	%	
Surrogate: Tetrachlorometaxylene [2C]				32-120 %	66.1	%	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-70-20213011

21K0444-02 (Water)

Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 11/30/2021 10:12

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 01:12

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21K0444-02 C 01

Preparation Batch: BJL0197

Sample Size: 25 mL

Prepared: 12/08/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium	7440-39-3	1	0.114	0.500	8.55	ug/L	
Chromium	7440-47-3	1	0.260	0.500	1.08	ug/L	
Iron	7439-89-6	1	18.2	36.0	593	ug/L	
Lead	7439-92-1	1	0.0513	0.100	0.632	ug/L	
Manganese	7439-96-5	1	0.142	0.500	118	ug/L	
Silver	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium	7440-62-2	1	0.0556	0.200	7.19	ug/L	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-70-20213011

21K0444-02 (Water)

Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 11/30/2021 10:12

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 01:12

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BJL0197 Sample Size: 25 mL
Prepared: 12/08/2021 Final Volume: 25 mL

Extract ID: 21K0444-02 C 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	1	0.0373	0.200	2.06	ug/L	
Cadmium	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt	7440-48-4	1	0.0178	0.200	0.474	ug/L	
Copper	7440-50-8	1	0.173	0.500	3.61	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	2.54	ug/L	
Selenium	7782-49-2	1	0.179	0.500	0.686	ug/L	
Zinc	7440-66-6	1	2.92	6.00	8.14	ug/L	



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Analytical Report

Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-70-20213011

21K0444-02 (Water)

Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 11/30/2021 10:12

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 14:13

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21K0444-02 C

Preparation Batch: BJL0219

Sample Size: 20 mL

Prepared: 12/09/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

MW-70-20213011
21K0444-03 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 11/30/2021 10:12

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/08/2021 04:39

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix	Extract ID: 21K0444-03 A 02
	Preparation Batch: BJL0168	Filtration Batch: BJL0036
	Prepared: 12/07/2021	Filtration Date: 12/01/2021 15:23
	Sample Size: 25 mL	
	Final Volume: 25 mL	

Analyte	CAS Number	Dilution	Detection		Reporting		Result	Units	Notes
			Limit	Limit	Limit	Limit			
Barium, Dissolved	7440-39-3	1	0.114	0.500			5.07	ug/L	
Chromium, Dissolved	7440-47-3	1	0.260	0.500			0.517	ug/L	
Iron, Dissolved	7439-89-6	1	18.2	36.0			55.8	ug/L	
Lead, Dissolved	7439-92-1	1	0.0513	0.100			ND	ug/L	U
Manganese, Dissolved	7439-96-5	1	0.142	0.500			103	ug/L	
Silver, Dissolved	7440-22-4	1	0.0220	0.200			ND	ug/L	U
Vanadium, Dissolved	7440-62-2	1	0.0556	0.200			6.09	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

MW-70-20213011
21K0444-03 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 11/30/2021 10:12

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 01:17

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix	Extract ID: 21K0444-03 A 02
	Preparation Batch: BJL0168	Filtration Batch: BJL0036
	Prepared: 12/07/2021	Filtration Date: 12/01/2021 15:23
	Sample Size: 25 mL	
	Final Volume: 25 mL	

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	1.41	ug/L	
Cadmium, Dissolved	7440-43-9	1	0.0300	0.100	0.0360	ug/L	J
Copper, Dissolved	7440-50-8	1	0.173	0.500	1.99	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	1.60	ug/L	
Selenium, Dissolved	7782-49-2	1	0.179	0.500	0.379	ug/L	J
Zinc, Dissolved	7440-66-6	1	2.92	6.00	6.39	ug/L	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-70-20213011
21K0444-03RE1 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 11/30/2021 10:12

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 15:13

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21K0444-03RE1 A 01

Preparation Batch: BJL0271

Sample Size: 20 mL

Filtration Batch: BJL0036

Prepared: 12/13/2021

Final Volume: 20 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


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 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

MW-39-20213011
21K0444-04 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 11/30/2021 10:50

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 14:46

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-04 I

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>112</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>103</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>98.3</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>99.8</i>	<i>%</i>	



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Project: Lower Duwamish Q4
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Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-39-20213011

21K0444-04 (Water)

Volatile Organic Compounds

Method: NWTPHg

Sampled: 11/30/2021 10:50

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 14:46

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-04 I

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
<i>Surrogate: Toluene-d8</i>			80-120 %	103	%	
<i>Surrogate: 4-Bromofluorobenzene</i>			80-120 %	98.3	%	



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Analytical Report

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Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-39-20213011

21K0444-04 (Water)

Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 11/30/2021 10:50

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 17:17

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-04 J

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	127	%	



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Analytical Report

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Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-39-20213011

21K0444-04 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 11/30/2021 10:50

Instrument: FID4 Analyst: TWC

Analyzed: 12/03/2021 19:04

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21K0444-04 D 01

Preparation Batch: BJL0006

Sample Size: 500 mL

Prepared: 12/02/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			<i>50-150 %</i>	<i>112</i>	<i>%</i>	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

MW-39-20213011
21K0444-04 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 11/30/2021 10:50

Instrument: ECD7 Analyst: JGR

Analyzed: 12/06/2021 18:48

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0034 Prepared: 12/02/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21K0444-04 A 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0045 Cleaned: 06-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21K0444-04 A 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0043 Cleaned: 06-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21K0444-04 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0044 Cleaned: 06-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21K0444-04 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	0.004	ug/L	J
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	84.0	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	75.8	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	86.1	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	75.1	%	



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Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-39-20213011

21K0444-04 (Water)

Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 11/30/2021 10:50

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 01:07

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21K0444-04 C 01

Preparation Batch: BJL0197

Sample Size: 25 mL

Prepared: 12/08/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Chromium	7440-47-3	1	0.260	0.500	11.4	ug/L	
Manganese	7439-96-5	1	0.142	0.500	7.74	ug/L	



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Analytical Report

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Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-39-20213011

21K0444-04 (Water)

Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 11/30/2021 10:50

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 01:07

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21K0444-04 C 01

Preparation Batch: BJL0197

Sample Size: 25 mL

Prepared: 12/08/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	1.59	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	0.421	ug/L	J
Zinc	7440-66-6	1	2.92	6.00	ND	ug/L	U



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Analytical Report

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Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-39-20213011

21K0444-04 (Water)

Wet Chemistry

Method: SM 3500-Cr B-09

Sampled: 11/30/2021 10:50

Instrument: UV1800-1 Analyst: RMS

Analyzed: 11/30/2021 16:56

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: No Prep Wet Chem

Extract ID: 21K0444-04 F 01

Preparation Batch: BJK0745

Sample Size: 40 mL

Prepared: 11/30/2021

Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Hexavalent Chromium	1854-02-99	1.25	0.013	0.013	0.013	mg/L	D



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Analytical Report

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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-39-20213011

21K0444-05 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 11/30/2021 10:50

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/08/2021 04:43

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21K0444-05 A 02

Preparation Batch: BJL0168

Sample Size: 25 mL

Filtration Batch: BJL0036

Prepared: 12/07/2021

Final Volume: 25 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Chromium, Dissolved	7440-47-3	1	0.260	0.500	12.3	ug/L	
Manganese, Dissolved	7439-96-5	1	0.142	0.500	0.246	ug/L	J



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Analytical Report

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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-39-20213011

21K0444-05 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 11/30/2021 10:50

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 01:29

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21K0444-05 A 02

Preparation Batch: BJL0168

Sample Size: 25 mL

Filtration Batch: BJL0036

Prepared: 12/07/2021

Final Volume: 25 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	1.65	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	0.179	ug/L	J
Zinc, Dissolved	7440-66-6	1	2.92	6.00	ND	ug/L	U


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

MW-59-20213011
21K0444-06 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 11/30/2021 13:15

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 15:11

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-06 G

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	117	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	101	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	94.7	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	104	%	



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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-59-20213011

21K0444-06 (Water)

Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 11/30/2021 13:15

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 17:46

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-06 H

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>131</i>	<i>%</i>	<i>*</i>



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-59-20213011

21K0444-06 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 11/30/2021 13:15

Instrument: NT11 Analyst: VTS

Analyzed: 12/11/2021 20:58

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0007 Prepared: 12/07/2021	Sample Size: 500 mL Final Volume: 0.5 mL	Extract ID: 21K0444-06 D 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0064 Cleaned: 08-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21K0444-06 D 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.004	ug/L	J
2-Methylnaphthalene	91-57-6	1	0.001	0.010	0.002	ug/L	J
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	0.002	ug/L	J
Acenaphthylene	208-96-8	1	0.002	0.010	ND	ug/L	U
Acenaphthene	83-32-9	1	0.003	0.010	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.002	0.010	0.002	ug/L	J
Fluorene	86-73-7	1	0.002	0.010	ND	ug/L	U
Phenanthrene	85-01-8	1	0.001	0.010	0.002	ug/L	J
Anthracene	120-12-7	1	0.001	0.010	ND	ug/L	U
Carbazole	86-74-8	1	0.001	0.010	ND	ug/L	U
Fluoranthene	206-44-0	1	0.002	0.010	ND	ug/L	U
Pyrene	129-00-0	1	0.001	0.010	0.002	ug/L	J
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	ND	ug/L	U
Chrysene	218-01-9	1	0.0009	0.010	0.002	ug/L	J
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	ND	ug/L	U
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.002	0.010	ND	ug/L	U
Perylene	1985-5-0	1	0.006	0.010	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	ND	ug/L	U
Surrogate: 2-Methylnaphthalene-d10					42-120 %	84.2 %	
Surrogate: Dibenzo[a,h]anthracene-d14					29-120 %	89.4 %	
Surrogate: Fluoranthene-d10					57-120 %	97.8 %	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-59-20213011

21K0444-06 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 11/30/2021 13:15

Instrument: FID4 Analyst: TWC

Analyzed: 12/03/2021 19:23

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21K0444-06 B 01

Preparation Batch: BJL0006

Sample Size: 500 mL

Prepared: 12/02/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			<i>50-150 %</i>	<i>110</i>	<i>%</i>	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-59-20213011

21K0444-06 (Water)

Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 11/30/2021 13:15

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 02:08

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21K0444-06 A 01

Preparation Batch: BJL0197

Sample Size: 25 mL

Prepared: 12/08/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium	7440-39-3	1	0.114	0.500	8.01	ug/L	
Chromium	7440-47-3	1	0.260	0.500	0.561	ug/L	
Iron	7439-89-6	1	18.2	36.0	5010	ug/L	
Lead	7439-92-1	1	0.0513	0.100	0.150	ug/L	
Manganese	7439-96-5	1	0.142	0.500	250	ug/L	
Silver	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium	7440-62-2	1	0.0556	0.200	3.08	ug/L	



Analytical Resources, LLC
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Analytical Report

Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-59-20213011

21K0444-06 (Water)

Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 11/30/2021 13:15

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 02:08

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21K0444-06 A 01

Preparation Batch: BJL0197

Sample Size: 25 mL

Prepared: 12/08/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	2.96	ug/L	
Cadmium	7440-43-9	1	0.0300	0.100	0.0420	ug/L	J
Cobalt	7440-48-4	1	0.0178	0.200	3.42	ug/L	
Copper	7440-50-8	1	0.173	0.500	1.87	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	3.26	ug/L	
Selenium	7782-49-2	1	0.179	0.500	0.420	ug/L	J
Zinc	7440-66-6	1	2.92	6.00	ND	ug/L	U



Analytical Resources, LLC
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Analytical Report

Shannon & Wilson, Inc
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Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-59-20213011

21K0444-06 (Water)

Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 11/30/2021 13:15

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 14:27

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21K0444-06 A

Preparation Batch: BJL0219

Sample Size: 20 mL

Prepared: 12/09/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-59-20213011

21K0444-07 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 11/30/2021 13:15

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/08/2021 04:48

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21K0444-07 A 02

Preparation Batch: BJL0168

Sample Size: 25 mL

Filtration Batch: BJL0036

Prepared: 12/07/2021

Final Volume: 25 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium, Dissolved	7440-39-3	1	0.114	0.500	5.95	ug/L	
Chromium, Dissolved	7440-47-3	1	0.260	0.500	ND	ug/L	U
Iron, Dissolved	7439-89-6	1	18.2	36.0	3940	ug/L	
Lead, Dissolved	7439-92-1	1	0.0513	0.100	ND	ug/L	U
Manganese, Dissolved	7439-96-5	1	0.142	0.500	251	ug/L	
Silver, Dissolved	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium, Dissolved	7440-62-2	1	0.0556	0.200	1.14	ug/L	



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Analytical Report

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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-59-20213011

21K0444-07 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 11/30/2021 13:15

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 01:22

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21K0444-07 A 02

Preparation Batch: BJL0168

Sample Size: 25 mL

Filtration Batch: BJL0036

Prepared: 12/07/2021

Final Volume: 25 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	1.93	ug/L	
Cadmium, Dissolved	7440-43-9	1	0.0300	0.100	0.0490	ug/L	J
Copper, Dissolved	7440-50-8	1	0.173	0.500	0.541	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	2.96	ug/L	
Selenium, Dissolved	7782-49-2	1	0.179	0.500	0.338	ug/L	J
Zinc, Dissolved	7440-66-6	1	2.92	6.00	ND	ug/L	U



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Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

MW-59-20213011
21K0444-07RE1 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 11/30/2021 13:15

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 15:41

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21K0444-07RE1 A 01

Preparation Batch: BJL0271

Sample Size: 20 mL

Filtration Batch: BJL0036

Prepared: 12/13/2021

Final Volume: 20 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

TB-13-20213011
21K0444-08 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 11/30/2021 12:30

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 13:04

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-08 D

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>113</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>101</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>99.5</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>102</i>	<i>%</i>	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

TB-13-20213011
21K0444-08 (Water)

Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 11/30/2021 12:30

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 18:14

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21K0444-08 E

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>116</i>	<i>%</i>	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - Quality Control
Batch BJL0023 - EPA 5030C (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0023-BLK1)		Prepared: 01-Dec-2021 Analyzed: 01-Dec-2021 12:16								
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	5.09		ug/L	5.00		102	80-120			
Surrogate: 4-Bromofluorobenzene	4.75		ug/L	5.00		94.9	80-120			
Blank (BJL0023-BLK2)		Prepared: 01-Dec-2021 Analyzed: 01-Dec-2021 12:16								
Vinyl Chloride	ND	0.08	0.20	ug/L						U
1,1-Dichloroethene	ND	0.08	0.20	ug/L						U
trans-1,2-Dichloroethene	ND	0.07	0.20	ug/L						U
cis-1,2-Dichloroethene	ND	0.08	0.20	ug/L						U
Benzene	ND	0.05	0.20	ug/L						U
Trichloroethene	ND	0.07	0.20	ug/L						U
Toluene	ND	0.05	0.20	ug/L						U
Tetrachloroethene	ND	0.09	0.20	ug/L						U
Ethylbenzene	ND	0.05	0.20	ug/L						U
m,p-Xylene	ND	0.14	0.40	ug/L						U
o-Xylene	ND	0.08	0.20	ug/L						U
Xylenes, total	ND	0.22	0.60	ug/L						U
Surrogate: 1,2-Dichloroethane-d4	5.90		ug/L	5.00		118	80-129			
Surrogate: Toluene-d8	5.09		ug/L	5.00		102	80-120			
Surrogate: 4-Bromofluorobenzene	4.75		ug/L	5.00		94.9	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.00		ug/L	5.00		100	80-120			
LCS (BJL0023-BS1)		Prepared: 01-Dec-2021 Analyzed: 01-Dec-2021 09:54								
Gasoline Range Organics (Tol-Nap)	932	100	ug/L	1000		93.2	72-128			
Surrogate: Toluene-d8	5.19		ug/L	5.00		104	80-120			
Surrogate: 4-Bromofluorobenzene	5.03		ug/L	5.00		101	80-120			
LCS (BJL0023-BS2)		Prepared: 01-Dec-2021 Analyzed: 01-Dec-2021 10:19								
Vinyl Chloride	10.1	0.08	0.20	ug/L	10.0	101	66-133			
1,1-Dichloroethene	10.7	0.08	0.20	ug/L	10.0	107	69-135			
trans-1,2-Dichloroethene	9.33	0.07	0.20	ug/L	10.0	93.3	78-128			
cis-1,2-Dichloroethene	9.71	0.08	0.20	ug/L	10.0	97.1	80-121			
Benzene	9.77	0.05	0.20	ug/L	10.0	97.7	80-120			
Trichloroethene	9.36	0.07	0.20	ug/L	10.0	93.6	80-120			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BJL0023 - EPA 5030C (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0023-BS2)						Prepared: 01-Dec-2021	Analyzed: 01-Dec-2021 10:19				
Toluene	9.42	0.05	0.20	ug/L	10.0		94.2	80-120			
Tetrachloroethene	9.42	0.09	0.20	ug/L	10.0		94.2	80-120			
Ethylbenzene	9.81	0.05	0.20	ug/L	10.0		98.1	80-120			
m,p-Xylene	19.8	0.14	0.40	ug/L	20.0		99.2	80-121			
o-Xylene	9.45	0.08	0.20	ug/L	10.0		94.5	80-121			
Xylenes, total	29.3	0.22	0.60	ug/L	30.0		97.6	76-127			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	5.98			ug/L	5.00		120	80-129			
<i>Surrogate: Toluene-d8</i>	5.03			ug/L	5.00		101	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.80			ug/L	5.00		96.0	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	5.05			ug/L	5.00		101	80-120			
LCS Dup (BJL0023-BSD1)						Prepared: 01-Dec-2021	Analyzed: 01-Dec-2021 10:44				
Gasoline Range Organics (Tol-Nap)	871		100	ug/L	1000		87.1	72-128	6.68	30	
<i>Surrogate: Toluene-d8</i>	4.90			ug/L	5.00		97.9	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	5.08			ug/L	5.00		102	80-120			
LCS Dup (BJL0023-BSD2)						Prepared: 01-Dec-2021	Analyzed: 01-Dec-2021 11:09				
Vinyl Chloride	10.6	0.08	0.20	ug/L	10.0		106	66-133	5.21	30	
1,1-Dichloroethene	11.4	0.08	0.20	ug/L	10.0		114	69-135	6.35	30	
trans-1,2-Dichloroethene	9.59	0.07	0.20	ug/L	10.0		95.9	78-128	2.72	30	
cis-1,2-Dichloroethene	10.1	0.08	0.20	ug/L	10.0		101	80-121	4.31	30	
Benzene	10.1	0.05	0.20	ug/L	10.0		101	80-120	3.07	30	
Trichloroethene	9.65	0.07	0.20	ug/L	10.0		96.5	80-120	3.11	30	
Toluene	9.86	0.05	0.20	ug/L	10.0		98.6	80-120	4.59	30	
Tetrachloroethene	9.36	0.09	0.20	ug/L	10.0		93.6	80-120	0.58	30	
Ethylbenzene	9.62	0.05	0.20	ug/L	10.0		96.2	80-120	1.97	30	
m,p-Xylene	19.5	0.14	0.40	ug/L	20.0		97.4	80-121	1.80	30	
o-Xylene	9.27	0.08	0.20	ug/L	10.0		92.7	80-121	1.95	30	
Xylenes, total	28.8	0.22	0.60	ug/L	30.0		95.8	76-127	1.85	30	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	5.82			ug/L	5.00		116	80-129			
<i>Surrogate: Toluene-d8</i>	5.15			ug/L	5.00		103	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.86			ug/L	5.00		97.2	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	5.25			ug/L	5.00		105	80-120			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - SIM - Quality Control

Batch BJL0145 - EPA 5030C (Purge and Trap)

Instrument: NT7 Analyst: PB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0145-BLK1)					Prepared: 06-Dec-2021 Analyzed: 06-Dec-2021 15:56					
Vinyl chloride	ND	5.01	20.0	ng/L						U
Surrogate: 1,2-Dichloroethane-d4	5780			ng/L	5000	116	80-129			
LCS (BJL0145-BS1)					Prepared: 06-Dec-2021 Analyzed: 06-Dec-2021 12:38					
Vinyl chloride	527	5.01	20.0	ng/L	500	105	62-141			
Surrogate: 1,2-Dichloroethane-d4	5150			ng/L	5000	103	80-129			
LCS Dup (BJL0145-BSD1)					Prepared: 06-Dec-2021 Analyzed: 06-Dec-2021 13:22					
Vinyl chloride	469	5.01	20.0	ng/L	500	93.9	62-141	11.60	30	
Surrogate: 1,2-Dichloroethane-d4	5830			ng/L	5000	117	80-129			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch BJL0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0109-BLK1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 19:35					
Phenol	ND	0.01	0.2	ug/L							U
bis(2-chloroethyl) ether	ND	0.03	0.2	ug/L							U
2-Chlorophenol	ND	0.03	0.2	ug/L							U
1,3-Dichlorobenzene	ND	0.03	0.2	ug/L							U
1,4-Dichlorobenzene	ND	0.03	0.2	ug/L							U
1,2-Dichlorobenzene	ND	0.03	0.2	ug/L							U
Benzyl Alcohol	ND	0.02	0.2	ug/L							U
2,2'-Oxybis(1-chloropropane)	ND	0.03	0.2	ug/L							U
2-Methylphenol	ND	0.03	0.2	ug/L							U
Hexachloroethane	ND	0.04	0.2	ug/L							U
N-Nitroso-di-n-Propylamine	ND	0.04	0.2	ug/L							U
4-Methylphenol	ND	0.03	0.2	ug/L							U
Nitrobenzene	ND	0.03	0.2	ug/L							U
Isophorone	ND	0.03	0.2	ug/L							U
2-Nitrophenol	ND	0.04	1.0	ug/L							U
2,4-Dimethylphenol	ND	0.3	1.0	ug/L							U
Bis(2-Chloroethoxy)methane	ND	0.03	0.2	ug/L							U
2,4-Dichlorophenol	ND	0.1	1.0	ug/L							U
1,2,4-Trichlorobenzene	ND	0.03	0.2	ug/L							U
Naphthalene	ND	0.03	0.2	ug/L							U
Benzoic acid	ND	0.1	2.0	ug/L							U
4-Chloroaniline	ND	0.04	1.0	ug/L							U
Hexachlorobutadiene	ND	0.04	0.2	ug/L							U
4-Chloro-3-Methylphenol	ND	0.1	1.0	ug/L							U
2-Methylnaphthalene	ND	0.03	0.2	ug/L							U
Hexachlorocyclopentadiene	ND	0.1	1.0	ug/L							U
2,4,6-Trichlorophenol	ND	0.2	1.0	ug/L							U
2,4,5-Trichlorophenol	ND	0.1	1.0	ug/L							U
2-Chloronaphthalene	ND	0.03	0.2	ug/L							U
2-Nitroaniline	ND	0.2	1.0	ug/L							U
Acenaphthylene	ND	0.02	0.2	ug/L							U
Dimethylphthalate	ND	0.04	0.2	ug/L							U
2,6-Dinitrotoluene	ND	0.2	1.0	ug/L							U
Acenaphthene	ND	0.03	0.2	ug/L							U
3-Nitroaniline	ND	0.2	1.0	ug/L							U


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch BJL0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0109-BLK1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 19:35					
2,4-Dinitrophenol	ND	0.2	2.0	ug/L							U
Dibenzofuran	ND	0.02	0.2	ug/L							U
4-Nitrophenol	ND	0.06	1.0	ug/L							U
2,4-Dinitrotoluene	ND	0.1	1.0	ug/L							U
Fluorene	ND	0.02	0.2	ug/L							U
4-Chlorophenylphenyl ether	ND	0.02	0.2	ug/L							U
Diethyl phthalate	ND	0.06	0.2	ug/L							U
4-Nitroaniline	ND	0.2	1.0	ug/L							U
4,6-Dinitro-2-methylphenol	ND	0.4	2.0	ug/L							U
N-Nitrosodiphenylamine	ND	0.03	0.2	ug/L							U
4-Bromophenyl phenyl ether	ND	0.02	0.2	ug/L							U
Hexachlorobenzene	ND	0.04	0.2	ug/L							U
Pentachlorophenol	ND	0.1	1.0	ug/L							U
Phenanthrene	ND	0.02	0.2	ug/L							U
Anthracene	ND	0.03	0.2	ug/L							U
Carbazole	ND	0.04	0.2	ug/L							U
Di-n-Butylphthalate	ND	0.05	0.2	ug/L							U
Fluoranthene	ND	0.03	0.2	ug/L							U
Pyrene	ND	0.03	0.2	ug/L							U
Butylbenzylphthalate	ND	0.07	0.2	ug/L							U
Benzo(a)anthracene	ND	0.04	0.2	ug/L							U
3,3'-Dichlorobenzidine	ND	0.3	1.0	ug/L							U
Chrysene	ND	0.04	0.2	ug/L							U
bis(2-Ethylhexyl)phthalate	ND	0.2	0.2	ug/L							U
Di-n-Octylphthalate	ND	0.05	0.2	ug/L							U
Benzo(a)fluoranthene, Total	ND	0.08	0.4	ug/L							U
Benzo(a)pyrene	ND	0.05	0.2	ug/L							U
Indeno(1,2,3-cd)pyrene	ND	0.06	0.2	ug/L							U
Dibenzo(a,h)anthracene	ND	0.07	0.2	ug/L							U
Benzo(g,h,i)perylene	ND	0.04	0.2	ug/L							U
1-Methylnaphthalene	ND	0.03	0.2	ug/L							U
Surrogate: 2-Fluorophenol	3.84			ug/L	7.50		51.2	30-160			
Surrogate: Phenol-d5	2.02			ug/L	7.50		26.9	30-160			*
Surrogate: 2-Chlorophenol-d4	6.56			ug/L	7.50		87.5	30-160			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch B.JL0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0109-BLK1)					Prepared: 07-Dec-2021		Analyzed: 10-Dec-2021 19:35				
Surrogate: 1,2-Dichlorobenzene-d4	3.73			ug/L	5.00		74.7	30-160			
Surrogate: Nitrobenzene-d5	4.32			ug/L	5.00		86.3	30-160			
Surrogate: 2-Fluorobiphenyl	3.87			ug/L	5.00		77.5	30-160			
Surrogate: 2,4,6-Tribromophenol	5.18			ug/L	7.50		69.1	30-160			
Surrogate: p-Terphenyl-d14	4.54			ug/L	5.00		90.8	30-160			
LCS (BJL0109-BS1)					Prepared: 07-Dec-2021		Analyzed: 10-Dec-2021 20:13				
Phenol	1.8	0.01	0.2	ug/L	5.00		36.3	30-160			
bis(2-chloroethyl) ether	4.7	0.03	0.2	ug/L	5.00		94.3	30-160			
2-Chlorophenol	4.3	0.03	0.2	ug/L	5.00		85.9	30-160			
1,3-Dichlorobenzene	3.4	0.03	0.2	ug/L	5.00		68.6	30-160			
1,4-Dichlorobenzene	4.0	0.03	0.2	ug/L	5.00		79.6	30-160			
1,2-Dichlorobenzene	3.5	0.03	0.2	ug/L	5.00		70.0	30-160			
Benzyl Alcohol	2.3	0.02	0.2	ug/L	5.00		46.6	30-160			
2,2'-Oxybis(1-chloropropane)	5.6	0.03	0.2	ug/L	5.00		112	30-160			
2-Methylphenol	3.1	0.03	0.2	ug/L	5.00		62.7	30-160			
Hexachloroethane	3.6	0.04	0.2	ug/L	5.00		72.2	30-160			
N-Nitroso-di-n-Propylamine	4.7	0.04	0.2	ug/L	5.00		93.2	30-160			
4-Methylphenol	2.9	0.03	0.2	ug/L	5.00		58.3	30-160			
Nitrobenzene	4.6	0.03	0.2	ug/L	5.00		92.1	30-160			
Isophorone	6.8	0.03	0.2	ug/L	5.00		136	30-160			
2-Nitrophenol	3.6	0.04	1.0	ug/L	5.00		71.1	30-160			
2,4-Dimethylphenol	11.5	0.3	1.0	ug/L	13.0		88.8	30-160			
Bis(2-Chloroethoxy)methane	4.6	0.03	0.2	ug/L	5.00		92.5	30-160			
2,4-Dichlorophenol	12.3	0.1	1.0	ug/L	13.0		95.0	30-160			
1,2,4-Trichlorobenzene	3.3	0.03	0.2	ug/L	5.00		65.7	30-160			
Naphthalene	3.8	0.03	0.2	ug/L	5.00		76.1	30-160			
Benzoic acid	6.4	0.1	2.0	ug/L	23.0		27.7	30-160			*, Q
4-Chloroaniline	1.0	0.04	1.0	ug/L	13.0		7.39	30-160			*, J
Hexachlorobutadiene	2.9	0.04	0.2	ug/L	5.00		58.6	30-160			
4-Chloro-3-Methylphenol	11.9	0.1	1.0	ug/L	13.0		91.4	30-160			
2-Methylnaphthalene	3.9	0.03	0.2	ug/L	5.00		78.5	30-160			
Hexachlorocyclopentadiene	5.7	0.1	1.0	ug/L	13.0		43.7	30-160			Q
2,4,6-Trichlorophenol	11.2	0.2	1.0	ug/L	13.0		86.2	30-160			
2,4,5-Trichlorophenol	11.0	0.1	1.0	ug/L	13.0		84.3	30-160			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BJJ0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJJ0109-BS1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:13					
2-Chloronaphthalene	4.1	0.03	0.2	ug/L	5.00		81.7	30-160			
2-Nitroaniline	16.5	0.2	1.0	ug/L	13.0		127	30-160			
Acenaphthylene	3.7	0.02	0.2	ug/L	5.00		74.9	30-160			
Dimethylphthalate	4.4	0.04	0.2	ug/L	5.00		88.2	30-160			
2,6-Dinitrotoluene	13.9	0.2	1.0	ug/L	13.0		107	30-160			
Acenaphthene	3.9	0.03	0.2	ug/L	5.00		78.5	30-160			
3-Nitroaniline	5.9	0.2	1.0	ug/L	13.0		45.6	30-160			
2,4-Dinitrophenol	22.5	0.2	2.0	ug/L	23.0		97.9	30-160			Q
Dibenzofuran	4.3	0.02	0.2	ug/L	5.00		85.1	30-160			
4-Nitrophenol	3.9	0.06	1.0	ug/L	13.0		29.8	30-160			*
2,4-Dinitrotoluene	12.6	0.1	1.0	ug/L	13.0		96.6	30-160			
Fluorene	4.0	0.02	0.2	ug/L	5.00		79.4	30-160			
4-Chlorophenylphenyl ether	4.2	0.02	0.2	ug/L	5.00		83.4	30-160			
Diethyl phthalate	4.4	0.06	0.2	ug/L	5.00		88.7	30-160			
4-Nitroaniline	8.5	0.2	1.0	ug/L	13.0		65.3	30-160			
4,6-Dinitro-2-methylphenol	21.5	0.4	2.0	ug/L	23.0		93.6	30-160			
N-Nitrosodiphenylamine	4.0	0.03	0.2	ug/L	5.00		79.9	30-160			
4-Bromophenyl phenyl ether	4.3	0.02	0.2	ug/L	5.00		85.3	30-160			
Hexachlorobenzene	4.1	0.04	0.2	ug/L	5.00		82.1	30-160			
Pentachlorophenol	9.4	0.1	1.0	ug/L	13.0		72.2	30-160			
Phenanthrene	4.0	0.02	0.2	ug/L	5.00		80.4	30-160			
Anthracene	4.0	0.03	0.2	ug/L	5.00		79.8	30-160			
Carbazole	4.3	0.04	0.2	ug/L	5.00		86.4	30-160			
Di-n-Butylphthalate	4.7	0.05	0.2	ug/L	5.00		93.2	30-160			
Fluoranthene	4.2	0.03	0.2	ug/L	5.00		83.2	30-160			
Pyrene	4.9	0.03	0.2	ug/L	5.00		98.9	30-160			
Butylbenzylphthalate	4.4	0.07	0.2	ug/L	5.00		87.9	30-160			Q
Benzo(a)anthracene	4.1	0.04	0.2	ug/L	5.00		81.3	30-160			
3,3'-Dichlorobenzidine	1.8	0.3	1.0	ug/L	13.0		14.0	30-160			*
Chrysene	3.8	0.04	0.2	ug/L	5.00		76.4	30-160			
bis(2-Ethylhexyl)phthalate	4.4	0.2	0.2	ug/L	5.00		87.9	30-160			
Di-n-Octylphthalate	4.2	0.05	0.2	ug/L	5.00		83.7	30-160			
Benzo(a)fluoranthene, Total	8.0	0.08	0.4	ug/L	10.0		79.7	30-160			
Benzo(a)pyrene	4.1	0.05	0.2	ug/L	5.00		81.5	30-160			
Indeno(1,2,3-cd)pyrene	4.0	0.06	0.2	ug/L	5.00		80.1	30-160			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BJJ0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJJ0109-BS1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:13					
Dibenzo(a,h)anthracene	4.0	0.07	0.2	ug/L	5.00		80.1	30-160			
Benzo(g,h,i)perylene	4.0	0.04	0.2	ug/L	5.00		80.9	30-160			
1-Methylnaphthalene	4.2	0.03	0.2	ug/L	5.00		84.5	30-160			
Surrogate: 2-Fluorophenol	4.42			ug/L	7.50		58.9	30-160			
Surrogate: Phenol-d5	2.67			ug/L	7.50		35.5	30-160			
Surrogate: 2-Chlorophenol-d4	6.61			ug/L	7.50		88.2	30-160			
Surrogate: 1,2-Dichlorobenzene-d4	3.82			ug/L	5.00		76.4	30-160			
Surrogate: Nitrobenzene-d5	4.71			ug/L	5.00		94.2	30-160			
Surrogate: 2-Fluorobiphenyl	4.30			ug/L	5.00		86.0	30-160			
Surrogate: 2,4,6-Tribromophenol	6.55			ug/L	7.50		87.3	30-160			
Surrogate: p-Terphenyl-d14	4.76			ug/L	5.00		95.2	30-160			
LCS Dup (BJJ0109-BSD1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:50					
Phenol	1.8	0.01	0.2	ug/L	5.00		37.0	30-160	1.85	30	
bis(2-chloroethyl) ether	4.9	0.03	0.2	ug/L	5.00		98.9	30-160	4.73	30	
2-Chlorophenol	4.5	0.03	0.2	ug/L	5.00		89.6	30-160	4.28	30	
1,3-Dichlorobenzene	3.7	0.03	0.2	ug/L	5.00		73.9	30-160	7.42	30	
1,4-Dichlorobenzene	4.2	0.03	0.2	ug/L	5.00		83.0	30-160	4.19	30	
1,2-Dichlorobenzene	3.7	0.03	0.2	ug/L	5.00		73.2	30-160	4.57	30	
Benzyl Alcohol	2.5	0.02	0.2	ug/L	5.00		50.2	30-160	7.37	30	
2,2'-Oxybis(1-chloropropane)	5.9	0.03	0.2	ug/L	5.00		117	30-160	4.30	30	
2-Methylphenol	3.2	0.03	0.2	ug/L	5.00		64.7	30-160	3.15	30	
Hexachloroethane	3.8	0.04	0.2	ug/L	5.00		76.2	30-160	5.33	30	
N-Nitroso-di-n-Propylamine	4.8	0.04	0.2	ug/L	5.00		96.4	30-160	3.30	30	
4-Methylphenol	3.1	0.03	0.2	ug/L	5.00		62.1	30-160	6.42	30	
Nitrobenzene	4.7	0.03	0.2	ug/L	5.00		94.3	30-160	2.35	30	
Isophorone	6.0	0.03	0.2	ug/L	5.00		120	30-160	12.80	30	
2-Nitrophenol	3.6	0.04	1.0	ug/L	5.00		72.0	30-160	1.23	30	
2,4-Dimethylphenol	11.2	0.3	1.0	ug/L	13.0		86.4	30-160	2.81	30	
Bis(2-Chloroethoxy)methane	4.6	0.03	0.2	ug/L	5.00		91.9	30-160	0.67	30	
2,4-Dichlorophenol	11.6	0.1	1.0	ug/L	13.0		89.1	30-160	6.33	30	
1,2,4-Trichlorobenzene	3.3	0.03	0.2	ug/L	5.00		66.0	30-160	0.46	30	
Naphthalene	3.8	0.03	0.2	ug/L	5.00		76.9	30-160	1.04	30	
Benzoic acid	6.2	0.1	2.0	ug/L	23.0		26.8	30-160	3.04	30	*, Q
4-Chloroaniline	1.2	0.04	1.0	ug/L	13.0		8.89	30-160	18.40	30	*



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BJJ0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJJ0109-BSD1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:50					
Hexachlorobutadiene	3.0	0.04	0.2	ug/L	5.00		60.7	30-160	3.59	30	
4-Chloro-3-Methylphenol	11.7	0.1	1.0	ug/L	13.0		90.0	30-160	1.54	30	
2-Methylnaphthalene	3.9	0.03	0.2	ug/L	5.00		78.8	30-160	0.37	30	
Hexachlorocyclopentadiene	6.4	0.1	1.0	ug/L	13.0		49.1	30-160	11.60	30	Q
2,4,6-Trichlorophenol	11.4	0.2	1.0	ug/L	13.0		87.8	30-160	1.92	30	
2,4,5-Trichlorophenol	11.9	0.1	1.0	ug/L	13.0		91.6	30-160	8.31	30	
2-Chloronaphthalene	4.2	0.03	0.2	ug/L	5.00		84.1	30-160	2.89	30	
2-Nitroaniline	16.8	0.2	1.0	ug/L	13.0		129	30-160	1.89	30	
Acenaphthylene	3.8	0.02	0.2	ug/L	5.00		76.2	30-160	1.65	30	
Dimethylphthalate	4.5	0.04	0.2	ug/L	5.00		89.6	30-160	1.65	30	
2,6-Dinitrotoluene	13.9	0.2	1.0	ug/L	13.0		107	30-160	0.31	30	
Acenaphthene	4.0	0.03	0.2	ug/L	5.00		80.5	30-160	2.51	30	
3-Nitroaniline	5.8	0.2	1.0	ug/L	13.0		44.4	30-160	2.75	30	
2,4-Dinitrophenol	23.6	0.2	2.0	ug/L	23.0		103	30-160	4.67	30	Q
Dibenzofuran	4.3	0.02	0.2	ug/L	5.00		86.9	30-160	2.10	30	
4-Nitrophenol	4.0	0.06	1.0	ug/L	13.0		30.8	30-160	3.45	30	
2,4-Dinitrotoluene	12.4	0.1	1.0	ug/L	13.0		95.4	30-160	1.30	30	
Fluorene	4.1	0.02	0.2	ug/L	5.00		81.4	30-160	2.47	30	
4-Chlorophenylphenyl ether	4.4	0.02	0.2	ug/L	5.00		87.2	30-160	4.43	30	
Diethyl phthalate	4.2	0.06	0.2	ug/L	5.00		84.2	30-160	5.20	30	
4-Nitroaniline	10.7	0.2	1.0	ug/L	13.0		82.2	30-160	22.90	30	
4,6-Dinitro-2-methylphenol	22.6	0.4	2.0	ug/L	23.0		98.3	30-160	4.92	30	
N-Nitrosodiphenylamine	4.2	0.03	0.2	ug/L	5.00		84.6	30-160	5.81	30	
4-Bromophenyl phenyl ether	4.5	0.02	0.2	ug/L	5.00		90.7	30-160	6.17	30	
Hexachlorobenzene	4.3	0.04	0.2	ug/L	5.00		85.6	30-160	4.25	30	
Pentachlorophenol	9.5	0.1	1.0	ug/L	13.0		73.0	30-160	1.12	30	
Phenanthrene	4.1	0.02	0.2	ug/L	5.00		82.8	30-160	2.88	30	
Anthracene	4.1	0.03	0.2	ug/L	5.00		82.6	30-160	3.46	30	
Carbazole	4.4	0.04	0.2	ug/L	5.00		87.6	30-160	1.35	30	
Di-n-Butylphthalate	4.9	0.05	0.2	ug/L	5.00		97.2	30-160	4.16	30	
Fluoranthene	4.3	0.03	0.2	ug/L	5.00		86.4	30-160	3.79	30	
Pyrene	5.1	0.03	0.2	ug/L	5.00		102	30-160	2.81	30	
Butylbenzylphthalate	4.7	0.07	0.2	ug/L	5.00		93.3	30-160	5.92	30	Q
Benzo(a)anthracene	4.2	0.04	0.2	ug/L	5.00		84.4	30-160	3.75	30	
3,3'-Dichlorobenzidine	4.9	0.3	1.0	ug/L	13.0		38.0	30-160	92.20	30	*


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch BJJ0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJJ0109-BSD1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:50					
Chrysene	4.0	0.04	0.2	ug/L	5.00		79.2	30-160	3.69	30	
bis(2-Ethylhexyl)phthalate	4.3	0.2	0.2	ug/L	5.00		86.8	30-160	1.23	30	
Di-n-Octylphthalate	4.4	0.05	0.2	ug/L	5.00		87.5	30-160	4.48	30	
Benzo(a)fluoranthene, Total	8.2	0.08	0.4	ug/L	10.0		81.9	30-160	2.71	30	
Benzo(a)pyrene	4.2	0.05	0.2	ug/L	5.00		84.3	30-160	3.35	30	
Indeno(1,2,3-cd)pyrene	4.2	0.06	0.2	ug/L	5.00		83.2	30-160	3.73	30	
Dibenzo(a,h)anthracene	4.0	0.07	0.2	ug/L	5.00		79.8	30-160	0.36	30	
Benzo(g,h,i)perylene	4.1	0.04	0.2	ug/L	5.00		81.3	30-160	0.51	30	
1-Methylnaphthalene	4.3	0.03	0.2	ug/L	5.00		86.3	30-160	2.18	30	
<i>Surrogate: 2-Fluorophenol</i>	4.47			ug/L	7.50		59.7	30-160			
<i>Surrogate: Phenol-d5</i>	2.56			ug/L	7.50		34.2	30-160			
<i>Surrogate: 2-Chlorophenol-d4</i>	6.51			ug/L	7.50		86.8	30-160			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	3.78			ug/L	5.00		75.7	30-160			
<i>Surrogate: Nitrobenzene-d5</i>	4.51			ug/L	5.00		90.3	30-160			
<i>Surrogate: 2-Fluorobiphenyl</i>	4.11			ug/L	5.00		82.3	30-160			
<i>Surrogate: 2,4,6-Tribromophenol</i>	6.08			ug/L	7.50		81.0	30-160			
<i>Surrogate: p-Terphenyl-d14</i>	4.59			ug/L	5.00		91.7	30-160			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJL0007 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0007-BLK1)						Prepared: 07-Dec-2021 Analyzed: 11-Dec-2021 18:27					
Naphthalene	0.003	0.001	0.010	ug/L							J
2-Methylnaphthalene	0.002	0.001	0.010	ug/L							J
1-Methylnaphthalene	0.002	0.0009	0.010	ug/L							J
Acenaphthylene	ND	0.002	0.010	ug/L							U
Acenaphthene	ND	0.003	0.010	ug/L							U
Dibenzofuran	ND	0.002	0.010	ug/L							U
Fluorene	ND	0.002	0.010	ug/L							U
Phenanthrene	0.001	0.001	0.010	ug/L							J
Anthracene	ND	0.001	0.010	ug/L							U
Carbazole	ND	0.001	0.010	ug/L							U
Fluoranthene	ND	0.002	0.010	ug/L							U
Pyrene	0.001	0.001	0.010	ug/L							J
Benzo(a)anthracene	ND	0.0008	0.010	ug/L							U
Chrysene	0.001	0.0009	0.010	ug/L							J
Benzo(b)fluoranthene	ND	0.0005	0.010	ug/L							U
Benzo(k)fluoranthene	ND	0.003	0.010	ug/L							U
Benzo(j)fluoranthene	ND	0.002	0.010	ug/L							U
Benzo(a)fluoranthene, Total	ND	0.004	0.010	ug/L							U
Benzo(a)pyrene	ND	0.002	0.010	ug/L							U
Perylene	ND	0.006	0.010	ug/L							U
Indeno(1,2,3-cd)pyrene	ND	0.001	0.010	ug/L							U
Dibenzo(a,h)anthracene	ND	0.001	0.010	ug/L							U
Benzo(g,h,i)perylene	ND	0.001	0.010	ug/L							U
<i>Surrogate: 2-Methylnaphthalene-d10</i>	255			ug/L	300		84.9	42-120			
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>	307			ug/L	300		102	29-120			
<i>Surrogate: Fluoranthene-d10</i>	299			ug/L	300		99.6	57-120			
LCS (BJL0007-BS1)						Prepared: 07-Dec-2021 Analyzed: 11-Dec-2021 18:58					
Naphthalene	0.227	0.001	0.010	ug/L	0.300		75.8	37-120			
2-Methylnaphthalene	0.231	0.001	0.010	ug/L	0.300		76.9	37-120			
1-Methylnaphthalene	0.228	0.0009	0.010	ug/L	0.300		76.0	29-120			
Acenaphthylene	0.232	0.002	0.010	ug/L	0.300		77.4	41-120			
Acenaphthene	0.232	0.003	0.010	ug/L	0.300		77.2	41-120			
Dibenzofuran	0.225	0.002	0.010	ug/L	0.300		75.1	38-120			
Fluorene	0.245	0.002	0.010	ug/L	0.300		81.6	43-120			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJL0007 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0007-BS1)						Prepared: 07-Dec-2021 Analyzed: 11-Dec-2021 18:58					
Phenanthrene	0.240	0.001	0.010	ug/L	0.300		80.1	41-120			
Anthracene	0.240	0.001	0.010	ug/L	0.300		79.8	40-120			
Carbazole	0.258	0.001	0.010	ug/L	0.300		86.1	30-160			
Fluoranthene	0.262	0.002	0.010	ug/L	0.300		87.3	45-120			
Pyrene	0.262	0.001	0.010	ug/L	0.300		87.3	41-120			
Benzo(a)anthracene	0.264	0.0008	0.010	ug/L	0.300		87.9	42-120			
Chrysene	0.244	0.0009	0.010	ug/L	0.300		81.2	44-120			
Benzo(b)fluoranthene	0.272	0.0005	0.010	ug/L	0.300		90.6	44-120			
Benzo(k)fluoranthene	0.244	0.003	0.010	ug/L	0.300		81.3	50-120			
Benzo(j)fluoranthene	0.236	0.002	0.010	ug/L	0.300		78.8	39-160			
Benzofluoranthenes, Total	0.752	0.004	0.010	ug/L	0.900		83.6	46-120			
Benzo(a)pyrene	0.242	0.002	0.010	ug/L	0.300		80.7	35-120			
Perylene	0.236	0.006	0.010	ug/L	0.300		78.7	30-160			
Indeno(1,2,3-cd)pyrene	0.248	0.001	0.010	ug/L	0.300		82.6	37-120			
Dibenzo(a,h)anthracene	0.249	0.001	0.010	ug/L	0.300		83.2	34-120			
Benzo(g,h,i)perylene	0.239	0.001	0.010	ug/L	0.300		79.7	38-120			
Surrogate: 2-Methylnaphthalene-d10	257			ug/L	300		85.8	42-120			
Surrogate: Dibenzo[a,h]anthracene-d14	295			ug/L	300		98.4	29-120			
Surrogate: Fluoranthene-d10	296			ug/L	300		98.6	57-120			
LCS Dup (BJL0007-BSD1)						Prepared: 07-Dec-2021 Analyzed: 11-Dec-2021 19:28					
Naphthalene	0.255	0.001	0.010	ug/L	0.300		85.1	37-120	11.60	30	
2-Methylnaphthalene	0.259	0.001	0.010	ug/L	0.300		86.3	37-120	11.50	30	
1-Methylnaphthalene	0.258	0.0009	0.010	ug/L	0.300		86.0	29-120	12.40	30	
Acenaphthylene	0.262	0.002	0.010	ug/L	0.300		87.4	41-120	12.10	30	
Acenaphthene	0.262	0.003	0.010	ug/L	0.300		87.4	41-120	12.40	30	
Dibenzofuran	0.255	0.002	0.010	ug/L	0.300		84.9	38-120	12.30	30	
Fluorene	0.275	0.002	0.010	ug/L	0.300		91.5	43-120	11.50	30	
Phenanthrene	0.272	0.001	0.010	ug/L	0.300		90.8	41-120	12.50	30	
Anthracene	0.274	0.001	0.010	ug/L	0.300		91.2	40-120	13.30	30	
Carbazole	0.288	0.001	0.010	ug/L	0.300		96.1	30-160	10.90	30	
Fluoranthene	0.296	0.002	0.010	ug/L	0.300		98.5	45-120	12.10	30	
Pyrene	0.296	0.001	0.010	ug/L	0.300		98.7	41-120	12.30	30	
Benzo(a)anthracene	0.296	0.0008	0.010	ug/L	0.300		98.6	42-120	11.60	30	
Chrysene	0.272	0.0009	0.010	ug/L	0.300		90.8	44-120	11.10	30	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJL0007 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJL0007-BSD1)						Prepared: 07-Dec-2021 Analyzed: 11-Dec-2021 19:28					
Benzo(b)fluoranthene	0.306	0.0005	0.010	ug/L	0.300		102	44-120	11.90	30	
Benzo(k)fluoranthene	0.276	0.003	0.010	ug/L	0.300		92.1	50-120	12.40	30	
Benzo(j)fluoranthene	0.263	0.002	0.010	ug/L	0.300		87.8	39-160	10.80	30	
Benzofluoranthenes, Total	0.846	0.004	0.010	ug/L	0.900		94.0	46-120	11.70	30	
Benzo(a)pyrene	0.274	0.002	0.010	ug/L	0.300		91.2	35-120	12.20	30	
Perylene	0.265	0.006	0.010	ug/L	0.300		88.4	30-160	11.70	30	
Indeno(1,2,3-cd)pyrene	0.288	0.001	0.010	ug/L	0.300		96.0	37-120	15.10	30	
Dibenzo(a,h)anthracene	0.289	0.001	0.010	ug/L	0.300		96.2	34-120	14.50	30	
Benzo(g,h,i)perylene	0.278	0.001	0.010	ug/L	0.300		92.5	38-120	14.90	30	
<i>Surrogate: 2-Methylnaphthalene-d10</i>	266			ug/L	300		88.6	42-120			
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>	304			ug/L	300		101	29-120			
<i>Surrogate: Fluoranthene-d10</i>	306			ug/L	300		102	57-120			



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Petroleum Hydrocarbons - Quality Control

Batch BJL0006 - EPA 3510C SepF

Instrument: FID4 Analyst: TWC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0006-BLK1)									
				Prepared: 02-Dec-2021 Analyzed: 03-Dec-2021 17:46					
Diesel Range Organics (C12-C24)	ND	0.100	mg/L						U
Motor Oil Range Organics (C24-C38)	ND	0.200	mg/L						U
Surrogate: o-Terphenyl	118		mg/L	113	105	50-150			
LCS (BJL0006-BS1)									
				Prepared: 02-Dec-2021 Analyzed: 03-Dec-2021 18:06					
Diesel Range Organics (C12-C24)	2.96	0.100	mg/L	3.00	98.8	56-120			
Surrogate: o-Terphenyl	130		mg/L	113	115	50-150			
LCS Dup (BJL0006-BSD1)									
				Prepared: 02-Dec-2021 Analyzed: 03-Dec-2021 18:25					
Diesel Range Organics (C12-C24)	3.00	0.100	mg/L	3.00	100	56-120	1.29	30	
Surrogate: o-Terphenyl	131		mg/L	113	117	50-150			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Aroclor PCB - Quality Control

Batch BJL0034 - EPA 3510C SepF

Instrument: ECD7 Analyst: JGR

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0034-BLK1)						Prepared: 02-Dec-2021 Analyzed: 06-Dec-2021 16:41					
Aroclor 1016	ND	0.002	0.010	ug/L							U
Aroclor 1221	ND	0.002	0.010	ug/L							U
Aroclor 1232	ND	0.002	0.010	ug/L							U
Aroclor 1242	ND	0.002	0.010	ug/L							U
Aroclor 1248	ND	0.002	0.010	ug/L							U
Aroclor 1254	ND	0.002	0.010	ug/L							U
Aroclor 1260	ND	0.003	0.010	ug/L							U
Aroclor 1262	ND	0.003	0.010	ug/L							U
Aroclor 1268	ND	0.003	0.010	ug/L							U
Surrogate: Decachlorobiphenyl	30.6			ug/L	40.0		76.5	29-120			
Surrogate: Tetrachlorometaxylene	34.1			ug/L	40.0		85.3	32-120			
Surrogate: Decachlorobiphenyl [2C]	32.0			ug/L	40.0		80.0	29-120			
Surrogate: Tetrachlorometaxylene [2C]	33.4			ug/L	40.0		83.6	32-120			
LCS (BJL0034-BS1)						Prepared: 02-Dec-2021 Analyzed: 06-Dec-2021 17:02					
Aroclor 1016 [2C]	0.047	0.002	0.010	ug/L	0.0500		94.4	54-120			
Aroclor 1260	0.046	0.003	0.010	ug/L	0.0500		92.2	51-128			
Surrogate: Decachlorobiphenyl	31.7			ug/L	40.0		79.2	29-120			
Surrogate: Tetrachlorometaxylene	30.8			ug/L	40.0		77.0	32-120			
Surrogate: Decachlorobiphenyl [2C]	32.1			ug/L	40.0		80.1	29-120			
Surrogate: Tetrachlorometaxylene [2C]	30.0			ug/L	40.0		75.0	32-120			
LCS Dup (BJL0034-BSD1)						Prepared: 02-Dec-2021 Analyzed: 06-Dec-2021 17:24					
Aroclor 1016 [2C]	0.048	0.002	0.010	ug/L	0.0500		95.1	54-120	0.79	30	
Aroclor 1260	0.047	0.003	0.010	ug/L	0.0500		94.1	51-128	2.10	30	
Surrogate: Decachlorobiphenyl	35.4			ug/L	40.0		88.5	29-120			
Surrogate: Tetrachlorometaxylene	32.0			ug/L	40.0		80.0	32-120			
Surrogate: Decachlorobiphenyl [2C]	37.2			ug/L	40.0		93.1	29-120			
Surrogate: Tetrachlorometaxylene [2C]	30.7			ug/L	40.0		76.9	32-120			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds - Quality Control

Batch BJL0197 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0197-BLK1)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 17:43						
Barium	135	ND	0.114	0.500	ug/L							U
Barium	137	ND	0.0765	0.500	ug/L							U
Chromium	52	ND	0.260	0.500	ug/L							U
Chromium	53	ND	0.239	0.500	ug/L							U
Iron	54	ND	18.2	36.0	ug/L							U
Iron	57	ND	6.63	36.0	ug/L							U
Lead	208	ND	0.0513	0.100	ug/L							U
Manganese	55	ND	0.142	0.500	ug/L							U
Silver	107	ND	0.0220	0.200	ug/L							U
Vanadium	51a	ND	0.0556	0.200	ug/L							U
Vanadium	51b	ND	0.0521	0.200	ug/L							U
Arsenic	75a	ND	0.0373	0.200	ug/L							U
Cadmium	111	ND	0.0300	0.100	ug/L							U
Cadmium	114	ND	0.0400	0.100	ug/L							U
Cobalt	59	ND	0.0178	0.200	ug/L							U
Copper	63	ND	0.173	0.500	ug/L							U
Copper	65	ND	0.350	0.500	ug/L							U
Nickel	60	ND	0.0792	0.500	ug/L							U
Nickel	62	ND	0.220	0.500	ug/L							U
Selenium	78	ND	0.179	0.500	ug/L							U
Zinc	66	ND	2.92	6.00	ug/L							U
Zinc	67	ND	0.940	6.00	ug/L							U

LCS (BJL0197-BS1)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 17:48						
Barium	135	25.1	0.114	0.500	ug/L	25.0		100	80-120			
Barium	137	24.6	0.0765	0.500	ug/L	25.0		98.4	80-120			
Chromium	52	24.1	0.260	0.500	ug/L	25.0		96.5	80-120			
Chromium	53	25.0	0.239	0.500	ug/L	25.0		100	80-120			
Iron	54	5020	18.2	36.0	ug/L	5000		100	80-120			
Iron	57	4990	6.63	36.0	ug/L	5000		99.8	80-120			
Lead	208	24.8	0.0513	0.100	ug/L	25.0		99.2	80-120			
Manganese	55	24.4	0.142	0.500	ug/L	25.0		97.7	80-120			
Silver	107	25.6	0.0220	0.200	ug/L	25.0		102	80-120			
Vanadium	51a	23.6	0.0556	0.200	ug/L	25.0		94.4	80-120			
Vanadium	51b	23.9	0.0521	0.200	ug/L	25.0		95.4	80-120			



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds - Quality Control

Batch BJL0197 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0197-BS1)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 17:48						
Arsenic	75a	24.1	0.0373	0.200	ug/L	25.0		96.5	80-120			
Cadmium	111	24.4	0.0300	0.100	ug/L	25.0		97.8	80-120			
Cadmium	114	24.9	0.0400	0.100	ug/L	25.0		99.4	80-120			
Cobalt	59	24.3	0.0178	0.200	ug/L	25.0		97.2	80-120			
Copper	63	24.5	0.173	0.500	ug/L	25.0		98.2	80-120			
Copper	65	24.5	0.350	0.500	ug/L	25.0		97.9	80-120			
Nickel	60	24.6	0.0792	0.500	ug/L	25.0		98.6	80-120			
Nickel	62	25.3	0.220	0.500	ug/L	25.0		101	80-120			
Selenium	78	77.4	0.179	0.500	ug/L	80.0		96.8	80-120			
Zinc	66	77.5	2.92	6.00	ug/L	80.0		96.9	80-120			
Zinc	67	72.1	0.940	6.00	ug/L	80.0		90.1	80-120			


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
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Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0219 - TWM EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0219-BLK1)						Prepared: 09-Dec-2021 Analyzed: 14-Dec-2021 14:08					
Mercury	ND	0.000013	0.000100	mg/L							U
LCS (BJL0219-BS1)						Prepared: 09-Dec-2021 Analyzed: 14-Dec-2021 14:11					
Mercury	0.00195	0.000013	0.000100	mg/L	0.00200		97.7	80-120			
Duplicate (BJL0219-DUP1)						Source: 21K0444-02 Prepared: 09-Dec-2021 Analyzed: 14-Dec-2021 14:15					
Mercury	ND	0.000013	0.000100	mg/L		ND					U
Matrix Spike (BJL0219-MS1)						Source: 21K0444-02 Prepared: 09-Dec-2021 Analyzed: 14-Dec-2021 14:18					
Mercury	0.00116	0.000013	0.000100	mg/L	0.00100	ND	116	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Matrix Spike Dup (BJL0219-MSD1)						Source: 21K0444-02 Prepared: 09-Dec-2021 Analyzed: 14-Dec-2021 14:20					
Mercury	0.00116	0.000013	0.000100	mg/L	0.00100	ND	116	75-125	0.70	20	
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											



Analytical Report

Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds (dissolved) - Quality Control

Batch BJJ0168 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0168-BLK1)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 01:13						
Barium, Dissolved	135	ND	0.114	0.500	ug/L							U
Barium, Dissolved	137	ND	0.0765	0.500	ug/L							U
Chromium, Dissolved	52	ND	0.260	0.500	ug/L							U
Chromium, Dissolved	53	ND	0.239	0.500	ug/L							U
Iron, Dissolved	54	ND	18.2	36.0	ug/L							U
Iron, Dissolved	57	ND	18.2	36.0	ug/L							U
Lead, Dissolved	208	ND	0.0513	0.100	ug/L							U
Manganese, Dissolved	55	ND	0.142	0.500	ug/L							U
Silver, Dissolved	107	ND	0.0220	0.200	ug/L							U
Vanadium, Dissolved	51a	ND	0.0556	0.200	ug/L							U
Vanadium, Dissolved	51b	ND	0.0521	0.200	ug/L							U
Cadmium, Dissolved	111	ND	0.0300	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.0400	0.100	ug/L							U

Blank (BJL0168-BLK2)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 17:33						
Arsenic, Dissolved	75a	ND	0.0373	0.200	ug/L							U
Copper, Dissolved	63	ND	0.173	0.500	ug/L							U
Copper, Dissolved	65	ND	0.350	0.500	ug/L							U
Nickel, Dissolved	60	ND	0.0792	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.220	0.500	ug/L							U
Selenium, Dissolved	78	ND	0.179	0.500	ug/L							U
Zinc, Dissolved	66	ND	2.92	6.00	ug/L							U
Zinc, Dissolved	67	ND	0.940	6.00	ug/L							U

LCS (BJL0168-BS1)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 01:18						
Barium, Dissolved	135	25.3	0.114	0.500	ug/L	25.0		101	80-120			
Barium, Dissolved	137	25.5	0.0765	0.500	ug/L	25.0		102	80-120			
Chromium, Dissolved	52	24.7	0.260	0.500	ug/L	25.0		98.7	80-120			
Chromium, Dissolved	53	24.5	0.239	0.500	ug/L	25.0		97.9	80-120			
Iron, Dissolved	54	5090	18.2	36.0	ug/L	5000		102	80-120			
Iron, Dissolved	57	5110	18.2	36.0	ug/L	5000		102	80-120			
Lead, Dissolved	208	24.2	0.0513	0.100	ug/L	25.0		96.8	80-120			
Manganese, Dissolved	55	24.9	0.142	0.500	ug/L	25.0		99.5	80-120			
Silver, Dissolved	107	25.9	0.0220	0.200	ug/L	25.0		103	80-120			
Vanadium, Dissolved	51a	24.9	0.0556	0.200	ug/L	25.0		99.6	80-120			


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 Project Manager: Meg Strong

Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0168 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0168-BS1)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 01:18						
Vanadium, Dissolved	51b	24.8	0.0521	0.200	ug/L	25.0		99.4	80-120			
Cadmium, Dissolved	111	24.4	0.0300	0.100	ug/L	25.0		97.7	80-120			
Cadmium, Dissolved	114	24.1	0.0400	0.100	ug/L	25.0		96.6	80-120			
LCS (BJL0168-BS2)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 17:38						
Arsenic, Dissolved	75a	23.7	0.0373	0.200	ug/L	25.0		94.9	80-120			
Copper, Dissolved	63	24.6	0.173	0.500	ug/L	25.0		98.2	80-120			
Copper, Dissolved	65	24.8	0.350	0.500	ug/L	25.0		99.1	80-120			
Nickel, Dissolved	60	24.3	0.0792	0.500	ug/L	25.0		97.4	80-120			
Nickel, Dissolved	62	24.3	0.220	0.500	ug/L	25.0		97.1	80-120			
Selenium, Dissolved	78	75.4	0.179	0.500	ug/L	80.0		94.3	80-120			
Zinc, Dissolved	66	74.9	2.92	6.00	ug/L	80.0		93.6	80-120			
Zinc, Dissolved	67	72.4	0.940	6.00	ug/L	80.0		90.5	80-120			



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds (dissolved) - Quality Control

Batch BJL0169 - TWM EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0169-BLK1)						Prepared: 07-Dec-2021 Analyzed: 09-Dec-2021 13:01					
Mercury, Dissolved	0.000024	0.000013	0.000100	mg/L							J
LCS (BJL0169-BS1)						Prepared: 07-Dec-2021 Analyzed: 09-Dec-2021 13:04					
Mercury, Dissolved	0.00200	0.000013	0.000100	mg/L	0.00200		100	80-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
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Reported:
 16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0271 - TWM EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0271-BLK1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 15:09					
Mercury, Dissolved	ND	0.000013	0.000100	mg/L							U
LCS (BJL0271-BS1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 15:11					
Mercury, Dissolved	0.00190	0.000013	0.000100	mg/L	0.00200		94.9	80-120			
Duplicate (BJL0271-DUP1)						Source: 21K0444-03RE1 Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 15:16					
Mercury, Dissolved	ND	0.000013	0.000100	mg/L		ND					U
Matrix Spike (BJL0271-MS1)						Source: 21K0444-03RE1 Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 15:23					
Mercury, Dissolved	0.000880	0.000013	0.000100	mg/L	0.00100	ND	88.0	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Matrix Spike Dup (BJL0271-MSD1)						Source: 21K0444-03RE1 Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 15:25					
Mercury, Dissolved	0.000953	0.000013	0.000100	mg/L	0.00100	ND	95.3	75-125	7.93	20	
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 11:57

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BJK0745 - No Prep Wet Chem

Instrument: UV1800-1 Analyst: RMS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJK0745-BLK1)						Prepared: 30-Nov-2021 Analyzed: 30-Nov-2021 16:54					
Hexavalent Chromium	ND	0.013	0.013	mg/L							U
LCS (BJK0745-BS1)						Prepared: 30-Nov-2021 Analyzed: 30-Nov-2021 16:55					
Hexavalent Chromium	0.626	0.013	0.013	mg/L	0.626		100	85-115			D
Duplicate (BJK0745-DUP1)						Source: 21K0444-04 Prepared: 30-Nov-2021 Analyzed: 30-Nov-2021 16:56					
Hexavalent Chromium	0.013	0.013	0.013	mg/L		0.013			0.71	20	D
Matrix Spike (BJK0745-MS1)						Source: 21K0444-04 Prepared: 30-Nov-2021 Analyzed: 30-Nov-2021 16:57					
Hexavalent Chromium	0.078	0.013	0.013	mg/L	0.0626	0.013	103	85-115			D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



Analytical Report

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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
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Reported:
16-Dec-2021 11:57

Certified Analyses included in this Report

Analyte	Certifications
<i>EPA 6020B in Water</i>	
Silver-107	WADOE,WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
Silver-107	WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
<i>EPA 6020B UCT-KED in Water</i>	
Arsenic-75a	WADOE,WA-DW,DoD-ELAP,ADEC,NELAP
Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Cobalt-59	NELAP,DoD-ELAP,WADOE
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	WADOE,WA-DW,DoD-ELAP
Zinc-67	WADOE,WA-DW,DoD-ELAP
Arsenic-75a	NELAP,WADOE,DoD-ELAP,ADEC


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Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	NELAP,WADOE,DoD-ELAP
Zinc-67	NELAP,WADOE,DoD-ELAP

EPA 7470A in Water

Mercury	WADOE,NELAP,DoD-ELAP
Mercury	WADOE,NELAP,DoD-ELAP

EPA 8082A in Water

Aroclor 1016	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1016 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268 [2C]	WADOE,DoD-ELAP,NELAP,ADEC

EPA 8260D in Water

Chloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Acrolein	DoD-ELAP,NELAP,WADOE



Analytical Report

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Project: Lower Duwamish Q4
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Reported:
16-Dec-2021 11:57

1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Iodomethane	DoD-ELAP,NELAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Butanone	DoD-ELAP,NELAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
m,p-Xylene	DoD-ELAP,ADEC,NELAP,WADOE


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

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o-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
Styrene	DoD-ELAP,NELAP,WADOE
Bromoform	DoD-ELAP,NELAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE

EPA 8260D-SIM in Water

Acrylonitrile	NELAP,WADOE
Vinyl chloride	NELAP,WADOE
1,1-Dichloroethene	NELAP,WADOE
cis-1,2-Dichloroethene	NELAP,WADOE
trans-1,2-Dichloroethene	NELAP,WADOE
Trichloroethene	NELAP,WADOE
Tetrachloroethene	NELAP,WADOE
1,1,2,2-Tetrachloroethane	NELAP,WADOE
1,2-Dichloroethane	NELAP,WADOE


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Benzene

NELAP,WADOE

EPA 8270E in Water

Phenol	NELAP,DoD-ELAP
bis(2-chloroethyl) ether	NELAP,DoD-ELAP
2-Chlorophenol	NELAP,DoD-ELAP
1,3-Dichlorobenzene	NELAP,DoD-ELAP
1,4-Dichlorobenzene	NELAP,DoD-ELAP
1,2-Dichlorobenzene	NELAP,DoD-ELAP
Benzyl Alcohol	NELAP,DoD-ELAP
2,2'-Oxybis(1-chloropropane)	NELAP,DoD-ELAP
2-Methylphenol	NELAP,DoD-ELAP
Hexachloroethane	NELAP,DoD-ELAP
N-Nitroso-di-n-Propylamine	NELAP,DoD-ELAP
4-Methylphenol	NELAP,DoD-ELAP
Nitrobenzene	NELAP,DoD-ELAP
Isophorone	NELAP,DoD-ELAP
2-Nitrophenol	NELAP,DoD-ELAP
2,4-Dimethylphenol	NELAP,DoD-ELAP
Bis(2-Chloroethoxy)methane	NELAP,DoD-ELAP
2,4-Dichlorophenol	NELAP,DoD-ELAP
1,2,4-Trichlorobenzene	NELAP,DoD-ELAP
Naphthalene	NELAP,DoD-ELAP
Benzoic acid	NELAP,DoD-ELAP
4-Chloroaniline	NELAP,DoD-ELAP
Hexachlorobutadiene	NELAP,DoD-ELAP
4-Chloro-3-Methylphenol	NELAP,DoD-ELAP
2-Methylnaphthalene	NELAP,DoD-ELAP
Hexachlorocyclopentadiene	NELAP,DoD-ELAP
2,4,6-Trichlorophenol	NELAP,DoD-ELAP
2,4,5-Trichlorophenol	NELAP,DoD-ELAP
2-Chloronaphthalene	NELAP,DoD-ELAP
2-Nitroaniline	NELAP,DoD-ELAP
Acenaphthylene	NELAP,DoD-ELAP
Dimethylphthalate	NELAP,DoD-ELAP
2,6-Dinitrotoluene	NELAP,DoD-ELAP
Acenaphthene	NELAP,DoD-ELAP
3-Nitroaniline	NELAP,DoD-ELAP
2,4-Dinitrophenol	NELAP,DoD-ELAP
Dibenzofuran	NELAP,DoD-ELAP


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4-Nitrophenol	NELAP,DoD-ELAP
2,4-Dinitrotoluene	NELAP,DoD-ELAP
Fluorene	NELAP,DoD-ELAP
4-Chlorophenylphenyl ether	NELAP,DoD-ELAP
Diethyl phthalate	NELAP,DoD-ELAP
4-Nitroaniline	NELAP,DoD-ELAP
4,6-Dinitro-2-methylphenol	NELAP,DoD-ELAP
N-Nitrosodiphenylamine	NELAP,DoD-ELAP
4-Bromophenyl phenyl ether	NELAP,DoD-ELAP
Hexachlorobenzene	NELAP,DoD-ELAP
Pentachlorophenol	NELAP,DoD-ELAP
Phenanthrene	NELAP,DoD-ELAP
Anthracene	NELAP,DoD-ELAP
Carbazole	NELAP,DoD-ELAP
Di-n-Butylphthalate	NELAP,DoD-ELAP
Fluoranthene	NELAP,DoD-ELAP
Pyrene	NELAP,DoD-ELAP
Butylbenzylphthalate	NELAP,DoD-ELAP
Benzo(a)anthracene	NELAP,DoD-ELAP
3,3'-Dichlorobenzidine	NELAP,DoD-ELAP
Chrysene	NELAP,DoD-ELAP
bis(2-Ethylhexyl)phthalate	NELAP,DoD-ELAP
Di-n-Octylphthalate	NELAP,DoD-ELAP
Benzo(b)fluoranthene	NELAP,DoD-ELAP
Benzo(k)fluoranthene	NELAP,DoD-ELAP
Benzofluoranthenes, Total	NELAP
Benzo(a)pyrene	NELAP,DoD-ELAP
Indeno(1,2,3-cd)pyrene	NELAP,DoD-ELAP
Dibenzo(a,h)anthracene	NELAP,DoD-ELAP
Benzo(g,h,i)perylene	NELAP,DoD-ELAP
N-Nitrosodimethylamine	NELAP,DoD-ELAP
1-Methylnaphthalene	NELAP,DoD-ELAP

EPA 8270E-SIM in Water

Naphthalene	ADEC,DoD-ELAP,NELAP,WADOE
2-Methylnaphthalene	ADEC,DoD-ELAP,NELAP
1-Methylnaphthalene	ADEC,DoD-ELAP,NELAP,WADOE
Biphenyl	NELAP
Acenaphthylene	ADEC,DoD-ELAP,NELAP,WADOE
Acenaphthene	ADEC,DoD-ELAP,NELAP,WADOE


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Dibenzofuran	ADEC, DoD-ELAP, NELAP
Fluorene	ADEC, DoD-ELAP, NELAP, WADOE
Phenanthrene	ADEC, DoD-ELAP, NELAP, WADOE
Anthracene	ADEC, DoD-ELAP, NELAP, WADOE
Carbazole	NELAP
Fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Pyrene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(a)anthracene	ADEC, DoD-ELAP, NELAP, WADOE
Chrysene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(b)fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(k)fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(j)fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(e)pyrene	NELAP
Benzo(a)pyrene	ADEC, DoD-ELAP, NELAP, WADOE
Perylene	ADEC, NELAP
Indeno(1,2,3-cd)pyrene	ADEC, DoD-ELAP, NELAP, WADOE
Dibenzo(a,h)anthracene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(g,h,i)perylene	ADEC, DoD-ELAP, NELAP, WADOE

NWTPH-Dx in Water

Diesel Range Organics (C12-C24)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C10-C25)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (Tol-C18)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C10-C24)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C10-C28)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C12-C22)	DoD-ELAP
Diesel Range Organics (C12-C25)	DoD-ELAP
Motor Oil Range Organics (C24-C38)	DoD-ELAP, NELAP, WADOE
Motor Oil Range Organics (C25-C36)	DoD-ELAP, NELAP, WADOE
Motor Oil Range Organics (C24-C40)	DoD-ELAP, NELAP, WADOE
Residual Range Organics (C23-C32)	DoD-ELAP
Mineral Spirits Range Organics (Tol-C12)	DoD-ELAP, NELAP, WADOE
Mineral Oil Range Organics (C16-C28)	DoD-ELAP, NELAP, WADOE
Kerosene Range Organics (Tol-C18)	DoD-ELAP, NELAP, WADOE
JP8 Range Organics (C8-C18)	DoD-ELAP, NELAP, WADOE
JP5 Range Organics (C10-C16)	DoD-ELAP, NELAP, WADOE
JP4 Range Organics (Tol-C14)	DoD-ELAP, NELAP, WADOE
Jet-A Range Organics (C10-C18)	DoD-ELAP, NELAP, WADOE
Creosote Range Organics (C12-C22)	DoD-ELAP, NELAP, WADOE
Bunker C Range Organics (C10-C38)	DoD-ELAP, NELAP, WADOE


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 Stoddard Range Organics (C8-C12) DoD-ELAP,NELAP,WADOE
 Transformer Oil Range Organics (C12-C28) DoD-ELAP,NELAP,WADOE

NWTPHg in Water

 Gasoline Range Organics (Tol-Nap) WADOE,DoD-ELAP
 Gasoline Range Organics (2MP-TMB) WADOE,DoD-ELAP
 Gasoline Range Organics (Tol-C12) WADOE,DoD-ELAP
 Gasoline Range Organics (C6-C10) WADOE,ADEC,DoD-ELAP
 Gasoline Range Organics (C5-C12) WADOE,DoD-ELAP

SM 3500-Cr B-09 in Water

Hexavalent Chromium WADOE,NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2023
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/28/2022
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2022
WADOE	WA Dept of Ecology	C558	06/30/2022
WA-DW	Ecology - Drinking Water	C558	06/30/2022



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Notes and Definitions

*	Flagged value is not within established control limits.
D	The reported value is from a dilution
J	Estimated concentration value detected below the reporting limit.
P1	The reported value is greater than 40% difference between the concentrations determined on two GC columns where applicable.
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20% RSD, <20% drift or minimum RRF)
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.



Analytical Resources, LLC
Analytical Chemists and Consultants

16 December 2021

Meg Strong
Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle, WA 98103-8636

RE: Lower Duwamish Q4

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)
21L0003

Associated SDG ID(s)
N/A

**Shelly
Fishel**

Digitally signed by
Shelly Fishel
Date: 2021.12.16
13:59:14 -08'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

Shelly Fishel, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Page: 1	of 1
Date:	Ice Present?
No. of Coolers:	Cooler Temps: 2.4; 5.3



Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

Client Project Name: LDW						Analysis Requested										Notes/Comments					
Client Project #: 21-1-12596		Samplers: DES, RMV				TPH-G	TPH-DX	BTEX	HVOCs	MTBE	PAHs	Full SVOCs	Limited SVOCs	PCBs (HCHLs)	metals						
Sample ID	Date	Time	Matrix	No. Containers																	
MW-42-20212911	11/29	1145	GW	11		X	X	X						X	①					① Cr, Mn, Hg	
TB-12-20212911	11/29	0917	W	5			X	X												② As, Ba, Cr, Mn, Ni, Cd, Co, Cu, Fe, Pb, Hg, Se, Ag, V, Zn	
MW-73-20212911	11/29	1347	GW	13	X	X	X	X		X					②						
MW-6-20212911	11/29	1459	GW	13	X	X	X	X					X		③					③ Cu, As,	
Comments/Special Instructions • Metals are <u>not</u> field filtered • Reference project for detection limits	Relinquished by: (Signature) <i>Rose Vogt</i>			Received by: <i>D. L...</i> (Signature)						Relinquished by: (Signature)					Received by: (Signature)						
	Printed Name: <i>Rose Vogt</i>			Printed Name: <i>Dimitri...</i>						Printed Name:					Printed Name:						
	Company: <i>Shannon + Wilson</i>			Company: <i>AR...</i>						Company:					Company:						
	Date & Time: <i>11/29/2021 1551</i>			Date & Time: <i>11/29/21 1551</i>						Date & Time:					Date & Time:						

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-42-20212911	21L0003-01	Water	29-Nov-2021 11:45	29-Nov-2021 15:51
MW-42-20212911	21L0003-02	Water	29-Nov-2021 11:45	29-Nov-2021 15:51
TB-12-20212911	21L0003-03	Water	29-Nov-2021 09:17	29-Nov-2021 15:51
MW-73-20212911	21L0003-04	Water	29-Nov-2021 13:47	29-Nov-2021 15:51
MW-73-20212911	21L0003-05	Water	29-Nov-2021 13:47	29-Nov-2021 15:51
MW-6-20212911	21L0003-06	Water	29-Nov-2021 14:59	29-Nov-2021 15:51
MW-6-20212911	21L0003-07	Water	29-Nov-2021 14:59	29-Nov-2021 15:51



Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
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Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

Work Order Case Narrative

Client: Shannon & Wilson, Inc
Project: Lower Duwamish Q4
Work Order: 21L0003

Sample receipt

Samples as listed on the preceding page were received 29-Nov-2021 15:51 under ARI work order 21L0003. For details regarding sample receipt, please refer to the Cooler Receipt Form.

PCB Aroclors - EPA Method SW8082A

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Gasoline by NWTPH-q (GC/MS)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method SW8260D

The sample(s) were analyzed within the recommended holding times.


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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
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Reported:
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Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method 8260D-SIM (Selected Ion Monitoring)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Polynuclear Aromatic Hydrocarbons (PAH) - EPA Method SW8270E-SIM

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Total Metals - EPA Method 6020B


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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
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The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21L0003-01 in Total Metals batch B JL0197. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference (RPD) were within advisory control limits.

Total Mercury - EPA Method 7470/7471

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Diesel/Heavy Oil Range Organics - WA-Ecology Method NW-TPHDx

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Sample 21L0003-04 and 21L0003-06 peaks were identified as Diesel Range Organics but appear to be a light oil. The peaks eluted early for an oil in the diesel range. The peaks did not have the Di-isoprenoids or n-Alkane peaks which are present in a diesel sample.



WORK ORDER

21L0003

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Preservation Confirmation

Container ID	Container Type	pH	
21L0003-01 A	Glass NM, Amber, 500 mL		
21L0003-01 B	Glass NM, Amber, 500 mL		
21L0003-01 C	VOA Vial, Clear, 40 mL, HCL		
21L0003-01 D	VOA Vial, Clear, 40 mL, HCL		
21L0003-01 E	VOA Vial, Clear, 40 mL, HCL		
21L0003-01 F	VOA Vial, Amber, 40 mL, HCL		
21L0003-01 G	VOA Vial, Amber, 40 mL, HCL		
21L0003-01 H	Glass NM, Amber, 1000 mL		
21L0003-01 I	Glass NM, Amber, 1000 mL		
21L0003-01 J	HDPE NM, 500 mL, 1:1 HNO3	< 2	Pass
21L0003-02 A	HDPE NM, 500 mL	> 2	Fail
21L0003-03 A	VOA Vial, Clear, 40 mL, HCL		bubble
21L0003-03 B	VOA Vial, Clear, 40 mL, HCL		
21L0003-03 C	VOA Vial, Clear, 40 mL, HCL		
21L0003-03 D	VOA Vial, Clear, 40 mL, HCL		
21L0003-03 E	VOA Vial, Clear, 40 mL, HCL		
21L0003-04 A	VOA Vial, Clear, 40 mL, HCL		
21L0003-04 B	VOA Vial, Clear, 40 mL, HCL		bubble
21L0003-04 C	Glass NM, Amber, 500 mL		
21L0003-04 D	Glass NM, Amber, 500 mL		
21L0003-04 E	VOA Vial, Clear, 40 mL, HCL		
21L0003-04 F	VOA Vial, Clear, 40 mL, HCL		
21L0003-04 G	VOA Vial, Clear, 40 mL, HCL		
21L0003-04 H	VOA Vial, Clear, 40 mL, HCL		
21L0003-04 I	VOA Vial, Clear, 40 mL, HCL		
21L0003-04 J	Glass NM, Amber, 500 mL		
21L0003-04 K	Glass NM, Amber, 500 mL		
21L0003-04 L	HDPE NM, 500 mL, 1:1 HNO3	< 2	Pass
21L0003-05 A	HDPE NM, 500 mL	> 2	Fail
21L0003-06 A	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 B	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 C	Glass NM, Amber, 500 mL	< 2 AP 12/01/21	
21L0003-06 D	Glass NM, Amber, 500 mL		
21L0003-06 E	VOA Vial, Clear, 40 mL, HCL		



Printed: 12/1/2021 11:09:25AM

WORK ORDER

21L0003

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21L0003-06 F	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 G	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 H	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 I	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 J	Glass NM, Amber, 1000 mL		
21L0003-06 K	Glass NM, Amber, 1000 mL		
21L0003-06 L	HDPE NM, 500 mL, 1:1 HNO3	< 2	Pass
21L0003-07 A	HDPE NM, 500 mL	> 2	Fail

Preservation Confirmed By

AP

Date

12/01/21



Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Shannon Wilson
COC No(s): NA
Assigned ARI Job No: 21L0003

Project Name: LDW
Delivered by: Fed-Ex UPS Courier Hand Delivered Other: NA
Tracking No: NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES NO

Were custody papers included with the cooler? YES NO

Were custody papers properly filled out (ink, signed, etc.) YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 15:51

If cooler temperature is out of compliance fill out form 00070F

Cooler Accepted by: AP for IB Date: 11/29/21 Time: 15:51 Temp Gun ID#: DOO 2565

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: NA

Was sufficient ice used (if appropriate)? YES NO

How were bottles sealed in plastic bags? Individually Grouped Not

Did all bottles arrive in good condition (unbroken)? YES NO

Were all bottle labels complete and legible? YES NO

Did the number of containers listed on COC match with the number of containers received? YES NO

Did all bottle labels and tags agree with custody papers? YES NO

Were all bottles used correct for the requested analyses? YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... NA YES NO

Were all VOC vials free of air bubbles? NA YES NO

Was sufficient amount of sample sent in each bottle? YES NO

Date VOC Trip Blank was made at ARI NA

Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: AP Date: 12/01/21 Time: 1027 Labels checked by: _____

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____ Date: _____



WORK ORDER

21L0003

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Preservation Confirmation

Container ID	Container Type	pH		
21L0003-01 A	Glass NM, Amber, 500 mL			
21L0003-01 B	Glass NM, Amber, 500 mL			
21L0003-01 C	VOA Vial, Clear, 40 mL, HCL			
21L0003-01 D	VOA Vial, Clear, 40 mL, HCL			
21L0003-01 E	VOA Vial, Clear, 40 mL, HCL			
21L0003-01 F	VOA Vial, Amber, 40 mL, HCL			
21L0003-01 G	VOA Vial, Amber, 40 mL, HCL			
21L0003-01 H	Glass NM, Amber, 1000 mL			
21L0003-01 I	Glass NM, Amber, 1000 mL			
21L0003-01 J	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass	
21L0003-02 A	HDPE NM, 500 mL	>2	Fail	(1)
21L0003-03 A	VOA Vial, Clear, 40 mL, HCL		bubble	
21L0003-03 B	VOA Vial, Clear, 40 mL, HCL			
21L0003-03 C	VOA Vial, Clear, 40 mL, HCL			
21L0003-03 D	VOA Vial, Clear, 40 mL, HCL			
21L0003-03 E	VOA Vial, Clear, 40 mL, HCL			
21L0003-04 A	VOA Vial, Clear, 40 mL, HCL			
21L0003-04 B	VOA Vial, Clear, 40 mL, HCL		bubble	
21L0003-04 C	Glass NM, Amber, 500 mL			
21L0003-04 D	Glass NM, Amber, 500 mL			
21L0003-04 E	VOA Vial, Clear, 40 mL, HCL			
21L0003-04 F	VOA Vial, Clear, 40 mL, HCL			
21L0003-04 G	VOA Vial, Clear, 40 mL, HCL			
21L0003-04 H	VOA Vial, Clear, 40 mL, HCL			
21L0003-04 I	VOA Vial, Clear, 40 mL, HCL			
21L0003-04 J	Glass NM, Amber, 500 mL			
21L0003-04 K	Glass NM, Amber, 500 mL			
21L0003-04 L	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass	
21L0003-05 A	HDPE NM, 500 mL	>2	Fail	(1)
21L0003-06 A	VOA Vial, Clear, 40 mL, HCL			
21L0003-06 B	VOA Vial, Clear, 40 mL, HCL			
21L0003-06 C	Glass NM, Amber, 500 mL	<2	AP 12/01/21	
21L0003-06 D	Glass NM, Amber, 500 mL			
21L0003-06 E	VOA Vial, Clear, 40 mL, HCL			



Analytical Resources, LLC
Analytical Chemists and Consultants

Printed: 12/1/2021 11:09:25AM

WORK ORDER

21L0003

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21L0003-06 F	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 G	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 H	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 I	VOA Vial, Clear, 40 mL, HCL		
21L0003-06 J	Glass NM, Amber, 1000 mL		
21L0003-06 K	Glass NM, Amber, 1000 mL		
21L0003-06 L	HDPE NM, 500 mL, 1:1 HNO ₃	< 2	Pass
21L0003-07 A	HDPE NM, 500 mL	> 2	Fail (1)

Preservation Confirmed By

AP

Date

12/01/21

(1) filtered w 0.45 micron
& preserved to pH < 2
w/ 0.75 mL conc. HNO₃
(510414) 12/1/21 MM

Reviewed By

Date



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

MW-42-20212911

21L0003-01 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 11/29/2021 11:45

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 16:04

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-01 C

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	128	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	101	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	94.8	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	106	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-42-20212911
21L0003-01 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 11/29/2021 11:45

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 18:43

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-01 D

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	113	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-42-20212911
21L0003-01 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 11/29/2021 11:45

Instrument: FID4 Analyst: TWC

Analyzed: 12/03/2021 20:41

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0003-01 A 01

Preparation Batch: BJL0037

Sample Size: 500 mL

Prepared: 12/02/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	74.2	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-42-20212911
21L0003-01 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 11/29/2021 11:45

Instrument: ECD7 Analyst: JGR

Analyzed: 12/06/2021 19:09

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0034 Prepared: 12/02/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0003-01 H 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0045 Cleaned: 06-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0003-01 H 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0043 Cleaned: 06-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0003-01 H 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0044 Cleaned: 06-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0003-01 H 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	87.5	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	76.4	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	90.9	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	75.7	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-42-20212911
21L0003-01 (Water)
Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 11/29/2021 11:45

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 03:55

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0197 Sample Size: 25 mL
 Prepared: 12/08/2021 Final Volume: 25 mL

Extract ID: 21L0003-01 J 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Chromium	7440-47-3	1	0.260	0.500	12.5	ug/L	
Manganese	7439-96-5	1	0.142	0.500	2.42	ug/L	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-42-20212911
21L0003-01 (Water)
Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 11/29/2021 11:45

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 14:29

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0003-01 J

Preparation Batch: BJL0219

Sample Size: 20 mL

Prepared: 12/09/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-42-20212911
21L0003-02 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 11/29/2021 11:45

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/08/2021 04:57

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix	Extract ID: 21L0003-02 A 02
	Preparation Batch: BJL0168	Filtration Batch: BJL0036
	Prepared: 12/07/2021	Filtration Date: 12/01/2021 15:23
	Sample Size: 25 mL	
	Final Volume: 25 mL	

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Chromium, Dissolved	7440-47-3	1	0.260	0.500	12.3	ug/L	
Manganese, Dissolved	7439-96-5	1	0.142	0.500	1.42	ug/L	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-42-20212911
21L0003-02RE1 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 11/29/2021 11:45

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 15:43

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0003-02RE1 A

Preparation Batch: BJL0271

Sample Size: 20 mL

Filtration Batch: BJL0036

Prepared: 12/13/2021

Final Volume: 20 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

TB-12-20212911

21L0003-03 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 11/29/2021 09:17

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 16:30

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-03 B

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>121</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>101</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>98.6</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>103</i>	<i>%</i>	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

TB-12-20212911
21L0003-03 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 11/29/2021 09:17

Instrument: NT16 Analyst: KOTT

Analyzed: 12/09/2021 17:16

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-03 D

Preparation Batch: BJL0225

Sample Size: 10 mL

Prepared: 12/09/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	96.8	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	98.7	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				75-125 %	95.9	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-73-20212911
21L0003-04 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 11/29/2021 13:47

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 16:55

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-04 A

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	0.11	ug/L	J
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	125	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	102	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	98.0	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	102	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-73-20212911
21L0003-04 (Water)
Volatile Organic Compounds

Method: NWTPHg

Sampled: 11/29/2021 13:47

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 16:55

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-04 A

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	520	ug/L	
HC ID: GRO						
Surrogate: Toluene-d8			80-120 %	102	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	98.0	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-73-20212911
21L0003-04 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 11/29/2021 13:47

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 19:41

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-04 B

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>115</i>	<i>%</i>	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

MW-73-20212911

21L0003-04 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 11/29/2021 13:47

Instrument: NT11 Analyst: VTS

Analyzed: 12/11/2021 17:27

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0066 Prepared: 12/06/2021	Sample Size: 500 mL Final Volume: 0.5 mL	Extract ID: 21L0003-04 D 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0063 Cleaned: 08-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0003-04 D 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.002	ug/L	J
2-Methylnaphthalene	91-57-6	1	0.001	0.010	ND	ug/L	U
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	ND	ug/L	U
Acenaphthylene	208-96-8	1	0.002	0.010	ND	ug/L	U
Acenaphthene	83-32-9	1	0.003	0.010	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.002	0.010	ND	ug/L	U
Fluorene	86-73-7	1	0.002	0.010	0.023	ug/L	
Phenanthrene	85-01-8	1	0.001	0.010	ND	ug/L	U
Anthracene	120-12-7	1	0.001	0.010	ND	ug/L	U
Carbazole	86-74-8	1	0.001	0.010	ND	ug/L	U
Fluoranthene	206-44-0	1	0.002	0.010	0.009	ug/L	J
Pyrene	129-00-0	1	0.001	0.010	0.090	ug/L	
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	ND	ug/L	U
Chrysene	218-01-9	1	0.0009	0.010	ND	ug/L	U
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	0.001	ug/L	J
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)fluoranthene, Total		1	0.004	0.010	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.002	0.010	ND	ug/L	U
Perylene	1985-5-0	1	0.006	0.010	0.012	ug/L	
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	0.001	ug/L	J
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	ND	ug/L	U
Surrogate: 2-Methylnaphthalene-d10					42-120 %	98.6 %	
Surrogate: Dibenzo[a,h]anthracene-d14					29-120 %	96.7 %	
Surrogate: Fluoranthene-d10					57-120 %	113 %	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-73-20212911
21L0003-04 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 11/29/2021 13:47

Instrument: FID4 Analyst: TWC

Analyzed: 12/06/2021 12:14

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0003-04 C 01

Preparation Batch: BJL0037

Sample Size: 500 mL

Prepared: 12/02/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	5	0.500	9.04	mg/L	D
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	5	1.00	1.95	mg/L	D
HC ID: MOTOR OIL						
Surrogate: o-Terphenyl			50-150 %	88.9	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-73-20212911
21L0003-04 (Water)
Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 11/29/2021 13:47

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 02:44

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0197 Sample Size: 25 mL
 Prepared: 12/08/2021 Final Volume: 25 mL

Extract ID: 21L0003-04 L 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium	7440-39-3	1	0.114	0.500	6.12	ug/L	
Chromium	7440-47-3	1	0.260	0.500	0.841	ug/L	
Iron	7439-89-6	1	18.2	36.0	12200	ug/L	
Lead	7439-92-1	1	0.0513	0.100	0.321	ug/L	
Manganese	7439-96-5	10	1.42	5.00	560	ug/L	D
Silver	7440-22-4	1	0.0220	0.200	0.0970	ug/L	J
Vanadium	7440-62-2	1	0.0556	0.200	4.91	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
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MW-73-20212911
21L0003-04 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 11/29/2021 13:47

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 02:44

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0003-04 L 01

Preparation Batch: BJL0197

Sample Size: 25 mL

Prepared: 12/08/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	5.48	ug/L	
Cadmium	7440-43-9	1	0.0300	0.100	0.0860	ug/L	J
Cobalt	7440-48-4	1	0.0178	0.200	5.29	ug/L	
Copper	7440-50-8	1	0.173	0.500	28.5	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	9.40	ug/L	
Selenium	7782-49-2	1	0.179	0.500	0.508	ug/L	
Zinc	7440-66-6	1	2.92	6.00	5.23	ug/L	J



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

MW-73-20212911

21L0003-04 (Water)

Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 11/29/2021 13:47

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 14:32

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0003-04 L

Preparation Batch: B JL0219

Sample Size: 20 mL

Prepared: 12/09/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-73-20212911
21L0003-05 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 11/29/2021 13:47

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/08/2021 04:53

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0003-05 A 02

Preparation Batch: BJL0168

Sample Size: 25 mL

Filtration Batch: BJL0036

Prepared: 12/07/2021

Final Volume: 25 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium, Dissolved	7440-39-3	1	0.114	0.500	3.78	ug/L	
Chromium, Dissolved	7440-47-3	1	0.260	0.500	0.312	ug/L	J
Iron, Dissolved	7439-89-6	1	18.2	36.0	241	ug/L	
Lead, Dissolved	7439-92-1	1	0.0513	0.100	ND	ug/L	U
Silver, Dissolved	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium, Dissolved	7440-62-2	1	0.0556	0.200	0.258	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
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MW-73-20212911
21L0003-05 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 11/29/2021 13:47

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 02:27

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0003-05 A 02

Preparation Batch: BJL0168

Sample Size: 25 mL

Filtration Batch: BJL0036

Prepared: 12/07/2021

Final Volume: 25 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	1.12	ug/L	
Cadmium, Dissolved	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt, Dissolved	7440-48-4	1	0.0178	0.200	5.04	ug/L	
Copper, Dissolved	7440-50-8	1	0.173	0.500	0.772	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	8.64	ug/L	
Selenium, Dissolved	7782-49-2	1	0.179	0.500	ND	ug/L	U
Zinc, Dissolved	7440-66-6	1	2.92	6.00	4.03	ug/L	J


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 Project: Lower Duwamish Q4
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 Project Manager: Meg Strong

Reported:
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MW-73-20212911
21L0003-05RE1 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 11/29/2021 13:47

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 02:22

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix	Extract ID: 21L0003-05RE1 A 02
	Preparation Batch: BJL0168	Filtration Batch: BJL0036
	Prepared: 12/07/2021	Filtration Date: 12/01/2021 15:23
	Sample Size: 25 mL	
	Final Volume: 25 mL	

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Manganese, Dissolved	7439-96-5	10	1.42	5.00	538	ug/L	D


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-73-20212911
21L0003-05RE1 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 11/29/2021 13:47

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 15:46

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0003-05RE1 A

Preparation Batch: BJL0271

Sample Size: 20 mL

Filtration Batch: BJL0036

Prepared: 12/13/2021

Final Volume: 20 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-6-20212911
21L0003-06 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 11/29/2021 14:59

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 17:20

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-06 B

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	125	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.7	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	103	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	102	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-6-20212911
21L0003-06 (Water)
Volatile Organic Compounds

Method: NWTPHg

Sampled: 11/29/2021 14:59

Instrument: NT3 Analyst: PKC

Analyzed: 12/01/2021 17:20

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-06 B

Preparation Batch: BJL0023

Sample Size: 10 mL

Prepared: 12/01/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
<i>Surrogate: Toluene-d8</i>			80-120 %	97.7	%	
<i>Surrogate: 4-Bromofluorobenzene</i>			80-120 %	103	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-6-20212911
21L0003-06 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 11/29/2021 14:59

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 20:09

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0003-06 E

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>89.9</i>	<i>%</i>	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-6-20212911
21L0003-06 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 11/29/2021 14:59

Instrument: FID4 Analyst: TWC

Analyzed: 12/03/2021 21:19

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0003-06 C 01

Preparation Batch: BJL0037

Sample Size: 500 mL

Prepared: 12/02/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	0.101	mg/L	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	0.204	mg/L	
HC ID: MOTOR OIL						
Surrogate: o-Terphenyl			50-150 %	89.3	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-6-20212911
21L0003-06 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 11/29/2021 14:59

Instrument: ECD7 Analyst: JGR

Analyzed: 12/06/2021 19:30

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0034 Prepared: 12/02/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0003-06 J 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0045 Cleaned: 06-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0003-06 J 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0043 Cleaned: 06-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0003-06 J 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0044 Cleaned: 06-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0003-06 J 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	80.9	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	77.0	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	84.0	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	76.3	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-6-20212911
21L0003-06 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 11/29/2021 14:59

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 02:38

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0197 Sample Size: 25 mL
 Prepared: 12/08/2021 Final Volume: 25 mL

Extract ID: 21L0003-06 L 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	14.8	ug/L	
Copper	7440-50-8	1	0.173	0.500	2.46	ug/L	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

MW-6-20212911
21L0003-07 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 11/29/2021 14:59

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/09/2021 02:33

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0003-07 A 02

Preparation Batch: BJL0168

Sample Size: 25 mL

Filtration Batch: BJL0036

Prepared: 12/07/2021

Final Volume: 25 mL

Filtration Date: 12/01/2021 15:23

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	8.55	ug/L	
Copper, Dissolved	7440-50-8	1	0.173	0.500	0.917	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - Quality Control
Batch BJL0023 - EPA 5030C (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0023-BLK1)		Prepared: 01-Dec-2021 Analyzed: 01-Dec-2021 12:16								
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	5.09		ug/L	5.00		102	80-120			
Surrogate: 4-Bromofluorobenzene	4.75		ug/L	5.00		94.9	80-120			
Blank (BJL0023-BLK2)		Prepared: 01-Dec-2021 Analyzed: 01-Dec-2021 12:16								
Vinyl Chloride	ND	0.08	0.20	ug/L						U
1,1-Dichloroethene	ND	0.08	0.20	ug/L						U
trans-1,2-Dichloroethene	ND	0.07	0.20	ug/L						U
cis-1,2-Dichloroethene	ND	0.08	0.20	ug/L						U
Benzene	ND	0.05	0.20	ug/L						U
Trichloroethene	ND	0.07	0.20	ug/L						U
Toluene	ND	0.05	0.20	ug/L						U
Tetrachloroethene	ND	0.09	0.20	ug/L						U
Ethylbenzene	ND	0.05	0.20	ug/L						U
m,p-Xylene	ND	0.14	0.40	ug/L						U
o-Xylene	ND	0.08	0.20	ug/L						U
Xylenes, total	ND	0.22	0.60	ug/L						U
Surrogate: 1,2-Dichloroethane-d4	5.90		ug/L	5.00		118	80-129			
Surrogate: Toluene-d8	5.09		ug/L	5.00		102	80-120			
Surrogate: 4-Bromofluorobenzene	4.75		ug/L	5.00		94.9	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.00		ug/L	5.00		100	80-120			
LCS (BJL0023-BS1)		Prepared: 01-Dec-2021 Analyzed: 01-Dec-2021 09:54								
Gasoline Range Organics (Tol-Nap)	932	100	ug/L	1000		93.2	72-128			
Surrogate: Toluene-d8	5.19		ug/L	5.00		104	80-120			
Surrogate: 4-Bromofluorobenzene	5.03		ug/L	5.00		101	80-120			
LCS (BJL0023-BS2)		Prepared: 01-Dec-2021 Analyzed: 01-Dec-2021 10:19								
Vinyl Chloride	10.1	0.08	0.20	ug/L	10.0	101	66-133			
1,1-Dichloroethene	10.7	0.08	0.20	ug/L	10.0	107	69-135			
trans-1,2-Dichloroethene	9.33	0.07	0.20	ug/L	10.0	93.3	78-128			
cis-1,2-Dichloroethene	9.71	0.08	0.20	ug/L	10.0	97.1	80-121			
Benzene	9.77	0.05	0.20	ug/L	10.0	97.7	80-120			
Trichloroethene	9.36	0.07	0.20	ug/L	10.0	93.6	80-120			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BJL0023 - EPA 5030C (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0023-BS2)						Prepared: 01-Dec-2021	Analyzed: 01-Dec-2021 10:19				
Toluene	9.42	0.05	0.20	ug/L	10.0		94.2	80-120			
Tetrachloroethene	9.42	0.09	0.20	ug/L	10.0		94.2	80-120			
Ethylbenzene	9.81	0.05	0.20	ug/L	10.0		98.1	80-120			
m,p-Xylene	19.8	0.14	0.40	ug/L	20.0		99.2	80-121			
o-Xylene	9.45	0.08	0.20	ug/L	10.0		94.5	80-121			
Xylenes, total	29.3	0.22	0.60	ug/L	30.0		97.6	76-127			
Surrogate: 1,2-Dichloroethane-d4	5.98			ug/L	5.00		120	80-129			
Surrogate: Toluene-d8	5.03			ug/L	5.00		101	80-120			
Surrogate: 4-Bromofluorobenzene	4.80			ug/L	5.00		96.0	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.05			ug/L	5.00		101	80-120			
LCS Dup (BJL0023-BSD1)						Prepared: 01-Dec-2021	Analyzed: 01-Dec-2021 10:44				
Gasoline Range Organics (Tol-Nap)	871		100	ug/L	1000		87.1	72-128	6.68	30	
Surrogate: Toluene-d8	4.90			ug/L	5.00		97.9	80-120			
Surrogate: 4-Bromofluorobenzene	5.08			ug/L	5.00		102	80-120			
LCS Dup (BJL0023-BSD2)						Prepared: 01-Dec-2021	Analyzed: 01-Dec-2021 11:09				
Vinyl Chloride	10.6	0.08	0.20	ug/L	10.0		106	66-133	5.21	30	
1,1-Dichloroethene	11.4	0.08	0.20	ug/L	10.0		114	69-135	6.35	30	
trans-1,2-Dichloroethene	9.59	0.07	0.20	ug/L	10.0		95.9	78-128	2.72	30	
cis-1,2-Dichloroethene	10.1	0.08	0.20	ug/L	10.0		101	80-121	4.31	30	
Benzene	10.1	0.05	0.20	ug/L	10.0		101	80-120	3.07	30	
Trichloroethene	9.65	0.07	0.20	ug/L	10.0		96.5	80-120	3.11	30	
Toluene	9.86	0.05	0.20	ug/L	10.0		98.6	80-120	4.59	30	
Tetrachloroethene	9.36	0.09	0.20	ug/L	10.0		93.6	80-120	0.58	30	
Ethylbenzene	9.62	0.05	0.20	ug/L	10.0		96.2	80-120	1.97	30	
m,p-Xylene	19.5	0.14	0.40	ug/L	20.0		97.4	80-121	1.80	30	
o-Xylene	9.27	0.08	0.20	ug/L	10.0		92.7	80-121	1.95	30	
Xylenes, total	28.8	0.22	0.60	ug/L	30.0		95.8	76-127	1.85	30	
Surrogate: 1,2-Dichloroethane-d4	5.82			ug/L	5.00		116	80-129			
Surrogate: Toluene-d8	5.15			ug/L	5.00		103	80-120			
Surrogate: 4-Bromofluorobenzene	4.86			ug/L	5.00		97.2	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.25			ug/L	5.00		105	80-120			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - SIM - Quality Control
Batch BJL0145 - EPA 5030C (Purge and Trap)

Instrument: NT7 Analyst: PB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0145-BLK1)					Prepared: 06-Dec-2021 Analyzed: 06-Dec-2021 15:56						
Vinyl chloride	ND	5.01	20.0	ng/L							U
Surrogate: 1,2-Dichloroethane-d4	5780			ng/L	5000		116	80-129			
Surrogate: Toluene-d8	4670			ng/L	5000		93.5	80-120			
Surrogate: 4-Bromofluorobenzene	1000000000			ng/L	5000		20000000	75-125			
LCS (BJL0145-BS1)					Prepared: 06-Dec-2021 Analyzed: 06-Dec-2021 12:38						
Vinyl chloride	527	5.01	20.0	ng/L	500		105	62-141			
Surrogate: 1,2-Dichloroethane-d4	5150			ng/L	5000		103	80-129			
Surrogate: Toluene-d8	5090			ng/L	5000		102	80-120			
Surrogate: 4-Bromofluorobenzene	1000000000			ng/L	5000		20000000	75-125			
LCS Dup (BJL0145-BS1)					Prepared: 06-Dec-2021 Analyzed: 06-Dec-2021 13:22						
Vinyl chloride	469	5.01	20.0	ng/L	500		93.9	62-141	11.60	30	
Surrogate: 1,2-Dichloroethane-d4	5830			ng/L	5000		117	80-129			
Surrogate: Toluene-d8	4990			ng/L	5000		99.7	80-120			
Surrogate: 4-Bromofluorobenzene	1000000000			ng/L	5000		20000000	75-125			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - SIM - Quality Control
Batch BJL0225 - EPA 5030C (Purge and Trap)

Instrument: NT16 Analyst: KOTT

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0225-BLK1)						Prepared: 09-Dec-2021 Analyzed: 09-Dec-2021 15:52					
Vinyl chloride	ND	5.01	20.0	ng/L							U
Surrogate: 1,2-Dichloroethane-d4	4940			ng/L	5000		98.7	80-129			
Surrogate: Toluene-d8	4830			ng/L	5000		96.6	80-120			
Surrogate: 4-Bromofluorobenzene	4840			ng/L	5000		96.8	75-125			
LCS (BJL0225-BS1)						Prepared: 09-Dec-2021 Analyzed: 09-Dec-2021 13:17					
Vinyl chloride	2380	5.01	20.0	ng/L	2000		119	62-141			
Surrogate: 1,2-Dichloroethane-d4	4890			ng/L	5000		97.7	80-129			
Surrogate: Toluene-d8	5070			ng/L	5000		101	80-120			
Surrogate: 4-Bromofluorobenzene	5170			ng/L	5000		103	75-125			
LCS Dup (BJL0225-BS1)						Prepared: 09-Dec-2021 Analyzed: 09-Dec-2021 14:56					
Vinyl chloride	2760	5.01	20.0	ng/L	2000		138	62-141	14.50	30	
Surrogate: 1,2-Dichloroethane-d4	4810			ng/L	5000		96.2	80-129			
Surrogate: Toluene-d8	5020			ng/L	5000		100	80-120			
Surrogate: 4-Bromofluorobenzene	5170			ng/L	5000		103	75-125			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJL0066 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0066-BLK1)						Prepared: 06-Dec-2021 Analyzed: 11-Dec-2021 15:57					
Naphthalene	0.002	0.001	0.010	ug/L							J
2-Methylnaphthalene	ND	0.001	0.010	ug/L							U
1-Methylnaphthalene	ND	0.0009	0.010	ug/L							U
Acenaphthylene	ND	0.002	0.010	ug/L							U
Acenaphthene	ND	0.003	0.010	ug/L							U
Dibenzofuran	ND	0.002	0.010	ug/L							U
Fluorene	ND	0.002	0.010	ug/L							U
Phenanthrene	ND	0.001	0.010	ug/L							U
Anthracene	ND	0.001	0.010	ug/L							U
Carbazole	ND	0.001	0.010	ug/L							U
Fluoranthene	ND	0.002	0.010	ug/L							U
Pyrene	0.002	0.001	0.010	ug/L							J
Benzo(a)anthracene	0.002	0.0008	0.010	ug/L							J
Chrysene	0.002	0.0009	0.010	ug/L							J
Benzo(b)fluoranthene	0.002	0.0005	0.010	ug/L							J
Benzo(k)fluoranthene	ND	0.003	0.010	ug/L							U
Benzo(j)fluoranthene	ND	0.002	0.010	ug/L							U
Benzo(a)pyrene	ND	0.002	0.010	ug/L							U
Perylene	ND	0.006	0.010	ug/L							U
Indeno(1,2,3-cd)pyrene	0.001	0.001	0.010	ug/L							J
Dibenzo(a,h)anthracene	ND	0.001	0.010	ug/L							U
Benzo(g,h,i)perylene	ND	0.001	0.010	ug/L							U
Surrogate: 2-Methylnaphthalene-d10	250			ug/L	300		83.2	42-120			
Surrogate: Dibenzo[a,h]anthracene-d14	273			ug/L	300		90.9	29-120			
Surrogate: Fluoranthene-d10	290			ug/L	300		96.6	57-120			

LCS (BJL0066-BS1)						Prepared: 06-Dec-2021 Analyzed: 11-Dec-2021 16:27					
Naphthalene	0.235	0.001	0.010	ug/L	0.300		78.5	37-120			
2-Methylnaphthalene	0.240	0.001	0.010	ug/L	0.300		80.1	37-120			
1-Methylnaphthalene	0.235	0.0009	0.010	ug/L	0.300		78.5	29-120			
Acenaphthylene	0.235	0.002	0.010	ug/L	0.300		78.4	41-120			
Acenaphthene	0.244	0.003	0.010	ug/L	0.300		81.2	41-120			
Dibenzofuran	0.240	0.002	0.010	ug/L	0.300		80.1	38-120			
Fluorene	0.250	0.002	0.010	ug/L	0.300		83.4	43-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJL0066 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0066-BS1)						Prepared: 06-Dec-2021 Analyzed: 11-Dec-2021 16:27					
Phenanthrene	0.250	0.001	0.010	ug/L	0.300		83.4	41-120			
Anthracene	0.239	0.001	0.010	ug/L	0.300		79.6	40-120			
Carbazole	0.256	0.001	0.010	ug/L	0.300		85.5	30-160			
Fluoranthene	0.266	0.002	0.010	ug/L	0.300		88.7	45-120			
Pyrene	0.266	0.001	0.010	ug/L	0.300		88.7	41-120			
Benzo(a)anthracene	0.263	0.0008	0.010	ug/L	0.300		87.7	42-120			
Chrysene	0.250	0.0009	0.010	ug/L	0.300		83.4	44-120			
Benzo(b)fluoranthene	0.258	0.0005	0.010	ug/L	0.300		86.1	44-120			
Benzo(k)fluoranthene	0.259	0.003	0.010	ug/L	0.300		86.5	50-120			
Benzo(j)fluoranthene	0.261	0.002	0.010	ug/L	0.300		86.9	39-160			
Benzofluoranthenes, Total	0.779	0.004	0.010	ug/L	0.900		86.5	46-120			
Benzo(a)pyrene	0.247	0.002	0.010	ug/L	0.300		82.2	35-120			
Perylene	0.250	0.006	0.010	ug/L	0.300		83.2	30-160			
Indeno(1,2,3-cd)pyrene	0.253	0.001	0.010	ug/L	0.300		84.3	37-120			
Dibenzo(a,h)anthracene	0.254	0.001	0.010	ug/L	0.300		84.7	34-120			
Benzo(g,h,i)perylene	0.246	0.001	0.010	ug/L	0.300		82.0	38-120			
Surrogate: 2-Methylnaphthalene-d10	273			ug/L	300		91.0	42-120			
Surrogate: Dibenzo[a,h]anthracene-d14	301			ug/L	300		100	29-120			
Surrogate: Fluoranthene-d10	306			ug/L	300		102	57-120			
LCS Dup (BJL0066-BS1)						Prepared: 06-Dec-2021 Analyzed: 11-Dec-2021 16:57					
Naphthalene	0.258	0.001	0.010	ug/L	0.300		86.0	37-120	9.13	30	
2-Methylnaphthalene	0.265	0.001	0.010	ug/L	0.300		88.5	37-120	9.87	30	
1-Methylnaphthalene	0.262	0.0009	0.010	ug/L	0.300		87.4	29-120	10.80	30	
Acenaphthylene	0.260	0.002	0.010	ug/L	0.300		86.7	41-120	9.98	30	
Acenaphthene	0.268	0.003	0.010	ug/L	0.300		89.4	41-120	9.58	30	
Dibenzofuran	0.261	0.002	0.010	ug/L	0.300		86.9	38-120	8.11	30	
Fluorene	0.276	0.002	0.010	ug/L	0.300		92.1	43-120	9.92	30	
Phenanthrene	0.276	0.001	0.010	ug/L	0.300		91.9	41-120	9.72	30	
Anthracene	0.271	0.001	0.010	ug/L	0.300		90.3	40-120	12.70	30	
Carbazole	0.287	0.001	0.010	ug/L	0.300		95.5	30-160	11.10	30	
Fluoranthene	0.296	0.002	0.010	ug/L	0.300		98.5	45-120	10.50	30	
Pyrene	0.294	0.001	0.010	ug/L	0.300		98.1	41-120	10.10	30	
Benzo(a)anthracene	0.295	0.0008	0.010	ug/L	0.300		98.2	42-120	11.30	30	
Chrysene	0.280	0.0009	0.010	ug/L	0.300		93.2	44-120	11.20	30	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJL0066 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJL0066-BSD1)						Prepared: 06-Dec-2021 Analyzed: 11-Dec-2021 16:57					
Benzo(b)fluoranthene	0.290	0.0005	0.010	ug/L	0.300		96.8	44-120	11.60	30	
Benzo(k)fluoranthene	0.290	0.003	0.010	ug/L	0.300		96.8	50-120	11.30	30	
Benzo(j)fluoranthene	0.291	0.002	0.010	ug/L	0.300		96.9	39-160	10.80	30	
Benzo(a)fluoranthene, Total	0.871	0.004	0.010	ug/L	0.900		96.8	46-120	11.20	30	
Benzo(a)pyrene	0.281	0.002	0.010	ug/L	0.300		93.5	35-120	12.90	30	
Perylene	0.277	0.006	0.010	ug/L	0.300		92.2	30-160	10.30	30	
Indeno(1,2,3-cd)pyrene	0.284	0.001	0.010	ug/L	0.300		94.7	37-120	11.70	30	
Dibenzo(a,h)anthracene	0.285	0.001	0.010	ug/L	0.300		95.1	34-120	11.70	30	
Benzo(g,h,i)perylene	0.276	0.001	0.010	ug/L	0.300		92.0	38-120	11.60	30	
Surrogate: 2-Methylnaphthalene-d10	265			ug/L	300		88.2	42-120			
Surrogate: Dibenzo[a,h]anthracene-d14	291			ug/L	300		97.0	29-120			
Surrogate: Fluoranthene-d10	296			ug/L	300		98.8	57-120			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Petroleum Hydrocarbons - Quality Control
Batch BJL0037 - EPA 3510C SepF

Instrument: FID4 Analyst: TWC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0037-BLK1)									
				Prepared: 02-Dec-2021 Analyzed: 03-Dec-2021 19:43					
Diesel Range Organics (C12-C24)	ND	0.100	mg/L						U
Motor Oil Range Organics (C24-C38)	ND	0.200	mg/L						U
<i>Surrogate: o-Terphenyl</i>	131		mg/L	113	116	50-150			
LCS (BJL0037-BS1)									
				Prepared: 02-Dec-2021 Analyzed: 03-Dec-2021 20:02					
Diesel Range Organics (C12-C24)	2.86	0.100	mg/L	3.00	95.4	56-120			
<i>Surrogate: o-Terphenyl</i>	126		mg/L	113	112	50-150			
LCS Dup (BJL0037-BSD1)									
				Prepared: 02-Dec-2021 Analyzed: 03-Dec-2021 20:21					
Diesel Range Organics (C12-C24)	2.48	0.100	mg/L	3.00	82.6	56-120	14.40	30	
<i>Surrogate: o-Terphenyl</i>	118		mg/L	113	105	50-150			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC

Aroclor PCB - Quality Control

Batch BJJ0034 - EPA 3510C SepF

Instrument: ECD7 Analyst: JGR

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0034-BLK1)						Prepared: 02-Dec-2021 Analyzed: 06-Dec-2021 16:41					
Aroclor 1016	ND	0.002	0.010	ug/L							U
Aroclor 1221	ND	0.002	0.010	ug/L							U
Aroclor 1232	ND	0.002	0.010	ug/L							U
Aroclor 1242	ND	0.002	0.010	ug/L							U
Aroclor 1248	ND	0.002	0.010	ug/L							U
Aroclor 1254	ND	0.002	0.010	ug/L							U
Aroclor 1260	ND	0.003	0.010	ug/L							U
Aroclor 1262	ND	0.003	0.010	ug/L							U
Aroclor 1268	ND	0.003	0.010	ug/L							U
Surrogate: Decachlorobiphenyl	30.6			ug/L	40.0		76.5	29-120			
Surrogate: Tetrachlorometaxylene	34.1			ug/L	40.0		85.3	32-120			
Surrogate: Decachlorobiphenyl [2C]	32.0			ug/L	40.0		80.0	29-120			
Surrogate: Tetrachlorometaxylene [2C]	33.4			ug/L	40.0		83.6	32-120			
LCS (BJL0034-BS1)						Prepared: 02-Dec-2021 Analyzed: 06-Dec-2021 17:02					
Aroclor 1016 [2C]	0.047	0.002	0.010	ug/L	0.0500		94.4	54-120			
Aroclor 1260	0.046	0.003	0.010	ug/L	0.0500		92.2	51-128			
Surrogate: Decachlorobiphenyl	31.7			ug/L	40.0		79.2	29-120			
Surrogate: Tetrachlorometaxylene	30.8			ug/L	40.0		77.0	32-120			
Surrogate: Decachlorobiphenyl [2C]	32.1			ug/L	40.0		80.1	29-120			
Surrogate: Tetrachlorometaxylene [2C]	30.0			ug/L	40.0		75.0	32-120			
LCS Dup (BJL0034-BSD1)						Prepared: 02-Dec-2021 Analyzed: 06-Dec-2021 17:24					
Aroclor 1016 [2C]	0.048	0.002	0.010	ug/L	0.0500		95.1	54-120	0.79	30	
Aroclor 1260	0.047	0.003	0.010	ug/L	0.0500		94.1	51-128	2.10	30	
Surrogate: Decachlorobiphenyl	35.4			ug/L	40.0		88.5	29-120			
Surrogate: Tetrachlorometaxylene	32.0			ug/L	40.0		80.0	32-120			
Surrogate: Decachlorobiphenyl [2C]	37.2			ug/L	40.0		93.1	29-120			
Surrogate: Tetrachlorometaxylene [2C]	30.7			ug/L	40.0		76.9	32-120			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0197 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0197-BLK1)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 17:43						
Barium	135	ND	0.114	0.500	ug/L							U
Barium	137	ND	0.0765	0.500	ug/L							U
Chromium	52	ND	0.260	0.500	ug/L							U
Chromium	53	ND	0.239	0.500	ug/L							U
Iron	54	ND	18.2	36.0	ug/L							U
Iron	57	ND	6.63	36.0	ug/L							U
Lead	208	ND	0.0513	0.100	ug/L							U
Manganese	55	ND	0.142	0.500	ug/L							U
Silver	107	ND	0.0220	0.200	ug/L							U
Vanadium	51a	ND	0.0556	0.200	ug/L							U
Vanadium	51b	ND	0.0521	0.200	ug/L							U
Arsenic	75a	ND	0.0373	0.200	ug/L							U
Cadmium	111	ND	0.0300	0.100	ug/L							U
Cadmium	114	ND	0.0400	0.100	ug/L							U
Cobalt	59	ND	0.0178	0.200	ug/L							U
Copper	63	ND	0.173	0.500	ug/L							U
Copper	65	ND	0.350	0.500	ug/L							U
Nickel	60	ND	0.0792	0.500	ug/L							U
Nickel	62	ND	0.220	0.500	ug/L							U
Selenium	78	ND	0.179	0.500	ug/L							U
Zinc	66	ND	2.92	6.00	ug/L							U
Zinc	67	ND	0.940	6.00	ug/L							U
LCS (BJL0197-BS1)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 17:48						
Barium	135	25.1	0.114	0.500	ug/L	25.0		100	80-120			
Barium	137	24.6	0.0765	0.500	ug/L	25.0		98.4	80-120			
Chromium	52	24.1	0.260	0.500	ug/L	25.0		96.5	80-120			
Chromium	53	25.0	0.239	0.500	ug/L	25.0		100	80-120			
Iron	54	5020	18.2	36.0	ug/L	5000		100	80-120			
Iron	57	4990	6.63	36.0	ug/L	5000		99.8	80-120			
Lead	208	24.8	0.0513	0.100	ug/L	25.0		99.2	80-120			
Manganese	55	24.4	0.142	0.500	ug/L	25.0		97.7	80-120			
Silver	107	25.6	0.0220	0.200	ug/L	25.0		102	80-120			
Vanadium	51a	23.6	0.0556	0.200	ug/L	25.0		94.4	80-120			
Vanadium	51b	23.9	0.0521	0.200	ug/L	25.0		95.4	80-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0197 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0197-BS1)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 17:48						
Arsenic	75a	24.1	0.0373	0.200	ug/L	25.0		96.5	80-120			
Cadmium	111	24.4	0.0300	0.100	ug/L	25.0		97.8	80-120			
Cadmium	114	24.9	0.0400	0.100	ug/L	25.0		99.4	80-120			
Cobalt	59	24.3	0.0178	0.200	ug/L	25.0		97.2	80-120			
Copper	63	24.5	0.173	0.500	ug/L	25.0		98.2	80-120			
Copper	65	24.5	0.350	0.500	ug/L	25.0		97.9	80-120			
Nickel	60	24.6	0.0792	0.500	ug/L	25.0		98.6	80-120			
Nickel	62	25.3	0.220	0.500	ug/L	25.0		101	80-120			
Selenium	78	77.4	0.179	0.500	ug/L	80.0		96.8	80-120			
Zinc	66	77.5	2.92	6.00	ug/L	80.0		96.9	80-120			
Zinc	67	72.1	0.940	6.00	ug/L	80.0		90.1	80-120			
Duplicate (BJL0197-DUP1)						Source: 21L0003-01 Prepared: 08-Dec-2021 Analyzed: 09-Dec-2021 04:00						
Barium	135	35.5	0.114	0.500	ug/L		35.4			0.22	20	
Chromium	52	12.5	0.260	0.500	ug/L		12.5			0.22	20	
Iron	54	78.9	18.2	36.0	ug/L		77.3			1.98	20	
Lead	208	ND	0.0513	0.100	ug/L		0.0570					U
Manganese	55	2.67	0.142	0.500	ug/L		2.42			9.77	20	
Silver	107	ND	0.0220	0.200	ug/L		ND					U
Vanadium	51a	4.49	0.0556	0.200	ug/L		4.49			0.02	20	
Cadmium	111	ND	0.0300	0.100	ug/L		ND					U
Cobalt	59	0.0700	0.0178	0.200	ug/L		0.0700			0.00		J
Copper	63	0.871	0.173	0.500	ug/L		0.858			1.50	20	
Nickel	60	0.227	0.0792	0.500	ug/L		0.247			8.44	20	J
Zinc	66	ND	2.92	6.00	ug/L		ND					U
Duplicate (BJL0197-DUP2)						Source: 21L0003-01 Prepared: 08-Dec-2021 Analyzed: 10-Dec-2021 19:50						
Arsenic	75a	2.26	0.0746	0.400	ug/L		2.11			6.81	20	D
Selenium	78	2.54	0.358	1.00	ug/L		2.78			9.09	20	D
Matrix Spike (BJL0197-MS1)						Source: 21L0003-01 Prepared: 08-Dec-2021 Analyzed: 09-Dec-2021 04:06						
Barium	135	61.9	0.114	0.500	ug/L	25.0	35.4	106	75-125			
Chromium	52	33.7	0.260	0.500	ug/L	25.0	12.5	85.0	75-125			
Iron	54	4250	18.2	36.0	ug/L	5000	77.3	83.4	75-125			
Lead	208	21.6	0.0513	0.100	ug/L	25.0	0.0570	86.3	75-125			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0197 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Matrix Spike (BJL0197-MS1)		Source: 21L0003-01			Prepared: 08-Dec-2021		Analyzed: 09-Dec-2021 04:06					
Manganese	55	22.6	0.142	0.500	ug/L	25.0	2.42	80.8	75-125			
Silver	107	20.8	0.0220	0.200	ug/L	25.0	ND	83.4	75-125			
Vanadium	51a	26.8	0.0556	0.200	ug/L	25.0	4.49	89.4	75-125			
Arsenic	75a	26.5	0.0373	0.200	ug/L	25.0	2.11	97.6	75-125			
Cadmium	111	20.2	0.0300	0.100	ug/L	25.0	ND	80.6	75-125			
Cobalt	59	27.8	0.0178	0.200	ug/L	25.0	0.0700	111	75-125			
Copper	63	25.3	0.173	0.500	ug/L	25.0	0.858	97.6	75-125			
Nickel	60	25.5	0.0792	0.500	ug/L	25.0	0.247	101	75-125			
Selenium	78	73.1	0.179	0.500	ug/L	80.0	2.78	87.9	75-125			
Zinc	66	64.2	2.92	6.00	ug/L	80.0	ND	80.3	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJL0197-MSD1)		Source: 21L0003-01			Prepared: 08-Dec-2021		Analyzed: 09-Dec-2021 04:12					
Barium	135	62.2	0.114	0.500	ug/L	25.0	35.4	107	75-125	0.40	20	
Chromium	52	34.0	0.260	0.500	ug/L	25.0	12.5	86.0	75-125	0.68	20	
Iron	54	4290	18.2	36.0	ug/L	5000	77.3	84.2	75-125	0.90	20	
Lead	208	22.0	0.0513	0.100	ug/L	25.0	0.0570	87.7	75-125	1.59	20	
Manganese	55	22.8	0.142	0.500	ug/L	25.0	2.42	81.6	75-125	0.88	20	
Silver	107	20.7	0.0220	0.200	ug/L	25.0	ND	82.8	75-125	0.62	20	
Vanadium	51a	26.9	0.0556	0.200	ug/L	25.0	4.49	89.5	75-125	0.06	20	
Arsenic	75a	25.5	0.0373	0.200	ug/L	25.0	2.11	93.6	75-125	3.88	20	
Cadmium	111	19.8	0.0300	0.100	ug/L	25.0	ND	79.3	75-125	1.65	20	
Cobalt	59	26.5	0.0178	0.200	ug/L	25.0	0.0700	106	75-125	4.47	20	
Copper	63	24.0	0.173	0.500	ug/L	25.0	0.858	92.4	75-125	5.27	20	
Nickel	60	24.4	0.0792	0.500	ug/L	25.0	0.247	96.4	75-125	4.44	20	
Selenium	78	70.6	0.179	0.500	ug/L	80.0	2.78	84.7	75-125	3.51	20	
Zinc	66	60.6	2.92	6.00	ug/L	80.0	ND	75.8	75-125	5.79	20	

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds - Quality Control

Batch BJL0219 - TWM EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0219-BLK1)					Prepared: 09-Dec-2021 Analyzed: 14-Dec-2021 14:08					
Mercury	ND	0.000013	0.000100	mg/L						U
LCS (BJL0219-BS1)					Prepared: 09-Dec-2021 Analyzed: 14-Dec-2021 14:11					
Mercury	0.00195	0.000013	0.000100	mg/L	0.00200		97.7	80-120		



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds (dissolved) - Quality Control

Batch BJJ0168 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0168-BLK1)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 01:13						
Barium, Dissolved	135	ND	0.114	0.500	ug/L							U
Barium, Dissolved	137	ND	0.0765	0.500	ug/L							U
Chromium, Dissolved	52	ND	0.260	0.500	ug/L							U
Chromium, Dissolved	53	ND	0.239	0.500	ug/L							U
Iron, Dissolved	54	ND	18.2	36.0	ug/L							U
Iron, Dissolved	57	ND	18.2	36.0	ug/L							U
Lead, Dissolved	208	ND	0.0513	0.100	ug/L							U
Manganese, Dissolved	55	ND	0.142	0.500	ug/L							U
Silver, Dissolved	107	ND	0.0220	0.200	ug/L							U
Vanadium, Dissolved	51a	ND	0.0556	0.200	ug/L							U
Vanadium, Dissolved	51b	ND	0.0521	0.200	ug/L							U
Cadmium, Dissolved	111	ND	0.0300	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.0400	0.100	ug/L							U

Blank (BJL0168-BLK2)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 17:33						
Arsenic, Dissolved	75a	ND	0.0373	0.200	ug/L							U
Cobalt, Dissolved	59	ND	0.0178	0.200	ug/L							U
Copper, Dissolved	63	ND	0.173	0.500	ug/L							U
Copper, Dissolved	65	ND	0.350	0.500	ug/L							U
Nickel, Dissolved	60	ND	0.0792	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.220	0.500	ug/L							U
Selenium, Dissolved	78	ND	0.179	0.500	ug/L							U
Zinc, Dissolved	66	ND	2.92	6.00	ug/L							U
Zinc, Dissolved	67	ND	0.940	6.00	ug/L							U

LCS (BJL0168-BS1)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 01:18						
Barium, Dissolved	135	25.3	0.114	0.500	ug/L	25.0		101	80-120			
Barium, Dissolved	137	25.5	0.0765	0.500	ug/L	25.0		102	80-120			
Chromium, Dissolved	52	24.7	0.260	0.500	ug/L	25.0		98.7	80-120			
Chromium, Dissolved	53	24.5	0.239	0.500	ug/L	25.0		97.9	80-120			
Iron, Dissolved	54	5090	18.2	36.0	ug/L	5000		102	80-120			
Iron, Dissolved	57	5110	18.2	36.0	ug/L	5000		102	80-120			
Lead, Dissolved	208	24.2	0.0513	0.100	ug/L	25.0		96.8	80-120			
Manganese, Dissolved	55	24.9	0.142	0.500	ug/L	25.0		99.5	80-120			
Silver, Dissolved	107	25.9	0.0220	0.200	ug/L	25.0		103	80-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
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Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0168 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0168-BS1)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 01:18						
Vanadium, Dissolved	51a	24.9	0.0556	0.200	ug/L	25.0		99.6	80-120			
Vanadium, Dissolved	51b	24.8	0.0521	0.200	ug/L	25.0		99.4	80-120			
Cadmium, Dissolved	111	24.4	0.0300	0.100	ug/L	25.0		97.7	80-120			
Cadmium, Dissolved	114	24.1	0.0400	0.100	ug/L	25.0		96.6	80-120			
LCS (BJL0168-BS2)						Prepared: 07-Dec-2021 Analyzed: 08-Dec-2021 17:38						
Arsenic, Dissolved	75a	23.7	0.0373	0.200	ug/L	25.0		94.9	80-120			
Cobalt, Dissolved	59	24.6	0.0178	0.200	ug/L	25.0		98.4	80-120			
Copper, Dissolved	63	24.6	0.173	0.500	ug/L	25.0		98.2	80-120			
Copper, Dissolved	65	24.8	0.350	0.500	ug/L	25.0		99.1	80-120			
Nickel, Dissolved	60	24.3	0.0792	0.500	ug/L	25.0		97.4	80-120			
Nickel, Dissolved	62	24.3	0.220	0.500	ug/L	25.0		97.1	80-120			
Selenium, Dissolved	78	75.4	0.179	0.500	ug/L	80.0		94.3	80-120			
Zinc, Dissolved	66	74.9	2.92	6.00	ug/L	80.0		93.6	80-120			
Zinc, Dissolved	67	72.4	0.940	6.00	ug/L	80.0		90.5	80-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0169 - TWM EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0169-BLK1)						Prepared: 07-Dec-2021 Analyzed: 09-Dec-2021 13:01					
Mercury, Dissolved	0.000024	0.000013	0.000100	mg/L							J
LCS (BJL0169-BS1)						Prepared: 07-Dec-2021 Analyzed: 09-Dec-2021 13:04					
Mercury, Dissolved	0.00200	0.000013	0.000100	mg/L	0.00200		100	80-120			


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 16-Dec-2021 13:46

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0271 - TWM EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0271-BLK1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 15:09				
Mercury, Dissolved	ND	0.000013	0.000100	mg/L						U
LCS (BJL0271-BS1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 15:11				
Mercury, Dissolved	0.00190	0.000013	0.000100	mg/L	0.00200		94.9	80-120		



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
16-Dec-2021 13:46

Certified Analyses included in this Report

Analyte	Certifications
<i>EPA 6020B in Water</i>	
Silver-107	WADOE,WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
Silver-107	WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
<i>EPA 6020B UCT-KED in Water</i>	
Arsenic-75a	WADOE,WA-DW,DoD-ELAP,ADEC,NELAP
Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Cobalt-59	NELAP,DoD-ELAP,WADOE
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	WADOE,WA-DW,DoD-ELAP
Zinc-67	WADOE,WA-DW,DoD-ELAP
Arsenic-75a	NELAP,WADOE,DoD-ELAP,ADEC


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Project Manager: Meg Strong

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Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Cobalt-59	DoD-ELAP,NELAP,WADOE
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	NELAP,WADOE,DoD-ELAP
Zinc-67	NELAP,WADOE,DoD-ELAP

EPA 7470A in Water

Mercury	WADOE,NELAP,DoD-ELAP
Mercury	WADOE,NELAP,DoD-ELAP

EPA 8082A in Water

Aroclor 1016	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1016 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268 [2C]	WADOE,DoD-ELAP,NELAP,ADEC

EPA 8260D in Water

Chloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,WADOE


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Acrolein	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Iodomethane	DoD-ELAP,NELAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Butanone	DoD-ELAP,NELAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE


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m,p-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
Styrene	DoD-ELAP,NELAP,WADOE
Bromoform	DoD-ELAP,NELAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE

EPA 8260D-SIM in Water

Acrylonitrile	NELAP,WADOE
Vinyl chloride	NELAP,WADOE
1,1-Dichloroethene	NELAP,WADOE
cis-1,2-Dichloroethene	NELAP,WADOE
trans-1,2-Dichloroethene	NELAP,WADOE
Trichloroethene	NELAP,WADOE
Tetrachloroethene	NELAP,WADOE
1,1,2,2-Tetrachloroethane	NELAP,WADOE


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1,2-Dichloroethane

NELAP,WADOE

Benzene

NELAP,WADOE

EPA 8270E-SIM in Water

Naphthalene

ADEC,DoD-ELAP,NELAP,WADOE

2-Methylnaphthalene

ADEC,DoD-ELAP,NELAP

1-Methylnaphthalene

ADEC,DoD-ELAP,NELAP,WADOE

Biphenyl

NELAP

Acenaphthylene

ADEC,DoD-ELAP,NELAP,WADOE

Acenaphthene

ADEC,DoD-ELAP,NELAP,WADOE

Dibenzofuran

ADEC,DoD-ELAP,NELAP

Fluorene

ADEC,DoD-ELAP,NELAP,WADOE

Phenanthrene

ADEC,DoD-ELAP,NELAP,WADOE

Anthracene

ADEC,DoD-ELAP,NELAP,WADOE

Carbazole

NELAP

Fluoranthene

ADEC,DoD-ELAP,NELAP,WADOE

Pyrene

ADEC,DoD-ELAP,NELAP,WADOE

Benzo(a)anthracene

ADEC,DoD-ELAP,NELAP,WADOE

Chrysene

ADEC,DoD-ELAP,NELAP,WADOE

Benzo(b)fluoranthene

ADEC,DoD-ELAP,NELAP,WADOE

Benzo(k)fluoranthene

ADEC,DoD-ELAP,NELAP,WADOE

Benzo(j)fluoranthene

ADEC,DoD-ELAP,NELAP,WADOE

Benzo(e)pyrene

NELAP

Benzo(a)pyrene

ADEC,DoD-ELAP,NELAP,WADOE

Perylene

ADEC,NELAP

Indeno(1,2,3-cd)pyrene

ADEC,DoD-ELAP,NELAP,WADOE

Dibenzo(a,h)anthracene

ADEC,DoD-ELAP,NELAP,WADOE

Benzo(g,h,i)perylene

ADEC,DoD-ELAP,NELAP,WADOE

NWTPH-Dx in Water

Diesel Range Organics (C12-C24)

DoD-ELAP,NELAP,WADOE

Diesel Range Organics (C10-C25)

DoD-ELAP,NELAP,WADOE

Diesel Range Organics (Tol-C18)

DoD-ELAP,NELAP,WADOE

Diesel Range Organics (C10-C24)

DoD-ELAP,NELAP,WADOE

Diesel Range Organics (C10-C28)

DoD-ELAP,NELAP,WADOE

Diesel Range Organics (C12-C22)

DoD-ELAP

Diesel Range Organics (C12-C25)

DoD-ELAP

Motor Oil Range Organics (C24-C38)

DoD-ELAP,NELAP,WADOE

Motor Oil Range Organics (C25-C36)

DoD-ELAP,NELAP,WADOE

Motor Oil Range Organics (C24-C40)

DoD-ELAP,NELAP,WADOE


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Residual Range Organics (C23-C32)	DoD-ELAP
Mineral Spirits Range Organics (Tol-C12)	DoD-ELAP,NELAP,WADOE
Mineral Oil Range Organics (C16-C28)	DoD-ELAP,NELAP,WADOE
Kerosene Range Organics (Tol-C18)	DoD-ELAP,NELAP,WADOE
JP8 Range Organics (C8-C18)	DoD-ELAP,NELAP,WADOE
JP5 Range Organics (C10-C16)	DoD-ELAP,NELAP,WADOE
JP4 Range Organics (Tol-C14)	DoD-ELAP,NELAP,WADOE
Jet-A Range Organics (C10-C18)	DoD-ELAP,NELAP,WADOE
Creosote Range Organics (C12-C22)	DoD-ELAP,NELAP,WADOE
Bunker C Range Organics (C10-C38)	DoD-ELAP,NELAP,WADOE
Stoddard Range Organics (C8-C12)	DoD-ELAP,NELAP,WADOE
Transformer Oil Range Organics (C12-C28)	DoD-ELAP,NELAP,WADOE

NWTPHg in Water

Gasoline Range Organics (Tol-Nap)	WADOE,DoD-ELAP
Gasoline Range Organics (2MP-TMB)	WADOE,DoD-ELAP
Gasoline Range Organics (Tol-C12)	WADOE,DoD-ELAP
Gasoline Range Organics (C6-C10)	WADOE,ADEC,DoD-ELAP
Gasoline Range Organics (C5-C12)	WADOE,DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2023
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/28/2022
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2022
WADOE	WA Dept of Ecology	C558	06/30/2022
WA-DW	Ecology - Drinking Water	C558	06/30/2022



Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
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16-Dec-2021 13:46

Notes and Definitions

*	Flagged value is not within established control limits.
D	The reported value is from a dilution
J	Estimated concentration value detected below the reporting limit.
P1	The reported value is greater than 40% difference between the concentrations determined on two GC columns where applicable.
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.



Analytical Resources, LLC
Analytical Chemists and Consultants

21 December 2021

Meg Strong
Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle, WA 98103-8636

RE: Lower Duwamish Q4

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)
21L0031

Associated SDG ID(s)
N/A

Shelly Fishel

Digitally signed by Shelly
Fishel
Date: 2021.12.21 16:43:19
-08'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

Shelly Fishel, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 21L0031		Turn-around Requested: Standard		Page: _____ of _____	
ARI Client Company: Shannon + Wilson		Phone: _____		Date: _____	Ice Present? ☒
Client Contact: Shoshana Howard		No. of Coolers: 3		Cooler Temps: see CRF	
Client Project Name: LDW		Analysis Requested			
Client Project #: 21-1-12596		Samplers: DES, BMV			
Sample ID	Date	Time	Matrix	No. Containers	Notes/Comments
					① As, Ba, Cr, Mn, Ni, Cd, Co, Cu, Fe, Pb, Hg, Se, Ag, V, Zn
					② As
MW-67-20210112	12/1	0824	GW	13	③ Mn ₂
TB-14-20210112	12/1	0745	GW	5	
MW-24-20210112	12/1	0940	GW	11	
MW-100-20210112	12/1	0955	GW	11	
MW-52-20210112	12/1	1125	GW	13	
MW-53-20210112	12/1	1304	GW	15	
MW-61-20210112	12/1	1425	GW	13	
Comments/Special Instructions • metals are <u>not</u> field filtered • reference project for detection limits Relinquished by: (Signature) <i>Rose Vogt</i> Printed Name: Rose Vogt Company: Shannon + Wilson Date & Time: 12/01/2021 1524 Received by: (Signature) <i>Raven Barbera</i> Printed Name: Raven Barbera Company: ARI Date & Time: 12/1/21 1524 Relinquished by: (Signature) _____ Printed Name: _____ Company: _____ Date & Time: _____					



Analytical Resources, Incorporated
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Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-67-20210112	21L0031-01	Water	01-Dec-2021 08:24	01-Dec-2021 15:24
MW-67-20210112	21L0031-02	Water	01-Dec-2021 08:24	01-Dec-2021 15:24
TB-14-20210112	21L0031-03	Water	01-Dec-2021 08:24	01-Dec-2021 15:24
MW-24-20210112	21L0031-04	Water	01-Dec-2021 09:40	01-Dec-2021 15:24
MW-24-20210112	21L0031-05	Water	01-Dec-2021 09:40	01-Dec-2021 15:24
MW-100-20210112	21L0031-06	Water	01-Dec-2021 09:55	01-Dec-2021 15:24
MW-100-20210112	21L0031-07	Water	01-Dec-2021 09:55	01-Dec-2021 15:24
MW-52-20210112	21L0031-08	Water	01-Dec-2021 11:25	01-Dec-2021 15:24
MW-52-20210112	21L0031-09	Water	01-Dec-2021 11:25	01-Dec-2021 15:24
MW-53-20210112	21L0031-10	Water	01-Dec-2021 13:04	01-Dec-2021 15:24
MW-53-20210112	21L0031-11	Water	01-Dec-2021 13:04	01-Dec-2021 15:24
MW-61-20210112	21L0031-12	Water	01-Dec-2021 14:25	01-Dec-2021 15:24
MW-61-20210112	21L0031-13	Water	01-Dec-2021 14:25	01-Dec-2021 15:24



Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

Work Order Case Narrative

Client: Shannon & Wilson, Inc
Project: Lower Duwamish Q4
Work Order: 21L0031

Sample receipt

Samples as listed on the preceding page were received 01-Dec-2021 15:24 under ARI work order 21L0031. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Revised Report - December 21, 2021

This report was revised to correct narrative errors.

PCB Aroclors - EPA Method SW8082A

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Gasoline by NWTPH-q (GC/MS)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.



Shannon & Wilson, Inc
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21-Dec-2021 16:33

Volatiles - EPA Method SW8260D

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method 8260D-SIM (Selected Ion Monitoring)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Semivolatiles - EPA Method SW8270E

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements except as follows 2,4-Dinitrophenol, Benzoic Acid, Hexachlorocyclopentadiene which were out of control low and Butylbenzylphthalate which was out of control high in the initial calibration verification SJL0168-ICV1. All samples which contain analyte have been flagged with a "Q" qualifier.

2,4-Dinitrophenol, 4,6-Dinitro-2-methylphenol, 4-Nitrophenol, Benzoic Acid, Benzyl Alcohol, Hexachlorocyclopentadiene and Pentachlorophenol which were out of control low in the low concentration calibration verification SJL0168-LCV1.

2,4-Dinitrophenol, 4,6-Dinitro-2-methylphenol, Benzoic Acid, Hexachlorocyclopentadiene and Pentachlorophenol which were out of control low in the low concentration calibration verification SJL0168-LCV2.

Internal standard areas were within limits.


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

The surrogate percent recoveries were within control limits except Phenol-d5 which was out of control low in samples 21L0031-01, 21L0031-04, 21L0031-06, 21L0031-10 and method blank BJL0109-BLK1. Deviations have been flagged.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits except Benzoic Acid, 4-Chloroaniline, 4-Nitrophenol and 3,3'-Dichlorobenzidine percent recoveries which out of control low and have been flagged.

Polynuclear Aromatic Hydrocarbons (PAH) - EPA Method SW8270E-SIM

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Total and Dissolved Metals - EPA Method 6020B

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21L0031-01 in Total Metals batch BJL0294 and in association with sample 21L0031-02 in Dissolved Metals batch BJL0296. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference (RPD) were within advisory control limits.

Diesel/Heavy Oil Range Organics - WA-Ecology Method NW-TPHDx

The sample(s) were extracted and analyzed within the recommended holding times.



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Total and Dissolved Mercury - EPA Method 7470/7471

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21L0031-10 in Total Mercury batch B JL0371 and in association with sample 21L0031-11 in Dissolved Mercury batch B JL0311. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference (RPD) were within advisory control limits.



WORK ORDER

21L0031

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Preservation Confirmation

Container ID	Container Type	pH	
21L0031-01 A	Glass NM, Amber, 1000 mL		
21L0031-01 B	Glass NM, Amber, 1000 mL		
21L0031-01 C	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21L0031-01 D	Glass NM, Amber, 500 mL		
21L0031-01 E	Glass NM, Amber, 500 mL		
21L0031-01 F	Glass NM, Amber, 500 mL		
21L0031-01 G	Glass NM, Amber, 500 mL		
21L0031-01 H	VOA Vial, Clear, 40 mL, HCL		
21L0031-01 I	VOA Vial, Clear, 40 mL, HCL		
21L0031-01 J	VOA Vial, Clear, 40 mL, HCL		
21L0031-01 K	VOA Vial, Clear, 40 mL, HCL		
21L0031-01 L	VOA Vial, Clear, 40 mL, HCL		
21L0031-02 A	HDPE NM, 1000 mL	>2	Fail
21L0031-03 A	VOA Vial, Clear, 40 mL, HCL		
21L0031-03 B	VOA Vial, Clear, 40 mL, HCL		
21L0031-03 C	VOA Vial, Clear, 40 mL, HCL		
21L0031-03 D	VOA Vial, Clear, 40 mL, HCL		
21L0031-03 E	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 A	Glass NM, Amber, 1000 mL		
21L0031-04 B	Glass NM, Amber, 1000 mL		
21L0031-04 C	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21L0031-04 D	Glass NM, Amber, 500 mL		
21L0031-04 E	Glass NM, Amber, 500 mL		
21L0031-04 F	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 G	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 H	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 I	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 J	VOA Vial, Clear, 40 mL, HCL		
21L0031-05 A	HDPE NM, 1000 mL	>2	Fail
21L0031-06 A	Glass NM, Amber, 1000 mL		
21L0031-06 B	Glass NM, Amber, 1000 mL		
21L0031-06 C	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21L0031-06 D	Glass NM, Amber, 500 mL		
21L0031-06 E	Glass NM, Amber, 500 mL		



WORK ORDER

21L0031

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21L0031-06 F	VOA Vial, Clear, 40 mL, HCL		
21L0031-06 G	VOA Vial, Clear, 40 mL, HCL		
21L0031-06 H	VOA Vial, Clear, 40 mL, HCL		
21L0031-06 I	VOA Vial, Clear, 40 mL, HCL		
21L0031-06 J	VOA Vial, Clear, 40 mL, HCL		
21L0031-07 A	HDPE NM, 1000 mL	>2	Fail
21L0031-08 A	Glass NM, Amber, 1000 mL		
21L0031-08 B	Glass NM, Amber, 1000 mL		
21L0031-08 C	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21L0031-08 D	Glass NM, Amber, 500 mL		
21L0031-08 E	Glass NM, Amber, 500 mL		
21L0031-08 F	VOA Vial, Clear, 40 mL, HCL		
21L0031-08 G	VOA Vial, Clear, 40 mL, HCL		
21L0031-08 H	VOA Vial, Clear, 40 mL, HCL		
21L0031-08 I	VOA Vial, Clear, 40 mL, HCL		
21L0031-08 J	VOA Vial, Clear, 40 mL, HCL		
21L0031-08 K	VOA Vial, Clear, 40 mL, HCL		
21L0031-08 L	VOA Vial, Clear, 40 mL, HCL		
21L0031-09 A	HDPE NM, 1000 mL	>2	Fail
21L0031-10 A	Glass NM, Amber, 1000 mL		
21L0031-10 B	Glass NM, Amber, 1000 mL		
21L0031-10 C	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21L0031-10 D	Glass NM, Amber, 500 mL		
21L0031-10 E	Glass NM, Amber, 500 mL		
21L0031-10 F	Glass NM, Amber, 500 mL		
21L0031-10 G	Glass NM, Amber, 500 mL		
21L0031-10 H	Glass NM, Amber, 500 mL		
21L0031-10 I	Glass NM, Amber, 500 mL		
21L0031-10 J	VOA Vial, Clear, 40 mL, HCL		
21L0031-10 K	VOA Vial, Clear, 40 mL, HCL		
21L0031-10 L	VOA Vial, Clear, 40 mL, HCL		
21L0031-10 M	VOA Vial, Clear, 40 mL, HCL		
21L0031-10 N	VOA Vial, Clear, 40 mL, HCL		
21L0031-11 A	HDPE NM, 1000 mL	>2	Fail
21L0031-12 A	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21L0031-12 B	Glass NM, Amber, 500 mL		



WORK ORDER

21L0031

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21L0031-12 C Glass NM, Amber, 500 mL

21L0031-12 D Glass NM, Amber, 500 mL

21L0031-12 E Glass NM, Amber, 500 mL

21L0031-12 F VOA Vial, Clear, 40 mL, HCL

21L0031-12 G VOA Vial, Clear, 40 mL, HCL

21L0031-12 H VOA Vial, Clear, 40 mL, HCL

21L0031-12 I VOA Vial, Clear, 40 mL, HCL

21L0031-12 J VOA Vial, Clear, 40 mL, HCL

21L0031-12 K VOA Vial, Clear, 40 mL, HCL

21L0031-12 L VOA Vial, Clear, 40 mL, HCL

21L0031-13 A HDPE NM, 1000 mL

>2 Fail

RV

Preservation Confirmed By

12/2/21

Date



Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Shannon & Wilson

Project Name: LDW

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 21L0031

Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? _____

YES NO

Were custody papers included with the cooler? _____

YES NO

Were custody papers properly filled out (ink, signed, etc.) _____

YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1524

5.6 5.9 5.2

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: DOO-1009708

Cooler Accepted by: RW Date: 12/1/21 Time: 1524

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? _____

YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? _____

NA YES NO

How were bottles sealed in plastic bags? _____

Individually Grouped Not

Did all bottles arrive in good condition (unbroken)? _____

YES NO

Were all bottle labels complete and legible? _____

YES NO

Did the number of containers listed on COC match with the number of containers received? _____

YES NO

Did all bottle labels and tags agree with custody papers? _____

YES NO

Were all bottles used correct for the requested analyses? _____

YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ...

NA YES NO

Were all VOC vials free of air bubbles? _____

NA YES NO

Was sufficient amount of sample sent in each bottle? _____

YES NO

Date VOC Trip Blank was made at ARI: _____

NA 11/29/21

Were the sample(s) split by ARI? NA

YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: RW Date: 12/2/21 Time: 1410 Labels checked by: _____

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____

Date: _____



WORK ORDER

21L0031

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Preservation Confirmation

Container ID	Container Type	pH	
21L0031-01 A	Glass NM, Amber, 1000 mL		
21L0031-01 B	Glass NM, Amber, 1000 mL		
21L0031-01 C	HDPE NM, 500 mL, 1:1 HNO3	~2	Pass
21L0031-01 D	Glass NM, Amber, 500 mL		
21L0031-01 E	Glass NM, Amber, 500 mL		
21L0031-01 F	Glass NM, Amber, 500 mL		
21L0031-01 G	Glass NM, Amber, 500 mL		
21L0031-01 H	VOA Vial, Clear, 40 mL, HCL		
21L0031-01 I	VOA Vial, Clear, 40 mL, HCL		
21L0031-01 J	VOA Vial, Clear, 40 mL, HCL		
21L0031-01 K	VOA Vial, Clear, 40 mL, HCL		
21L0031-01 L	VOA Vial, Clear, 40 mL, HCL		
21L0031-02 A	HDPE NM, 1000 mL	>2	Fail (1)
21L0031-03 A	VOA Vial, Clear, 40 mL, HCL		
21L0031-03 B	VOA Vial, Clear, 40 mL, HCL		
21L0031-03 C	VOA Vial, Clear, 40 mL, HCL		
21L0031-03 D	VOA Vial, Clear, 40 mL, HCL		
21L0031-03 E	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 A	Glass NM, Amber, 1000 mL		
21L0031-04 B	Glass NM, Amber, 1000 mL		
21L0031-04 C	HDPE NM, 500 mL, 1:1 HNO3	~2	Pass
21L0031-04 D	Glass NM, Amber, 500 mL		
21L0031-04 E	Glass NM, Amber, 500 mL		
21L0031-04 F	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 G	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 H	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 I	VOA Vial, Clear, 40 mL, HCL		
21L0031-04 J	VOA Vial, Clear, 40 mL, HCL		
21L0031-05 A	HDPE NM, 1000 mL	>2	Fail (1)
21L0031-06 A	Glass NM, Amber, 1000 mL		
21L0031-06 B	Glass NM, Amber, 1000 mL		
21L0031-06 C	HDPE NM, 500 mL, 1:1 HNO3	~2	Pass
21L0031-06 D	Glass NM, Amber, 500 mL		
21L0031-06 E	Glass NM, Amber, 500 mL		



WORK ORDER

21L0031

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21L0031-06 F	VOA Vial, Clear, 40 mL, HCL			
21L0031-06 G	VOA Vial, Clear, 40 mL, HCL			
21L0031-06 H	VOA Vial, Clear, 40 mL, HCL			
21L0031-06 I	VOA Vial, Clear, 40 mL, HCL			
21L0031-06 J	VOA Vial, Clear, 40 mL, HCL			
21L0031-07 A	HDPE NM, 1000 mL	>2	Fail	(1)
21L0031-08 A	Glass NM, Amber, 1000 mL			
21L0031-08 B	Glass NM, Amber, 1000 mL			
21L0031-08 C	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass	
21L0031-08 D	Glass NM, Amber, 500 mL			
21L0031-08 E	Glass NM, Amber, 500 mL			
21L0031-08 F	VOA Vial, Clear, 40 mL, HCL			
21L0031-08 G	VOA Vial, Clear, 40 mL, HCL			
21L0031-08 H	VOA Vial, Clear, 40 mL, HCL			
21L0031-08 I	VOA Vial, Clear, 40 mL, HCL			
21L0031-08 J	VOA Vial, Clear, 40 mL, HCL			
21L0031-08 K	VOA Vial, Clear, 40 mL, HCL			
21L0031-08 L	VOA Vial, Clear, 40 mL, HCL			
21L0031-09 A	HDPE NM, 1000 mL	>2	Fail	(1)
21L0031-10 A	Glass NM, Amber, 1000 mL			
21L0031-10 B	Glass NM, Amber, 1000 mL			
21L0031-10 C	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass	
21L0031-10 D	Glass NM, Amber, 500 mL			
21L0031-10 E	Glass NM, Amber, 500 mL			
21L0031-10 F	Glass NM, Amber, 500 mL			
21L0031-10 G	Glass NM, Amber, 500 mL			
21L0031-10 H	Glass NM, Amber, 500 mL			
21L0031-10 I	Glass NM, Amber, 500 mL			
21L0031-10 J	VOA Vial, Clear, 40 mL, HCL			
21L0031-10 K	VOA Vial, Clear, 40 mL, HCL			
21L0031-10 L	VOA Vial, Clear, 40 mL, HCL			
21L0031-10 M	VOA Vial, Clear, 40 mL, HCL			
21L0031-10 N	VOA Vial, Clear, 40 mL, HCL			
21L0031-11 A	HDPE NM, 1000 mL	>2	Fail	(1)
21L0031-12 A	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass	
21L0031-12 B	Glass NM, Amber, 500 mL			



WORK ORDER

21L0031

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21L0031-12 C Glass NM, Amber, 500 mL

21L0031-12 D Glass NM, Amber, 500 mL

21L0031-12 E Glass NM, Amber, 500 mL

21L0031-12 F VOA Vial, Clear, 40 mL, HCL

21L0031-12 G VOA Vial, Clear, 40 mL, HCL

21L0031-12 H VOA Vial, Clear, 40 mL, HCL

21L0031-12 I VOA Vial, Clear, 40 mL, HCL

21L0031-12 J VOA Vial, Clear, 40 mL, HCL

21L0031-12 K VOA Vial, Clear, 40 mL, HCL

21L0031-12 L VOA Vial, Clear, 40 mL, HCL

21L0031-13 A HDPE NM, 1000 mL

>2 Fail (1)

RW

Preservation Confirmed By

12/2/21
Date

(1) filtered w/ 0.45µm
& preserved to pH < 2
with 0.75mL conc. HNO₃
(511523) mm 12/2/21



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-67-20210112

21L0031-01 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/01/2021 08:24

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 22:13

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-01 H

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	0.22	ug/L	
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					<i>80-129 %</i>	<i>106 %</i>	
<i>Surrogate: Toluene-d8</i>					<i>80-120 %</i>	<i>95.7 %</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>					<i>80-120 %</i>	<i>97.4 %</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					<i>80-120 %</i>	<i>99.7 %</i>	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-67-20210112
21L0031-01 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/01/2021 08:24

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 20:38

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-01 J

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>95.1</i>	<i>%</i>	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-67-20210112

21L0031-01 (Water)

Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/01/2021 08:24

Instrument: NT10 Analyst: VTS

Analyzed: 12/10/2021 22:06

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJL0109
Prepared: 12/07/2021

Sample Size: 1000 mL
Final Volume: 1 mL

Extract ID: 21L0031-01 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Phenol	108-95-2	1	0.01	0.2	ND	ug/L	U
bis(2-chloroethyl) ether	111-44-4	1	0.03	0.2	ND	ug/L	U
2-Chlorophenol	95-57-8	1	0.03	0.2	ND	ug/L	U
1,3-Dichlorobenzene	541-73-1	1	0.03	0.2	ND	ug/L	U
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	ND	ug/L	U
Benzyl Alcohol	100-51-6	1	0.02	0.2	ND	ug/L	U
2,2'-Oxybis(1-chloropropane)	108-60-1	1	0.03	0.2	ND	ug/L	U
2-Methylphenol	95-48-7	1	0.03	0.2	ND	ug/L	U
Hexachloroethane	67-72-1	1	0.04	0.2	ND	ug/L	U
N-Nitroso-di-n-Propylamine	621-64-7	1	0.04	0.2	ND	ug/L	U
4-Methylphenol	106-44-5	1	0.03	0.2	ND	ug/L	U
Nitrobenzene	98-95-3	1	0.03	0.2	ND	ug/L	U
Isophorone	78-59-1	1	0.03	0.2	ND	ug/L	U
2-Nitrophenol	88-75-5	1	0.04	1.0	ND	ug/L	U
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Bis(2-Chloroethoxy)methane	111-91-1	1	0.03	0.2	ND	ug/L	U
2,4-Dichlorophenol	120-83-2	1	0.1	1.0	ND	ug/L	U
1,2,4-Trichlorobenzene	120-82-1	1	0.03	0.2	ND	ug/L	U
Naphthalene	91-20-3	1	0.03	0.2	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
4-Chloroaniline	106-47-8	1	0.04	1.0	ND	ug/L	U
Hexachlorobutadiene	87-68-3	1	0.04	0.2	ND	ug/L	U
4-Chloro-3-Methylphenol	59-50-7	1	0.1	1.0	ND	ug/L	U
2-Methylnaphthalene	91-57-6	1	0.03	0.2	ND	ug/L	U
Hexachlorocyclopentadiene	77-47-4	1	0.1	1.0	ND	ug/L	U
2,4,6-Trichlorophenol	88-06-2	1	0.2	1.0	ND	ug/L	U
2,4,5-Trichlorophenol	95-95-4	1	0.1	1.0	ND	ug/L	U
2-Chloronaphthalene	91-58-7	1	0.03	0.2	ND	ug/L	U
2-Nitroaniline	88-74-4	1	0.2	1.0	ND	ug/L	U
Acenaphthylene	208-96-8	1	0.02	0.2	ND	ug/L	U
Dimethylphthalate	131-11-3	1	0.04	0.2	ND	ug/L	U
2,6-Dinitrotoluene	606-20-2	1	0.2	1.0	ND	ug/L	U
Acenaphthene	83-32-9	1	0.03	0.2	ND	ug/L	U



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-67-20210112

21L0031-01 (Water)

Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/01/2021 08:24

Instrument: NT10 Analyst: VTS

Analyzed: 12/10/2021 22:06

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
3-Nitroaniline	99-09-2	1	0.2	1.0	0.2	ug/L	J
2,4-Dinitrophenol	51-28-5	1	0.2	2.0	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.02	0.2	ND	ug/L	U
4-Nitrophenol	100-02-7	1	0.06	1.0	ND	ug/L	U
2,4-Dinitrotoluene	121-14-2	1	0.1	1.0	ND	ug/L	U
Fluorene	86-73-7	1	0.02	0.2	ND	ug/L	U
4-Chlorophenylphenyl ether	7005-72-3	1	0.02	0.2	ND	ug/L	U
Diethyl phthalate	84-66-2	1	0.06	0.2	ND	ug/L	U
4-Nitroaniline	100-01-6	1	0.2	1.0	ND	ug/L	U
4,6-Dinitro-2-methylphenol	534-52-1	1	0.4	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
4-Bromophenyl phenyl ether	101-55-3	1	0.02	0.2	ND	ug/L	U
Hexachlorobenzene	118-74-1	1	0.04	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Phenanthrene	85-01-8	1	0.02	0.2	ND	ug/L	U
Anthracene	120-12-7	1	0.03	0.2	ND	ug/L	U
Carbazole	86-74-8	1	0.04	0.2	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Fluoranthene	206-44-0	1	0.03	0.2	ND	ug/L	U
Pyrene	129-00-0	1	0.03	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
Benzo(a)anthracene	56-55-3	1	0.04	0.2	ND	ug/L	U
3,3'-Dichlorobenzidine	91-94-1	1	0.3	1.0	ND	ug/L	U
Chrysene	218-01-9	1	0.04	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U
Di-n-Octylphthalate	117-84-0	1	0.05	0.2	ND	ug/L	U
Benzo(a)fluoranthene, Total		1	0.08	0.4	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.05	0.2	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.06	0.2	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.07	0.2	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.04	0.2	ND	ug/L	U
1-Methylnaphthalene	90-12-0	1	0.03	0.2	ND	ug/L	U
Surrogate: 2-Fluorophenol					30-160 %	53.5 %	
Surrogate: Phenol-d5					30-160 %	27.7 %	*
Surrogate: 2-Chlorophenol-d4					30-160 %	84.0 %	
Surrogate: 1,2-Dichlorobenzene-d4					30-160 %	79.3 %	
Surrogate: Nitrobenzene-d5					30-160 %	89.4 %	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-67-20210112

21L0031-01 (Water)

Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/01/2021 08:24

Instrument: NT10 Analyst: VTS

Analyzed: 12/10/2021 22:06

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Recovery	Recovery	Units	Notes
		Limits			
Surrogate: 2-Fluorobiphenyl		30-160 %	82.9	%	
Surrogate: 2,4,6-Tribromophenol		30-160 %	85.3	%	
Surrogate: p-Terphenyl-d14		30-160 %	93.2	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-67-20210112
21L0031-01 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 12/01/2021 08:24

Instrument: FID4 Analyst: TWC

Analyzed: 12/12/2021 04:19

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0031-01 D 01

Preparation Batch: BJL0110

Sample Size: 500 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	0.208	mg/L	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	0.351	mg/L	
HC ID: MOTOR OIL						
Surrogate: o-Terphenyl			50-150 %	102	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-67-20210112
21L0031-01 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 12/01/2021 08:24

Instrument: ECD7 Analyst: JGR

Analyzed: 12/14/2021 15:29

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0111 Prepared: 12/07/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0031-01 B 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0092 Cleaned: 14-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0031-01 B 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0090 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-01 B 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0091 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-01 B 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	80.6	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	62.8	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	79.0	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	61.5	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-67-20210112
21L0031-01 (Water)
Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 12/01/2021 08:24

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 19:51

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0031-01 C 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium	7440-39-3	1	0.114	0.500	6.50	ug/L	
Chromium	7440-47-3	1	0.260	0.500	4.96	ug/L	
Iron	7439-89-6	1	18.2	36.0	839	ug/L	
Lead	7439-92-1	1	0.0513	0.100	ND	ug/L	U
Manganese	7439-96-5	1	0.142	0.500	19.4	ug/L	
Silver	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium	7440-62-2	1	0.0556	0.200	1.72	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-67-20210112
21L0031-01 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 08:24

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 19:51

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0031-01 C 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	1	0.0373	0.200	1.01	ug/L	
Cadmium	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt	7440-48-4	1	0.0178	0.200	0.0570	ug/L	J
Copper	7440-50-8	1	0.173	0.500	2.06	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	0.686	ug/L	
Selenium	7782-49-2	1	0.179	0.500	3.36	ug/L	
Zinc	7440-66-6	1	2.92	6.00	ND	ug/L	U



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-67-20210112

21L0031-01 (Water)

Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 12/01/2021 08:24

Instrument: HYDRA Analyst: SKD

Analyzed: 12/20/2021 14:53

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0031-01 C

Preparation Batch: B JL0371

Sample Size: 20 mL

Prepared: 12/15/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-67-20210112
21L0031-02 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 12/01/2021 08:24

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 17:11

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-02 A 02

Preparation Batch: BJL0296

Sample Size: 25 mL

Filtration Batch: BJL0085

Prepared: 12/13/2021

Final Volume: 25 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection		Reporting		Result	Units	Notes
			Limit	Limit	Limit	Limit			
Barium, Dissolved	7440-39-3	1	0.114	0.500			5.09	ug/L	
Chromium, Dissolved	7440-47-3	1	0.260	0.500			0.451	ug/L	J
Iron, Dissolved	7439-89-6	1	18.2	36.0			ND	ug/L	U
Lead, Dissolved	7439-92-1	1	0.0513	0.100			ND	ug/L	U
Manganese, Dissolved	7439-96-5	1	0.142	0.500			19.2	ug/L	
Silver, Dissolved	7440-22-4	1	0.0220	0.200			ND	ug/L	U
Vanadium, Dissolved	7440-62-2	1	0.0556	0.200			1.41	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-67-20210112
21L0031-02 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 08:24

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/13/2021 22:02

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-02 A 02

Preparation Batch: BJL0296

Sample Size: 25 mL

Filtration Batch: BJL0085

Prepared: 12/13/2021

Final Volume: 25 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	0.498	ug/L	
Cadmium, Dissolved	7440-43-9	1	0.0300	0.100	0.0320	ug/L	J
Cobalt, Dissolved	7440-48-4	1	0.0178	0.200	0.0650	ug/L	J
Copper, Dissolved	7440-50-8	1	0.173	0.500	1.75	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	0.696	ug/L	
Selenium, Dissolved	7782-49-2	1	0.179	0.500	3.05	ug/L	
Zinc, Dissolved	7440-66-6	1	2.92	6.00	ND	ug/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-67-20210112
21L0031-02 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 12/01/2021 08:24

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 17:23

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0031-02 A 01

Preparation Batch: BJL0331

Sample Size: 20 mL

Filtration Batch: BJL0085

Prepared: 12/14/2021

Final Volume: 20 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

TB-14-20210112

21L0031-03 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/01/2021 08:24

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 16:31

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-03 B

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	107	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	96.1	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	97.2	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	101	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

TB-14-20210112
21L0031-03 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/01/2021 08:24

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 21:07

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-03 C

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	115	%	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-24-20210112
21L0031-04 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/01/2021 09:40

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 22:34

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-04 H

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	0.09	ug/L	J
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	107	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	96.3	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	98.8	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	102	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-24-20210112
21L0031-04 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/01/2021 09:40

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 21:36

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-04 G

Preparation Batch: B JL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>96.7</i>	<i>%</i>	



Analytical Report

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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-24-20210112

21L0031-04 (Water)

Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/01/2021 09:40

Instrument: NT10 Analyst: VTS

Analyzed: 12/10/2021 22:43

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJL0109
Prepared: 12/07/2021

Sample Size: 1000 mL
Final Volume: 1 mL

Extract ID: 21L0031-04 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	ND	ug/L	U
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U

Surrogate: 2-Fluorophenol

30-160 % 50.1 %

Surrogate: Phenol-d5

30-160 % 27.9 % *

Surrogate: 2-Chlorophenol-d4

30-160 % 83.8 %

Surrogate: 1,2-Dichlorobenzene-d4

30-160 % 69.6 %

Surrogate: Nitrobenzene-d5

30-160 % 77.3 %

Surrogate: 2-Fluorobiphenyl

30-160 % 73.5 %

Surrogate: 2,4,6-Tribromophenol

30-160 % 79.4 %

Surrogate: p-Terphenyl-d14

30-160 % 84.2 %


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-24-20210112
21L0031-04 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 12/01/2021 09:40

Instrument: ECD7 Analyst: JGR

Analyzed: 12/14/2021 15:50

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0111 Prepared: 12/07/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0031-04 B 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0092 Cleaned: 14-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0031-04 B 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0090 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-04 B 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0091 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-04 B 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	71.4	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	59.2	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	67.7	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	58.9	%	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-24-20210112

21L0031-04 (Water)

Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 09:40

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 20:35

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO₃ matrix

Extract ID: 21L0031-04 C 01

Preparation Batch: BJL0294

Sample Size: 25 mL

Prepared: 12/14/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	1	0.0373	0.200	35.3	ug/L	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-24-20210112
21L0031-05 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 09:40

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/13/2021 21:35

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-05 A 02

Preparation Batch: BJL0296

Sample Size: 25 mL

Filtration Batch: BJL0085

Prepared: 12/13/2021

Final Volume: 25 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	4.56	ug/L	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-100-20210112
21L0031-06 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/01/2021 09:55

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 22:55

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-06 F

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	0.09	ug/L	J
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	108	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.7	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	99.2	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	101	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-100-20210112
21L0031-06 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/01/2021 09:55

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 22:05

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-06 H

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	87.9	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-100-20210112
21L0031-06 (Water)
Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/01/2021 09:55

Instrument: NT10 Analyst: VTS

Analyzed: 12/10/2021 23:21

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0031-06 A 01

Preparation Batch: BJL0109

Sample Size: 1000 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	ND	ug/L	U
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U

Surrogate: 2-Fluorophenol

30-160 %

41.9 %

Surrogate: Phenol-d5

30-160 %

23.7 %

*

Surrogate: 2-Chlorophenol-d4

30-160 %

62.4 %

Surrogate: 1,2-Dichlorobenzene-d4

30-160 %

57.4 %

Surrogate: Nitrobenzene-d5

30-160 %

66.1 %

Surrogate: 2-Fluorobiphenyl

30-160 %

65.6 %

Surrogate: 2,4,6-Tribromophenol

30-160 %

71.9 %

Surrogate: p-Terphenyl-d14

30-160 %

76.0 %



Analytical Report

Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-100-20210112

21L0031-06 (Water)

Aroclor PCB

Method: EPA 8082A

Sampled: 12/01/2021 09:55

Instrument: ECD7 Analyst: JGR

Analyzed: 12/14/2021 16:11

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0111 Prepared: 12/07/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0031-06 B 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0092 Cleaned: 14-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0031-06 B 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0090 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-06 B 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0091 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-06 B 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
Surrogate: Decachlorobiphenyl				29-120 %	72.2	%	
Surrogate: Tetrachlorometaxylene				32-120 %	61.6	%	
Surrogate: Decachlorobiphenyl [2C]				29-120 %	71.6	%	
Surrogate: Tetrachlorometaxylene [2C]				32-120 %	61.0	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-100-20210112
21L0031-06 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 09:55

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 20:39

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0031-06 C 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	1	0.0373	0.200	36.9	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-100-20210112
21L0031-07 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 09:55

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/13/2021 21:41

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-07 A 02

Preparation Batch: BJL0296

Sample Size: 25 mL

Filtration Batch: BJL0085

Prepared: 12/13/2021

Final Volume: 25 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	4.45	ug/L	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-52-20210112

21L0031-08 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/01/2021 11:25

Instrument: NT2 Analyst: PKC

Analyzed: 12/10/2021 16:07

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-08 I

Preparation Batch: BJL0242

Sample Size: 10 mL

Prepared: 12/10/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	0.70	ug/L	
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	2.32	ug/L	
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	0.19	ug/L	J
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					<i>80-129 %</i>	<i>101 %</i>	
<i>Surrogate: Toluene-d8</i>					<i>80-120 %</i>	<i>97.3 %</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>					<i>80-120 %</i>	<i>97.3 %</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					<i>80-120 %</i>	<i>98.7 %</i>	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-52-20210112
21L0031-08 (Water)
Volatile Organic Compounds

Method: NWTPHg

Sampled: 12/01/2021 11:25

Instrument: NT2 Analyst: PKC

Analyzed: 12/10/2021 16:07

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-08 I

Preparation Batch: BJL0242

Sample Size: 10 mL

Prepared: 12/10/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
<i>Surrogate: Toluene-d8</i>			80-120 %	97.3	%	
<i>Surrogate: 4-Bromofluorobenzene</i>			80-120 %	97.3	%	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-52-20210112

21L0031-08 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 12/01/2021 11:25

Instrument: NT11 Analyst: VTS

Analyzed: 12/11/2021 23:28

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0107 Prepared: 12/08/2021	Sample Size: 500 mL Final Volume: 0.5 mL	Extract ID: 21L0031-08 D 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0084 Cleaned: 10-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0031-08 D 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.003	ug/L	J
2-Methylnaphthalene	91-57-6	1	0.001	0.010	0.002	ug/L	J
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	0.001	ug/L	J
Acenaphthylene	208-96-8	1	0.002	0.010	ND	ug/L	U
Acenaphthene	83-32-9	1	0.003	0.010	0.070	ug/L	
Dibenzofuran	132-64-9	1	0.002	0.010	0.003	ug/L	J
Fluorene	86-73-7	1	0.002	0.010	ND	ug/L	U
Phenanthrene	85-01-8	1	0.001	0.010	0.002	ug/L	J
Anthracene	120-12-7	1	0.001	0.010	0.002	ug/L	J
Carbazole	86-74-8	1	0.001	0.010	ND	ug/L	U
Fluoranthene	206-44-0	1	0.002	0.010	ND	ug/L	U
Pyrene	129-00-0	1	0.001	0.010	0.002	ug/L	J
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	ND	ug/L	U
Chrysene	218-01-9	1	0.0009	0.010	0.002	ug/L	J
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	0.001	ug/L	J
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.002	0.010	ND	ug/L	U
Perylene	1985-5-0	1	0.006	0.010	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	ND	ug/L	U
Surrogate: 2-Methylnaphthalene-d10					42-120 %	79.7 %	
Surrogate: Dibenzo[a,h]anthracene-d14					29-120 %	87.0 %	
Surrogate: Fluoranthene-d10					57-120 %	95.0 %	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-52-20210112
21L0031-08 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 12/01/2021 11:25

Instrument: ECD7 Analyst: JGR

Analyzed: 12/14/2021 16:33

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0111 Prepared: 12/07/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0031-08 A 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0092 Cleaned: 14-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0031-08 A 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0090 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-08 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0091 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-08 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	67.9	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	59.5	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	67.9	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	58.8	%	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-52-20210112
21L0031-08 (Water)
Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 12/01/2021 11:25

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 18:36

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0031-08 C 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Manganese	7439-96-5	10	1.42	5.00	975	ug/L	D


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-52-20210112
21L0031-09 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 12/01/2021 11:25

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 18:41

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-09 A 02

Preparation Batch: BJL0296

Sample Size: 25 mL

Filtration Batch: BJL0085

Prepared: 12/13/2021

Final Volume: 25 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Manganese, Dissolved	7439-96-5	10	1.42	5.00	482	ug/L	D



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-53-20210112

21L0031-10 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/01/2021 13:04

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 23:16

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-10 M

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	0.15	ug/L	J
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	107	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	95.4	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	100	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	101	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-53-20210112
21L0031-10 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/01/2021 13:04

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 23:02

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-10 J

Preparation Batch: BJL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>98.8</i>	<i>%</i>	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-53-20210112
21L0031-10 (Water)
Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/01/2021 13:04

Instrument: NT10 Analyst: VTS

Analyzed: 12/10/2021 23:58

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0031-10 A 01

Preparation Batch: BJL0109

Sample Size: 1000 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	ND	ug/L	U
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U

Surrogate: 2-Fluorophenol

30-160 %

48.3 %

Surrogate: Phenol-d5

30-160 %

25.9 %

*

Surrogate: 2-Chlorophenol-d4

30-160 %

74.2 %

Surrogate: 1,2-Dichlorobenzene-d4

30-160 %

70.5 %

Surrogate: Nitrobenzene-d5

30-160 %

77.9 %

Surrogate: 2-Fluorobiphenyl

30-160 %

73.8 %

Surrogate: 2,4,6-Tribromophenol

30-160 %

81.3 %

Surrogate: p-Terphenyl-d14

30-160 %

88.1 %



Analytical Report

Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-53-20210112

21L0031-10 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 12/01/2021 13:04

Instrument: NT11 Analyst: VTS

Analyzed: 12/11/2021 23:58

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0107 Prepared: 12/08/2021	Sample Size: 500 mL Final Volume: 0.5 mL	Extract ID: 21L0031-10 D 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0084 Cleaned: 10-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0031-10 D 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.003	ug/L	J
2-Methylnaphthalene	91-57-6	1	0.001	0.010	0.002	ug/L	J
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	0.001	ug/L	J
Acenaphthylene	208-96-8	1	0.002	0.010	ND	ug/L	U
Acenaphthene	83-32-9	1	0.003	0.010	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.002	0.010	ND	ug/L	U
Fluorene	86-73-7	1	0.002	0.010	ND	ug/L	U
Phenanthrene	85-01-8	1	0.001	0.010	0.002	ug/L	J
Anthracene	120-12-7	1	0.001	0.010	ND	ug/L	U
Carbazole	86-74-8	1	0.001	0.010	ND	ug/L	U
Fluoranthene	206-44-0	1	0.002	0.010	0.002	ug/L	J
Pyrene	129-00-0	1	0.001	0.010	0.005	ug/L	J
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	ND	ug/L	U
Chrysene	218-01-9	1	0.0009	0.010	0.002	ug/L	J
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	ND	ug/L	U
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.002	0.010	ND	ug/L	U
Perylene	1985-5-0	1	0.006	0.010	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	ND	ug/L	U
Surrogate: 2-Methylnaphthalene-d10				42-120 %	82.6	%	
Surrogate: Dibenzo[a,h]anthracene-d14				29-120 %	86.4	%	
Surrogate: Fluoranthene-d10				57-120 %	96.0	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-53-20210112
21L0031-10 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 12/01/2021 13:04

Instrument: FID4 Analyst: TWC

Analyzed: 12/12/2021 04:38

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0031-10 F 01

Preparation Batch: BJL0110

Sample Size: 500 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			<i>50-150 %</i>	<i>106</i>	<i>%</i>	


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 Project Number: 21-1-12596-012
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Reported:
 21-Dec-2021 16:33

MW-53-20210112
21L0031-10 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 12/01/2021 13:04

Instrument: ECD7 Analyst: JGR

Analyzed: 12/14/2021 16:54

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0111 Prepared: 12/07/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0031-10 B 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0092 Cleaned: 14-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0031-10 B 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0090 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-10 B 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0091 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0031-10 B 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	78.3	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	66.7	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	79.5	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	66.3	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-53-20210112
21L0031-10 (Water)
Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 12/01/2021 13:04

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 19:42

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-10 C 01

Preparation Batch: BJL0294

Sample Size: 25 mL

Prepared: 12/14/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium	7440-39-3	1	0.114	0.500	15.4	ug/L	
Chromium	7440-47-3	1	0.260	0.500	0.626	ug/L	
Iron	7439-89-6	1	18.2	36.0	6880	ug/L	
Lead	7439-92-1	1	0.0513	0.100	ND	ug/L	U
Manganese	7439-96-5	1	0.142	0.500	204	ug/L	
Silver	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium	7440-62-2	1	0.0556	0.200	1.58	ug/L	


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 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-53-20210112
21L0031-10 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 13:04

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 19:42

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0031-10 C 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	0.759	ug/L	
Cadmium	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt	7440-48-4	1	0.0178	0.200	0.221	ug/L	
Copper	7440-50-8	1	0.173	0.500	0.292	ug/L	J
Nickel	7440-02-0	1	0.0792	0.500	1.15	ug/L	
Selenium	7782-49-2	1	0.179	0.500	0.430	ug/L	J
Zinc	7440-66-6	1	2.92	6.00	ND	ug/L	U



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-53-20210112

21L0031-10 (Water)

Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 12/01/2021 13:04

Instrument: HYDRA Analyst: SKD

Analyzed: 12/20/2021 15:14

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0031-10 C

Preparation Batch: B JL0371

Sample Size: 20 mL

Prepared: 12/15/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-53-20210112
21L0031-11 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 12/01/2021 13:04

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/13/2021 21:51

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-11 A 02

Preparation Batch: BJL0296

Sample Size: 25 mL

Filtration Batch: BJL0085

Prepared: 12/13/2021

Final Volume: 25 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection		Reporting		Result	Units	Notes
			Limit	Limit	Limit	Limit			
Barium, Dissolved	7440-39-3	1	0.114	0.500			6.62	ug/L	
Chromium, Dissolved	7440-47-3	1	0.260	0.500			ND	ug/L	U
Iron, Dissolved	7439-89-6	1	18.2	36.0			187	ug/L	
Lead, Dissolved	7439-92-1	1	0.0513	0.100			ND	ug/L	U
Manganese, Dissolved	7439-96-5	1	0.142	0.500			141	ug/L	
Silver, Dissolved	7440-22-4	1	0.0220	0.200			ND	ug/L	U
Vanadium, Dissolved	7440-62-2	1	0.0556	0.200			0.268	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-53-20210112
21L0031-11 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 13:04

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/13/2021 21:51

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-11 A 02

Preparation Batch: BJL0296

Sample Size: 25 mL

Filtration Batch: BJL0085

Prepared: 12/13/2021

Final Volume: 25 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	0.203	ug/L	
Cadmium, Dissolved	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt, Dissolved	7440-48-4	1	0.0178	0.200	0.0980	ug/L	J
Copper, Dissolved	7440-50-8	1	0.173	0.500	0.510	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	0.585	ug/L	
Selenium, Dissolved	7782-49-2	1	0.179	0.500	0.573	ug/L	
Zinc, Dissolved	7440-66-6	1	2.92	6.00	ND	ug/L	U


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 Project: Lower Duwamish Q4
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 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-53-20210112
21L0031-11 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 12/01/2021 13:04

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 17:14

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0031-11 A 01

Preparation Batch: BJL0331

Sample Size: 20 mL

Filtration Batch: BJL0085

Prepared: 12/14/2021

Final Volume: 20 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U



Analytical Report

Shannon & Wilson, Inc
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-61-20210112

21L0031-12 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/01/2021 14:25

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 23:37

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-12 G

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	20.8	ug/L	
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					<i>80-129 %</i>	<i>111 %</i>	
<i>Surrogate: Toluene-d8</i>					<i>80-120 %</i>	<i>99.5 %</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>					<i>80-120 %</i>	<i>98.9 %</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					<i>80-120 %</i>	<i>103 %</i>	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-61-20210112
21L0031-12 (Water)
Volatile Organic Compounds

Method: NWTPHg

Sampled: 12/01/2021 14:25

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 23:37

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-12 G

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	167	ug/L	
HC ID: GRO						
Surrogate: Toluene-d8			80-120 %	99.5	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	98.9	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-61-20210112
21L0031-12 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/01/2021 14:25

Instrument: NT7 Analyst: PB

Analyzed: 12/06/2021 23:31

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0031-12 F

Preparation Batch: B JL0145

Sample Size: 10 mL

Prepared: 12/06/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>102</i>	<i>%</i>	



Analytical Report

Shannon & Wilson, Inc
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Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-61-20210112

21L0031-12 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 12/01/2021 14:25

Instrument: NT11 Analyst: VTS

Analyzed: 12/12/2021 00:28

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0107 Prepared: 12/08/2021	Sample Size: 500 mL Final Volume: 0.5 mL	Extract ID: 21L0031-12 B 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0084 Cleaned: 10-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0031-12 B 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.020	ug/L	
2-Methylnaphthalene	91-57-6	1	0.001	0.010	0.010	ug/L	
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	0.031	ug/L	
Acenaphthylene	208-96-8	1	0.002	0.010	0.006	ug/L	J
Acenaphthene	83-32-9	1	0.003	0.010	0.777	ug/L	
Dibenzofuran	132-64-9	1	0.002	0.010	0.013	ug/L	
Fluorene	86-73-7	1	0.002	0.010	0.014	ug/L	
Phenanthrene	85-01-8	1	0.001	0.010	0.021	ug/L	
Anthracene	120-12-7	1	0.001	0.010	0.006	ug/L	J
Carbazole	86-74-8	1	0.001	0.010	0.011	ug/L	
Fluoranthene	206-44-0	1	0.002	0.010	0.014	ug/L	
Pyrene	129-00-0	1	0.001	0.010	0.019	ug/L	
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	0.004	ug/L	J
Chrysene	218-01-9	1	0.0009	0.010	0.005	ug/L	J
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	0.003	ug/L	J
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)fluoranthene, Total		1	0.004	0.010	0.007	ug/L	J
Benzo(a)pyrene	50-32-8	1	0.002	0.010	0.003	ug/L	J
Perylene	1985-5-0	1	0.006	0.010	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	0.002	ug/L	J
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	0.002	ug/L	J
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	0.002	ug/L	J
Surrogate: 2-Methylnaphthalene-d10					42-120 %	86.9 %	
Surrogate: Dibenzo[a,h]anthracene-d14					29-120 %	84.3 %	
Surrogate: Fluoranthene-d10					57-120 %	97.1 %	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-61-20210112
21L0031-12 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 12/01/2021 14:25

Instrument: FID4 Analyst: TWC

Analyzed: 12/12/2021 04:58

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0031-12 D 01

Preparation Batch: BJL0110

Sample Size: 500 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	1.68	mg/L	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	1.13	mg/L	
HC ID: MOTOR OIL						
Surrogate: o-Terphenyl			50-150 %	101	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-61-20210112
21L0031-12 (Water)
Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 12/01/2021 14:25

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 19:46

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-12 A 01

Preparation Batch: BJL0294

Sample Size: 25 mL

Prepared: 12/14/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium	7440-39-3	1	0.114	0.500	7.26	ug/L	
Chromium	7440-47-3	1	0.260	0.500	0.595	ug/L	
Iron	7439-89-6	1	18.2	36.0	1730	ug/L	
Lead	7439-92-1	1	0.0513	0.100	0.262	ug/L	
Manganese	7439-96-5	1	0.142	0.500	53.2	ug/L	
Silver	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium	7440-62-2	1	0.0556	0.200	4.04	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-61-20210112
21L0031-12 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 14:25

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 19:46

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0031-12 A 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	2.86	ug/L	
Cadmium	7440-43-9	1	0.0300	0.100	0.0340	ug/L	J
Cobalt	7440-48-4	1	0.0178	0.200	1.38	ug/L	
Copper	7440-50-8	1	0.173	0.500	5.12	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	4.84	ug/L	
Selenium	7782-49-2	1	0.179	0.500	0.354	ug/L	J
Zinc	7440-66-6	1	2.92	6.00	ND	ug/L	U



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-61-20210112

21L0031-12 (Water)

Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 12/01/2021 14:25

Instrument: HYDRA Analyst: SKD

Analyzed: 12/20/2021 15:31

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0031-12 A

Preparation Batch: BJL0371

Sample Size: 20 mL

Prepared: 12/15/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-61-20210112
21L0031-13 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 12/01/2021 14:25

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/13/2021 21:57

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0031-13 A 02

Preparation Batch: BJL0296

Sample Size: 25 mL

Filtration Batch: BJL0085

Prepared: 12/13/2021

Final Volume: 25 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium, Dissolved	7440-39-3	1	0.114	0.500	5.04	ug/L	
Chromium, Dissolved	7440-47-3	1	0.260	0.500	0.360	ug/L	J
Iron, Dissolved	7439-89-6	1	18.2	36.0	458	ug/L	
Lead, Dissolved	7439-92-1	1	0.0513	0.100	ND	ug/L	U
Manganese, Dissolved	7439-96-5	1	0.142	0.500	43.7	ug/L	
Silver, Dissolved	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium, Dissolved	7440-62-2	1	0.0556	0.200	2.19	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

MW-61-20210112
21L0031-13 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/01/2021 14:25

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/13/2021 21:57

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix	Extract ID: 21L0031-13 A 02
	Preparation Batch: BJL0296	Filtration Batch: BJL0085
	Sample Size: 25 mL	
Prepared: 12/13/2021	Final Volume: 25 mL	Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	1.55	ug/L	
Cadmium, Dissolved	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt, Dissolved	7440-48-4	1	0.0178	0.200	1.22	ug/L	
Copper, Dissolved	7440-50-8	1	0.173	0.500	1.44	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	4.41	ug/L	
Selenium, Dissolved	7782-49-2	1	0.179	0.500	0.329	ug/L	J
Zinc, Dissolved	7440-66-6	1	2.92	6.00	ND	ug/L	U



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

MW-61-20210112

21L0031-13 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 12/01/2021 14:25

Instrument: HYDRA Analyst: ML

Analyzed: 12/14/2021 17:26

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0031-13 A 01

Preparation Batch: BJL0331

Sample Size: 20 mL

Filtration Batch: BJL0085

Prepared: 12/14/2021

Final Volume: 20 mL

Filtration Date: 12/02/2021 17:02

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - Quality Control
Batch BJJ0204 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0204-BLK1)		Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 15:47								
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.86		ug/L	5.00		97.1	80-120			
Surrogate: 4-Bromofluorobenzene	4.81		ug/L	5.00		96.2	80-120			
Blank (BJL0204-BLK2)		Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 15:47								
Vinyl Chloride	ND	0.08	0.20	ug/L						U
1,1-Dichloroethene	ND	0.08	0.20	ug/L						U
trans-1,2-Dichloroethene	ND	0.07	0.20	ug/L						U
cis-1,2-Dichloroethene	ND	0.08	0.20	ug/L						U
Benzene	ND	0.05	0.20	ug/L						U
Trichloroethene	ND	0.07	0.20	ug/L						U
Toluene	ND	0.05	0.20	ug/L						U
Tetrachloroethene	ND	0.09	0.20	ug/L						U
Ethylbenzene	ND	0.05	0.20	ug/L						U
m,p-Xylene	ND	0.14	0.40	ug/L						U
o-Xylene	ND	0.08	0.20	ug/L						U
Xylenes, total	ND	0.22	0.60	ug/L						U
Surrogate: 1,2-Dichloroethane-d4	5.26		ug/L	5.00		105	80-129			
Surrogate: Toluene-d8	4.86		ug/L	5.00		97.1	80-120			
Surrogate: 4-Bromofluorobenzene	4.81		ug/L	5.00		96.2	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.05		ug/L	5.00		101	80-120			
LCS (BJL0204-BS1)		Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 14:24								
Gasoline Range Organics (Tol-Nap)	1050	100	ug/L	1000		105	72-128			
Surrogate: Toluene-d8	4.91		ug/L	5.00		98.2	80-120			
Surrogate: 4-Bromofluorobenzene	4.90		ug/L	5.00		97.9	80-120			
LCS (BJL0204-BS2)		Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 14:02								
Vinyl Chloride	10.1	0.08	0.20	ug/L	10.0	101	66-133			
1,1-Dichloroethene	10.1	0.08	0.20	ug/L	10.0	101	69-135			
trans-1,2-Dichloroethene	9.63	0.07	0.20	ug/L	10.0	96.3	78-128			
cis-1,2-Dichloroethene	9.56	0.08	0.20	ug/L	10.0	95.6	80-121			
Benzene	9.71	0.05	0.20	ug/L	10.0	97.1	80-120			
Trichloroethene	9.88	0.07	0.20	ug/L	10.0	98.8	80-120			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BJL0204 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0204-BS2)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 14:02					
Toluene	9.90	0.05	0.20	ug/L	10.0		99.0	80-120			
Tetrachloroethene	9.57	0.09	0.20	ug/L	10.0		95.7	80-120			
Ethylbenzene	9.56	0.05	0.20	ug/L	10.0		95.6	80-120			
m,p-Xylene	19.4	0.14	0.40	ug/L	20.0		97.0	80-121			
o-Xylene	9.54	0.08	0.20	ug/L	10.0		95.4	80-121			
Xylenes, total	28.9	0.22	0.60	ug/L	30.0		96.5	76-127			
Surrogate: 1,2-Dichloroethane-d4	5.03			ug/L	5.00		101	80-129			
Surrogate: Toluene-d8	4.96			ug/L	5.00		99.3	80-120			
Surrogate: 4-Bromofluorobenzene	4.99			ug/L	5.00		99.8	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.01			ug/L	5.00		100	80-120			
LCS Dup (BJL0204-BSD1)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 14:45					
Gasoline Range Organics (Tol-Nap)	1060		100	ug/L	1000		106	72-128	0.92	30	
Surrogate: Toluene-d8	5.02			ug/L	5.00		100	80-120			
Surrogate: 4-Bromofluorobenzene	4.77			ug/L	5.00		95.3	80-120			
LCS Dup (BJL0204-BSD2)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 15:06					
Vinyl Chloride	9.86	0.08	0.20	ug/L	10.0		98.6	66-133	2.34	30	
1,1-Dichloroethene	9.80	0.08	0.20	ug/L	10.0		98.0	69-135	2.70	30	
trans-1,2-Dichloroethene	9.20	0.07	0.20	ug/L	10.0		92.0	78-128	4.55	30	
cis-1,2-Dichloroethene	9.17	0.08	0.20	ug/L	10.0		91.7	80-121	4.19	30	
Benzene	9.23	0.05	0.20	ug/L	10.0		92.3	80-120	5.00	30	
Trichloroethene	9.49	0.07	0.20	ug/L	10.0		94.9	80-120	3.98	30	
Toluene	9.35	0.05	0.20	ug/L	10.0		93.5	80-120	5.72	30	
Tetrachloroethene	9.17	0.09	0.20	ug/L	10.0		91.7	80-120	4.31	30	
Ethylbenzene	9.14	0.05	0.20	ug/L	10.0		91.4	80-120	4.45	30	
m,p-Xylene	18.5	0.14	0.40	ug/L	20.0		92.7	80-121	4.52	30	
o-Xylene	9.26	0.08	0.20	ug/L	10.0		92.6	80-121	3.02	30	
Xylenes, total	27.8	0.22	0.60	ug/L	30.0		92.7	76-127	4.02	30	
Surrogate: 1,2-Dichloroethane-d4	5.34			ug/L	5.00		107	80-129			
Surrogate: Toluene-d8	4.91			ug/L	5.00		98.2	80-120			
Surrogate: 4-Bromofluorobenzene	5.10			ug/L	5.00		102	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.03			ug/L	5.00		101	80-120			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - Quality Control
Batch BJJ0242 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0242-BLK1)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 12:12								
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.90		ug/L	5.00		97.9	80-120			
Surrogate: 4-Bromofluorobenzene	4.75		ug/L	5.00		95.1	80-120			
Blank (BJL0242-BLK2)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 12:12								
Vinyl Chloride	ND	0.08	0.20	ug/L						U
1,1-Dichloroethene	ND	0.08	0.20	ug/L						U
trans-1,2-Dichloroethene	ND	0.07	0.20	ug/L						U
cis-1,2-Dichloroethene	ND	0.08	0.20	ug/L						U
Benzene	ND	0.05	0.20	ug/L						U
Trichloroethene	ND	0.07	0.20	ug/L						U
Toluene	ND	0.05	0.20	ug/L						U
Tetrachloroethene	ND	0.09	0.20	ug/L						U
Ethylbenzene	ND	0.05	0.20	ug/L						U
m,p-Xylene	ND	0.14	0.40	ug/L						U
o-Xylene	ND	0.08	0.20	ug/L						U
Xylenes, total	ND	0.22	0.60	ug/L						U
Surrogate: 1,2-Dichloroethane-d4	5.08		ug/L	5.00		102	80-129			
Surrogate: Toluene-d8	4.90		ug/L	5.00		97.9	80-120			
Surrogate: 4-Bromofluorobenzene	4.75		ug/L	5.00		95.1	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	4.99		ug/L	5.00		99.8	80-120			
LCS (BJL0242-BS1)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 10:27								
Gasoline Range Organics (Tol-Nap)	1110	100	ug/L	1000		111	72-128			
Surrogate: Toluene-d8	4.97		ug/L	5.00		99.5	80-120			
Surrogate: 4-Bromofluorobenzene	4.94		ug/L	5.00		98.8	80-120			
LCS (BJL0242-BS2)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 10:48								
Vinyl Chloride	10.5	0.08	0.20	ug/L	10.0	105	66-133			
1,1-Dichloroethene	10.9	0.08	0.20	ug/L	10.0	109	69-135			
trans-1,2-Dichloroethene	9.94	0.07	0.20	ug/L	10.0	99.4	78-128			
cis-1,2-Dichloroethene	9.81	0.08	0.20	ug/L	10.0	98.1	80-121			
Benzene	10.1	0.05	0.20	ug/L	10.0	101	80-120			
Trichloroethene	9.93	0.07	0.20	ug/L	10.0	99.3	80-120			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - Quality Control
Batch BJJ0242 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0242-BS2)						Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 10:48					
Toluene	10.0	0.05	0.20	ug/L	10.0		100	80-120			
Tetrachloroethene	10.0	0.09	0.20	ug/L	10.0		100	80-120			
Ethylbenzene	10.2	0.05	0.20	ug/L	10.0		102	80-120			
m,p-Xylene	20.7	0.14	0.40	ug/L	20.0		103	80-121			
o-Xylene	10.2	0.08	0.20	ug/L	10.0		102	80-121			
Xylenes, total	30.9	0.22	0.60	ug/L	30.0		103	76-127			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	5.12			ug/L	5.00		102	80-129			
<i>Surrogate: Toluene-d8</i>	5.00			ug/L	5.00		99.9	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.98			ug/L	5.00		99.5	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	5.02			ug/L	5.00		100	80-120			
LCS Dup (BJL0242-BSD1)						Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 11:09					
Gasoline Range Organics (Tol-Nap)	1160		100	ug/L	1000		116	72-128	4.34	30	
<i>Surrogate: Toluene-d8</i>	5.00			ug/L	5.00		99.9	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.88			ug/L	5.00		97.6	80-120			
LCS Dup (BJL0242-BSD2)						Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 11:30					
Vinyl Chloride	11.0	0.08	0.20	ug/L	10.0		110	66-133	5.22	30	
1,1-Dichloroethene	11.4	0.08	0.20	ug/L	10.0		114	69-135	3.90	30	
trans-1,2-Dichloroethene	10.2	0.07	0.20	ug/L	10.0		102	78-128	2.44	30	
cis-1,2-Dichloroethene	10.3	0.08	0.20	ug/L	10.0		103	80-121	4.85	30	
Benzene	10.8	0.05	0.20	ug/L	10.0		108	80-120	6.98	30	
Trichloroethene	10.8	0.07	0.20	ug/L	10.0		108	80-120	8.07	30	
Toluene	10.7	0.05	0.20	ug/L	10.0		107	80-120	6.64	30	
Tetrachloroethene	10.6	0.09	0.20	ug/L	10.0		106	80-120	6.16	30	
Ethylbenzene	10.9	0.05	0.20	ug/L	10.0		109	80-120	7.20	30	
m,p-Xylene	22.2	0.14	0.40	ug/L	20.0		111	80-121	7.20	30	
o-Xylene	11.1	0.08	0.20	ug/L	10.0		111	80-121	7.72	30	
Xylenes, total	33.3	0.22	0.60	ug/L	30.0		111	76-127	7.37	30	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	5.11			ug/L	5.00		102	80-129			
<i>Surrogate: Toluene-d8</i>	4.99			ug/L	5.00		99.8	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.95			ug/L	5.00		99.1	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	4.98			ug/L	5.00		99.6	80-120			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - SIM - Quality Control
Batch BJL0145 - EPA 5030C (Purge and Trap)

Instrument: NT7 Analyst: PB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0145-BLK1)					Prepared: 06-Dec-2021 Analyzed: 06-Dec-2021 15:56						
Vinyl chloride	ND	5.01	20.0	ng/L							U
Surrogate: 1,2-Dichloroethane-d4	5780			ng/L	5000		116	80-129			
LCS (BJL0145-BS1)					Prepared: 06-Dec-2021 Analyzed: 06-Dec-2021 12:38						
Vinyl chloride	527	5.01	20.0	ng/L	500		105	62-141			
Surrogate: 1,2-Dichloroethane-d4	5150			ng/L	5000		103	80-129			
LCS Dup (BJL0145-BSD1)					Prepared: 06-Dec-2021 Analyzed: 06-Dec-2021 13:22						
Vinyl chloride	469	5.01	20.0	ng/L	500		93.9	62-141	11.60	30	
Surrogate: 1,2-Dichloroethane-d4	5830			ng/L	5000		117	80-129			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch BJL0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0109-BLK1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 19:35					
Phenol	ND	0.01	0.2	ug/L							U
bis(2-chloroethyl) ether	ND	0.03	0.2	ug/L							U
2-Chlorophenol	ND	0.03	0.2	ug/L							U
1,3-Dichlorobenzene	ND	0.03	0.2	ug/L							U
1,4-Dichlorobenzene	ND	0.03	0.2	ug/L							U
1,2-Dichlorobenzene	ND	0.03	0.2	ug/L							U
Benzyl Alcohol	ND	0.02	0.2	ug/L							U
2,2'-Oxybis(1-chloropropane)	ND	0.03	0.2	ug/L							U
2-Methylphenol	ND	0.03	0.2	ug/L							U
Hexachloroethane	ND	0.04	0.2	ug/L							U
N-Nitroso-di-n-Propylamine	ND	0.04	0.2	ug/L							U
4-Methylphenol	ND	0.03	0.2	ug/L							U
Nitrobenzene	ND	0.03	0.2	ug/L							U
Isophorone	ND	0.03	0.2	ug/L							U
2-Nitrophenol	ND	0.04	1.0	ug/L							U
2,4-Dimethylphenol	ND	0.3	1.0	ug/L							U
Bis(2-Chloroethoxy)methane	ND	0.03	0.2	ug/L							U
2,4-Dichlorophenol	ND	0.1	1.0	ug/L							U
1,2,4-Trichlorobenzene	ND	0.03	0.2	ug/L							U
Naphthalene	ND	0.03	0.2	ug/L							U
Benzoic acid	ND	0.1	2.0	ug/L							U
4-Chloroaniline	ND	0.04	1.0	ug/L							U
Hexachlorobutadiene	ND	0.04	0.2	ug/L							U
4-Chloro-3-Methylphenol	ND	0.1	1.0	ug/L							U
2-Methylnaphthalene	ND	0.03	0.2	ug/L							U
Hexachlorocyclopentadiene	ND	0.1	1.0	ug/L							U
2,4,6-Trichlorophenol	ND	0.2	1.0	ug/L							U
2,4,5-Trichlorophenol	ND	0.1	1.0	ug/L							U
2-Chloronaphthalene	ND	0.03	0.2	ug/L							U
2-Nitroaniline	ND	0.2	1.0	ug/L							U
Acenaphthylene	ND	0.02	0.2	ug/L							U
Dimethylphthalate	ND	0.04	0.2	ug/L							U
2,6-Dinitrotoluene	ND	0.2	1.0	ug/L							U
Acenaphthene	ND	0.03	0.2	ug/L							U
3-Nitroaniline	ND	0.2	1.0	ug/L							U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch BJL0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0109-BLK1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 19:35					
2,4-Dinitrophenol	ND	0.2	2.0	ug/L							U
Dibenzofuran	ND	0.02	0.2	ug/L							U
4-Nitrophenol	ND	0.06	1.0	ug/L							U
2,4-Dinitrotoluene	ND	0.1	1.0	ug/L							U
Fluorene	ND	0.02	0.2	ug/L							U
4-Chlorophenylphenyl ether	ND	0.02	0.2	ug/L							U
Diethyl phthalate	ND	0.06	0.2	ug/L							U
4-Nitroaniline	ND	0.2	1.0	ug/L							U
4,6-Dinitro-2-methylphenol	ND	0.4	2.0	ug/L							U
N-Nitrosodiphenylamine	ND	0.03	0.2	ug/L							U
4-Bromophenyl phenyl ether	ND	0.02	0.2	ug/L							U
Hexachlorobenzene	ND	0.04	0.2	ug/L							U
Pentachlorophenol	ND	0.1	1.0	ug/L							U
Phenanthrene	ND	0.02	0.2	ug/L							U
Anthracene	ND	0.03	0.2	ug/L							U
Carbazole	ND	0.04	0.2	ug/L							U
Di-n-Butylphthalate	ND	0.05	0.2	ug/L							U
Fluoranthene	ND	0.03	0.2	ug/L							U
Pyrene	ND	0.03	0.2	ug/L							U
Butylbenzylphthalate	ND	0.07	0.2	ug/L							U
Benzo(a)anthracene	ND	0.04	0.2	ug/L							U
3,3'-Dichlorobenzidine	ND	0.3	1.0	ug/L							U
Chrysene	ND	0.04	0.2	ug/L							U
bis(2-Ethylhexyl)phthalate	ND	0.2	0.2	ug/L							U
Di-n-Octylphthalate	ND	0.05	0.2	ug/L							U
Benzo(a)fluoranthene, Total	ND	0.08	0.4	ug/L							U
Benzo(a)pyrene	ND	0.05	0.2	ug/L							U
Indeno(1,2,3-cd)pyrene	ND	0.06	0.2	ug/L							U
Dibenzo(a,h)anthracene	ND	0.07	0.2	ug/L							U
Benzo(g,h,i)perylene	ND	0.04	0.2	ug/L							U
1-Methylnaphthalene	ND	0.03	0.2	ug/L							U
Surrogate: 2-Fluorophenol	3.84			ug/L	7.50		51.2	30-160			
Surrogate: Phenol-d5	2.02			ug/L	7.50		26.9	30-160			*
Surrogate: 2-Chlorophenol-d4	6.56			ug/L	7.50		87.5	30-160			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch B.JL0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0109-BLK1)						Prepared: 07-Dec-2021	Analyzed: 10-Dec-2021 19:35				
Surrogate: 1,2-Dichlorobenzene-d4	3.73			ug/L	5.00		74.7	30-160			
Surrogate: Nitrobenzene-d5	4.32			ug/L	5.00		86.3	30-160			
Surrogate: 2-Fluorobiphenyl	3.87			ug/L	5.00		77.5	30-160			
Surrogate: 2,4,6-Tribromophenol	5.18			ug/L	7.50		69.1	30-160			
Surrogate: p-Terphenyl-d14	4.54			ug/L	5.00		90.8	30-160			
LCS (BJL0109-BS1)						Prepared: 07-Dec-2021	Analyzed: 10-Dec-2021 20:13				
Phenol	1.8	0.01	0.2	ug/L	5.00		36.3	30-160			
bis(2-chloroethyl) ether	4.7	0.03	0.2	ug/L	5.00		94.3	30-160			
2-Chlorophenol	4.3	0.03	0.2	ug/L	5.00		85.9	30-160			
1,3-Dichlorobenzene	3.4	0.03	0.2	ug/L	5.00		68.6	30-160			
1,4-Dichlorobenzene	4.0	0.03	0.2	ug/L	5.00		79.6	30-160			
1,2-Dichlorobenzene	3.5	0.03	0.2	ug/L	5.00		70.0	30-160			
Benzyl Alcohol	2.3	0.02	0.2	ug/L	5.00		46.6	30-160			
2,2'-Oxybis(1-chloropropane)	5.6	0.03	0.2	ug/L	5.00		112	30-160			
2-Methylphenol	3.1	0.03	0.2	ug/L	5.00		62.7	30-160			
Hexachloroethane	3.6	0.04	0.2	ug/L	5.00		72.2	30-160			
N-Nitroso-di-n-Propylamine	4.7	0.04	0.2	ug/L	5.00		93.2	30-160			
4-Methylphenol	2.9	0.03	0.2	ug/L	5.00		58.3	30-160			
Nitrobenzene	4.6	0.03	0.2	ug/L	5.00		92.1	30-160			
Isophorone	6.8	0.03	0.2	ug/L	5.00		136	30-160			
2-Nitrophenol	3.6	0.04	1.0	ug/L	5.00		71.1	30-160			
2,4-Dimethylphenol	11.5	0.3	1.0	ug/L	13.0		88.8	30-160			
Bis(2-Chloroethoxy)methane	4.6	0.03	0.2	ug/L	5.00		92.5	30-160			
2,4-Dichlorophenol	12.3	0.1	1.0	ug/L	13.0		95.0	30-160			
1,2,4-Trichlorobenzene	3.3	0.03	0.2	ug/L	5.00		65.7	30-160			
Naphthalene	3.8	0.03	0.2	ug/L	5.00		76.1	30-160			
Benzoic acid	6.4	0.1	2.0	ug/L	23.0		27.7	30-160			*, Q
4-Chloroaniline	1.0	0.04	1.0	ug/L	13.0		7.39	30-160			*, J
Hexachlorobutadiene	2.9	0.04	0.2	ug/L	5.00		58.6	30-160			
4-Chloro-3-Methylphenol	11.9	0.1	1.0	ug/L	13.0		91.4	30-160			
2-Methylnaphthalene	3.9	0.03	0.2	ug/L	5.00		78.5	30-160			
Hexachlorocyclopentadiene	5.7	0.1	1.0	ug/L	13.0		43.7	30-160			Q
2,4,6-Trichlorophenol	11.2	0.2	1.0	ug/L	13.0		86.2	30-160			
2,4,5-Trichlorophenol	11.0	0.1	1.0	ug/L	13.0		84.3	30-160			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch BJJ0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJJ0109-BS1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:13					
2-Chloronaphthalene	4.1	0.03	0.2	ug/L	5.00		81.7	30-160			
2-Nitroaniline	16.5	0.2	1.0	ug/L	13.0		127	30-160			
Acenaphthylene	3.7	0.02	0.2	ug/L	5.00		74.9	30-160			
Dimethylphthalate	4.4	0.04	0.2	ug/L	5.00		88.2	30-160			
2,6-Dinitrotoluene	13.9	0.2	1.0	ug/L	13.0		107	30-160			
Acenaphthene	3.9	0.03	0.2	ug/L	5.00		78.5	30-160			
3-Nitroaniline	5.9	0.2	1.0	ug/L	13.0		45.6	30-160			
2,4-Dinitrophenol	22.5	0.2	2.0	ug/L	23.0		97.9	30-160			Q
Dibenzofuran	4.3	0.02	0.2	ug/L	5.00		85.1	30-160			
4-Nitrophenol	3.9	0.06	1.0	ug/L	13.0		29.8	30-160			*
2,4-Dinitrotoluene	12.6	0.1	1.0	ug/L	13.0		96.6	30-160			
Fluorene	4.0	0.02	0.2	ug/L	5.00		79.4	30-160			
4-Chlorophenylphenyl ether	4.2	0.02	0.2	ug/L	5.00		83.4	30-160			
Diethyl phthalate	4.4	0.06	0.2	ug/L	5.00		88.7	30-160			
4-Nitroaniline	8.5	0.2	1.0	ug/L	13.0		65.3	30-160			
4,6-Dinitro-2-methylphenol	21.5	0.4	2.0	ug/L	23.0		93.6	30-160			
N-Nitrosodiphenylamine	4.0	0.03	0.2	ug/L	5.00		79.9	30-160			
4-Bromophenyl phenyl ether	4.3	0.02	0.2	ug/L	5.00		85.3	30-160			
Hexachlorobenzene	4.1	0.04	0.2	ug/L	5.00		82.1	30-160			
Pentachlorophenol	9.4	0.1	1.0	ug/L	13.0		72.2	30-160			
Phenanthrene	4.0	0.02	0.2	ug/L	5.00		80.4	30-160			
Anthracene	4.0	0.03	0.2	ug/L	5.00		79.8	30-160			
Carbazole	4.3	0.04	0.2	ug/L	5.00		86.4	30-160			
Di-n-Butylphthalate	4.7	0.05	0.2	ug/L	5.00		93.2	30-160			
Fluoranthene	4.2	0.03	0.2	ug/L	5.00		83.2	30-160			
Pyrene	4.9	0.03	0.2	ug/L	5.00		98.9	30-160			
Butylbenzylphthalate	4.4	0.07	0.2	ug/L	5.00		87.9	30-160			Q
Benzo(a)anthracene	4.1	0.04	0.2	ug/L	5.00		81.3	30-160			
3,3'-Dichlorobenzidine	1.8	0.3	1.0	ug/L	13.0		14.0	30-160			*
Chrysene	3.8	0.04	0.2	ug/L	5.00		76.4	30-160			
bis(2-Ethylhexyl)phthalate	4.4	0.2	0.2	ug/L	5.00		87.9	30-160			
Di-n-Octylphthalate	4.2	0.05	0.2	ug/L	5.00		83.7	30-160			
Benzo(a)fluoranthene, Total	8.0	0.08	0.4	ug/L	10.0		79.7	30-160			
Benzo(a)pyrene	4.1	0.05	0.2	ug/L	5.00		81.5	30-160			
Indeno(1,2,3-cd)pyrene	4.0	0.06	0.2	ug/L	5.00		80.1	30-160			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BJJ0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJJ0109-BS1)											
						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:13					
Dibenzo(a,h)anthracene	4.0	0.07	0.2	ug/L	5.00		80.1	30-160			
Benzo(g,h,i)perylene	4.0	0.04	0.2	ug/L	5.00		80.9	30-160			
1-Methylnaphthalene	4.2	0.03	0.2	ug/L	5.00		84.5	30-160			
Surrogate: 2-Fluorophenol	4.42			ug/L	7.50		58.9	30-160			
Surrogate: Phenol-d5	2.67			ug/L	7.50		35.5	30-160			
Surrogate: 2-Chlorophenol-d4	6.61			ug/L	7.50		88.2	30-160			
Surrogate: 1,2-Dichlorobenzene-d4	3.82			ug/L	5.00		76.4	30-160			
Surrogate: Nitrobenzene-d5	4.71			ug/L	5.00		94.2	30-160			
Surrogate: 2-Fluorobiphenyl	4.30			ug/L	5.00		86.0	30-160			
Surrogate: 2,4,6-Tribromophenol	6.55			ug/L	7.50		87.3	30-160			
Surrogate: p-Terphenyl-d14	4.76			ug/L	5.00		95.2	30-160			
LCS Dup (BJJ0109-BSD1)											
						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:50					
Phenol	1.8	0.01	0.2	ug/L	5.00		37.0	30-160	1.85	30	
bis(2-chloroethyl) ether	4.9	0.03	0.2	ug/L	5.00		98.9	30-160	4.73	30	
2-Chlorophenol	4.5	0.03	0.2	ug/L	5.00		89.6	30-160	4.28	30	
1,3-Dichlorobenzene	3.7	0.03	0.2	ug/L	5.00		73.9	30-160	7.42	30	
1,4-Dichlorobenzene	4.2	0.03	0.2	ug/L	5.00		83.0	30-160	4.19	30	
1,2-Dichlorobenzene	3.7	0.03	0.2	ug/L	5.00		73.2	30-160	4.57	30	
Benzyl Alcohol	2.5	0.02	0.2	ug/L	5.00		50.2	30-160	7.37	30	
2,2'-Oxybis(1-chloropropane)	5.9	0.03	0.2	ug/L	5.00		117	30-160	4.30	30	
2-Methylphenol	3.2	0.03	0.2	ug/L	5.00		64.7	30-160	3.15	30	
Hexachloroethane	3.8	0.04	0.2	ug/L	5.00		76.2	30-160	5.33	30	
N-Nitroso-di-n-Propylamine	4.8	0.04	0.2	ug/L	5.00		96.4	30-160	3.30	30	
4-Methylphenol	3.1	0.03	0.2	ug/L	5.00		62.1	30-160	6.42	30	
Nitrobenzene	4.7	0.03	0.2	ug/L	5.00		94.3	30-160	2.35	30	
Isophorone	6.0	0.03	0.2	ug/L	5.00		120	30-160	12.80	30	
2-Nitrophenol	3.6	0.04	1.0	ug/L	5.00		72.0	30-160	1.23	30	
2,4-Dimethylphenol	11.2	0.3	1.0	ug/L	13.0		86.4	30-160	2.81	30	
Bis(2-Chloroethoxy)methane	4.6	0.03	0.2	ug/L	5.00		91.9	30-160	0.67	30	
2,4-Dichlorophenol	11.6	0.1	1.0	ug/L	13.0		89.1	30-160	6.33	30	
1,2,4-Trichlorobenzene	3.3	0.03	0.2	ug/L	5.00		66.0	30-160	0.46	30	
Naphthalene	3.8	0.03	0.2	ug/L	5.00		76.9	30-160	1.04	30	
Benzoic acid	6.2	0.1	2.0	ug/L	23.0		26.8	30-160	3.04	30	*, Q
4-Chloroaniline	1.2	0.04	1.0	ug/L	13.0		8.89	30-160	18.40	30	*



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch B.JL0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (B.JL0109-BSD1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:50					
Hexachlorobutadiene	3.0	0.04	0.2	ug/L	5.00		60.7	30-160	3.59	30	
4-Chloro-3-Methylphenol	11.7	0.1	1.0	ug/L	13.0		90.0	30-160	1.54	30	
2-Methylnaphthalene	3.9	0.03	0.2	ug/L	5.00		78.8	30-160	0.37	30	
Hexachlorocyclopentadiene	6.4	0.1	1.0	ug/L	13.0		49.1	30-160	11.60	30	Q
2,4,6-Trichlorophenol	11.4	0.2	1.0	ug/L	13.0		87.8	30-160	1.92	30	
2,4,5-Trichlorophenol	11.9	0.1	1.0	ug/L	13.0		91.6	30-160	8.31	30	
2-Chloronaphthalene	4.2	0.03	0.2	ug/L	5.00		84.1	30-160	2.89	30	
2-Nitroaniline	16.8	0.2	1.0	ug/L	13.0		129	30-160	1.89	30	
Acenaphthylene	3.8	0.02	0.2	ug/L	5.00		76.2	30-160	1.65	30	
Dimethylphthalate	4.5	0.04	0.2	ug/L	5.00		89.6	30-160	1.65	30	
2,6-Dinitrotoluene	13.9	0.2	1.0	ug/L	13.0		107	30-160	0.31	30	
Acenaphthene	4.0	0.03	0.2	ug/L	5.00		80.5	30-160	2.51	30	
3-Nitroaniline	5.8	0.2	1.0	ug/L	13.0		44.4	30-160	2.75	30	
2,4-Dinitrophenol	23.6	0.2	2.0	ug/L	23.0		103	30-160	4.67	30	Q
Dibenzofuran	4.3	0.02	0.2	ug/L	5.00		86.9	30-160	2.10	30	
4-Nitrophenol	4.0	0.06	1.0	ug/L	13.0		30.8	30-160	3.45	30	
2,4-Dinitrotoluene	12.4	0.1	1.0	ug/L	13.0		95.4	30-160	1.30	30	
Fluorene	4.1	0.02	0.2	ug/L	5.00		81.4	30-160	2.47	30	
4-Chlorophenylphenyl ether	4.4	0.02	0.2	ug/L	5.00		87.2	30-160	4.43	30	
Diethyl phthalate	4.2	0.06	0.2	ug/L	5.00		84.2	30-160	5.20	30	
4-Nitroaniline	10.7	0.2	1.0	ug/L	13.0		82.2	30-160	22.90	30	
4,6-Dinitro-2-methylphenol	22.6	0.4	2.0	ug/L	23.0		98.3	30-160	4.92	30	
N-Nitrosodiphenylamine	4.2	0.03	0.2	ug/L	5.00		84.6	30-160	5.81	30	
4-Bromophenyl phenyl ether	4.5	0.02	0.2	ug/L	5.00		90.7	30-160	6.17	30	
Hexachlorobenzene	4.3	0.04	0.2	ug/L	5.00		85.6	30-160	4.25	30	
Pentachlorophenol	9.5	0.1	1.0	ug/L	13.0		73.0	30-160	1.12	30	
Phenanthrene	4.1	0.02	0.2	ug/L	5.00		82.8	30-160	2.88	30	
Anthracene	4.1	0.03	0.2	ug/L	5.00		82.6	30-160	3.46	30	
Carbazole	4.4	0.04	0.2	ug/L	5.00		87.6	30-160	1.35	30	
Di-n-Butylphthalate	4.9	0.05	0.2	ug/L	5.00		97.2	30-160	4.16	30	
Fluoranthene	4.3	0.03	0.2	ug/L	5.00		86.4	30-160	3.79	30	
Pyrene	5.1	0.03	0.2	ug/L	5.00		102	30-160	2.81	30	
Butylbenzylphthalate	4.7	0.07	0.2	ug/L	5.00		93.3	30-160	5.92	30	Q
Benzo(a)anthracene	4.2	0.04	0.2	ug/L	5.00		84.4	30-160	3.75	30	
3,3'-Dichlorobenzidine	4.9	0.3	1.0	ug/L	13.0		38.0	30-160	92.20	30	*


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch BJJ0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJJ0109-BSD1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:50					
Chrysene	4.0	0.04	0.2	ug/L	5.00		79.2	30-160	3.69	30	
bis(2-Ethylhexyl)phthalate	4.3	0.2	0.2	ug/L	5.00		86.8	30-160	1.23	30	
Di-n-Octylphthalate	4.4	0.05	0.2	ug/L	5.00		87.5	30-160	4.48	30	
Benzo(a)fluoranthene, Total	8.2	0.08	0.4	ug/L	10.0		81.9	30-160	2.71	30	
Benzo(a)pyrene	4.2	0.05	0.2	ug/L	5.00		84.3	30-160	3.35	30	
Indeno(1,2,3-cd)pyrene	4.2	0.06	0.2	ug/L	5.00		83.2	30-160	3.73	30	
Dibenzo(a,h)anthracene	4.0	0.07	0.2	ug/L	5.00		79.8	30-160	0.36	30	
Benzo(g,h,i)perylene	4.1	0.04	0.2	ug/L	5.00		81.3	30-160	0.51	30	
1-Methylnaphthalene	4.3	0.03	0.2	ug/L	5.00		86.3	30-160	2.18	30	
Surrogate: 2-Fluorophenol	4.47			ug/L	7.50		59.7	30-160			
Surrogate: Phenol-d5	2.56			ug/L	7.50		34.2	30-160			
Surrogate: 2-Chlorophenol-d4	6.51			ug/L	7.50		86.8	30-160			
Surrogate: 1,2-Dichlorobenzene-d4	3.78			ug/L	5.00		75.7	30-160			
Surrogate: Nitrobenzene-d5	4.51			ug/L	5.00		90.3	30-160			
Surrogate: 2-Fluorobiphenyl	4.11			ug/L	5.00		82.3	30-160			
Surrogate: 2,4,6-Tribromophenol	6.08			ug/L	7.50		81.0	30-160			
Surrogate: p-Terphenyl-d14	4.59			ug/L	5.00		91.7	30-160			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJJ0107 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0107-BLK1)						Prepared: 08-Dec-2021 Analyzed: 11-Dec-2021 22:28					
Naphthalene	0.002	0.001	0.010	ug/L							J
2-Methylnaphthalene	ND	0.001	0.010	ug/L							U
1-Methylnaphthalene	ND	0.0009	0.010	ug/L							U
Acenaphthylene	ND	0.002	0.010	ug/L							U
Acenaphthene	ND	0.003	0.010	ug/L							U
Dibenzofuran	ND	0.002	0.010	ug/L							U
Fluorene	ND	0.002	0.010	ug/L							U
Phenanthrene	0.001	0.001	0.010	ug/L							J
Anthracene	0.002	0.001	0.010	ug/L							J
Carbazole	ND	0.001	0.010	ug/L							U
Fluoranthene	ND	0.002	0.010	ug/L							U
Pyrene	0.002	0.001	0.010	ug/L							J
Benzo(a)anthracene	0.002	0.0008	0.010	ug/L							J
Chrysene	0.002	0.0009	0.010	ug/L							J
Benzo(b)fluoranthene	0.001	0.0005	0.010	ug/L							J
Benzo(k)fluoranthene	ND	0.003	0.010	ug/L							U
Benzo(j)fluoranthene	ND	0.002	0.010	ug/L							U
Benzo(a)pyrene	ND	0.002	0.010	ug/L							U
Perylene	ND	0.006	0.010	ug/L							U
Indeno(1,2,3-cd)pyrene	ND	0.001	0.010	ug/L							U
Dibenzo(a,h)anthracene	ND	0.001	0.010	ug/L							U
Benzo(g,h,i)perylene	ND	0.001	0.010	ug/L							U
Surrogate: 2-Methylnaphthalene-d10	0.229			ug/L	0.300		76.5	42-120			
Surrogate: Dibenzo[a,h]anthracene-d14	0.234			ug/L	0.300		78.0	29-120			
Surrogate: Fluoranthene-d10	0.268			ug/L	0.300		89.5	57-120			

LCS (BJL0107-BS1)						Prepared: 08-Dec-2021 Analyzed: 11-Dec-2021 22:58					
Naphthalene	0.234	0.001	0.010	ug/L	0.300		77.9	37-120			
2-Methylnaphthalene	0.242	0.001	0.010	ug/L	0.300		80.7	37-120			
1-Methylnaphthalene	0.241	0.0009	0.010	ug/L	0.300		80.2	29-120			
Acenaphthylene	0.236	0.002	0.010	ug/L	0.300		78.6	41-120			
Acenaphthene	0.240	0.003	0.010	ug/L	0.300		80.1	41-120			
Dibenzofuran	0.235	0.002	0.010	ug/L	0.300		78.2	38-120			
Fluorene	0.250	0.002	0.010	ug/L	0.300		83.3	43-120			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJL0107 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0107-BS1)						Prepared: 08-Dec-2021 Analyzed: 11-Dec-2021 22:58					
Phenanthrene	0.250	0.001	0.010	ug/L	0.300		83.3	41-120			
Anthracene	0.247	0.001	0.010	ug/L	0.300		82.5	40-120			
Carbazole	0.265	0.001	0.010	ug/L	0.300		88.4	30-160			
Fluoranthene	0.272	0.002	0.010	ug/L	0.300		90.6	45-120			
Pyrene	0.274	0.001	0.010	ug/L	0.300		91.3	41-120			
Benzo(a)anthracene	0.270	0.0008	0.010	ug/L	0.300		90.0	42-120			
Chrysene	0.254	0.0009	0.010	ug/L	0.300		84.8	44-120			
Benzo(b)fluoranthene	0.272	0.0005	0.010	ug/L	0.300		90.5	44-120			
Benzo(k)fluoranthene	0.260	0.003	0.010	ug/L	0.300		86.5	50-120			
Benzo(j)fluoranthene	0.257	0.002	0.010	ug/L	0.300		85.6	39-160			
Benzofluoranthenes, Total	0.788	0.004	0.010	ug/L	0.900		87.5	46-120			
Benzo(a)pyrene	0.253	0.002	0.010	ug/L	0.300		84.3	35-120			
Perylene	0.246	0.006	0.010	ug/L	0.300		82.0	30-160			
Indeno(1,2,3-cd)pyrene	0.259	0.001	0.010	ug/L	0.300		86.2	37-120			
Dibenzo(a,h)anthracene	0.259	0.001	0.010	ug/L	0.300		86.3	34-120			
Benzo(g,h,i)perylene	0.250	0.001	0.010	ug/L	0.300		83.3	38-120			
Surrogate: 2-Methylnaphthalene-d10	0.261			ug/L	0.300		86.9	42-120			
Surrogate: Dibenzo[a,h]anthracene-d14	0.284			ug/L	0.300		94.8	29-120			
Surrogate: Fluoranthene-d10	0.294			ug/L	0.300		98.0	57-120			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Petroleum Hydrocarbons - Quality Control
Batch BJL0110 - EPA 3510C SepF

Instrument: FID4 Analyst: TWC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0110-BLK1)		Prepared: 07-Dec-2021 Analyzed: 12-Dec-2021 03:01								
Diesel Range Organics (C12-C24)	ND	0.100	mg/L							U
Motor Oil Range Organics (C24-C38)	ND	0.200	mg/L							U
<i>Surrogate: o-Terphenyl</i>	0.221		mg/L	0.225		98.2	50-150			
LCS (BJL0110-BS1)		Prepared: 07-Dec-2021 Analyzed: 12-Dec-2021 03:20								
Diesel Range Organics (C12-C24)	2.46	0.100	mg/L	3.00		81.9	56-120			
<i>Surrogate: o-Terphenyl</i>	0.226		mg/L	0.225		101	50-150			
LCS Dup (BJL0110-BSD1)		Prepared: 07-Dec-2021 Analyzed: 12-Dec-2021 03:40								
Diesel Range Organics (C12-C24)	2.62	0.100	mg/L	3.00		87.3	56-120	6.38	30	
<i>Surrogate: o-Terphenyl</i>	0.237		mg/L	0.225		105	50-150			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC

Aroclor PCB - Quality Control

Batch BJJ0111 - EPA 3510C SepF

Instrument: ECD7 Analyst: JGR

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0111-BLK1)											
						Prepared: 07-Dec-2021 Analyzed: 14-Dec-2021 14:26					
Aroclor 1016	ND	0.002	0.010	ug/L							U
Aroclor 1221	ND	0.002	0.010	ug/L							U
Aroclor 1232	ND	0.002	0.010	ug/L							U
Aroclor 1242	ND	0.002	0.010	ug/L							U
Aroclor 1248	ND	0.002	0.010	ug/L							U
Aroclor 1254	ND	0.002	0.010	ug/L							U
Aroclor 1260	ND	0.003	0.010	ug/L							U
Aroclor 1262	ND	0.003	0.010	ug/L							U
Aroclor 1268	ND	0.003	0.010	ug/L							U
Surrogate: Decachlorobiphenyl	0.0159			ug/L	0.0200		79.4	29-120			
Surrogate: Tetrachlorometaxylene	0.0121			ug/L	0.0200		60.4	32-120			
Surrogate: Decachlorobiphenyl [2C]	0.0166			ug/L	0.0200		82.8	29-120			
Surrogate: Tetrachlorometaxylene [2C]	0.0119			ug/L	0.0200		59.4	32-120			
LCS (BJL0111-BS1)											
						Prepared: 07-Dec-2021 Analyzed: 14-Dec-2021 14:47					
Aroclor 1016 [2C]	0.039	0.002	0.010	ug/L	0.0500		78.6	54-120			
Aroclor 1260	0.038	0.003	0.010	ug/L	0.0500		75.5	51-128			
Surrogate: Decachlorobiphenyl	0.0151			ug/L	0.0200		75.3	29-120			
Surrogate: Tetrachlorometaxylene	0.0116			ug/L	0.0200		57.8	32-120			
Surrogate: Decachlorobiphenyl [2C]	0.0156			ug/L	0.0200		78.1	29-120			
Surrogate: Tetrachlorometaxylene [2C]	0.0115			ug/L	0.0200		57.7	32-120			
LCS Dup (BJL0111-BSD1)											
						Prepared: 07-Dec-2021 Analyzed: 14-Dec-2021 15:08					
Aroclor 1016 [2C]	0.041	0.002	0.010	ug/L	0.0500		82.1	54-120	4.27	30	
Aroclor 1260	0.042	0.003	0.010	ug/L	0.0500		85.0	51-128	11.80	30	
Surrogate: Decachlorobiphenyl	0.0175			ug/L	0.0200		87.3	29-120			
Surrogate: Tetrachlorometaxylene	0.0120			ug/L	0.0200		60.0	32-120			
Surrogate: Decachlorobiphenyl [2C]	0.0173			ug/L	0.0200		86.4	29-120			
Surrogate: Tetrachlorometaxylene [2C]	0.0119			ug/L	0.0200		59.7	32-120			


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0294 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0294-BLK1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:53						
Barium	135	ND	0.114	0.500	ug/L							U
Barium	137	ND	0.0765	0.500	ug/L							U
Chromium	52	ND	0.260	0.500	ug/L							U
Chromium	53	ND	0.239	0.500	ug/L							U
Iron	54	ND	18.2	36.0	ug/L							U
Iron	57	ND	6.63	36.0	ug/L							U
Lead	208	ND	0.0513	0.100	ug/L							U
Manganese	55	ND	0.142	0.500	ug/L							U
Silver	107	ND	0.0220	0.200	ug/L							U
Vanadium	51a	ND	0.0556	0.200	ug/L							U
Vanadium	51b	ND	0.0521	0.200	ug/L							U
Arsenic	75a	ND	0.0373	0.200	ug/L							U
Cadmium	111	ND	0.0300	0.100	ug/L							U
Cadmium	114	ND	0.0400	0.100	ug/L							U
Cobalt	59	ND	0.0178	0.200	ug/L							U
Copper	63	ND	0.173	0.500	ug/L							U
Copper	65	ND	0.350	0.500	ug/L							U
Nickel	60	ND	0.0792	0.500	ug/L							U
Nickel	62	ND	0.220	0.500	ug/L							U
Selenium	78	ND	0.179	0.500	ug/L							U
Zinc	66	ND	2.92	6.00	ug/L							U
Zinc	67	ND	0.940	6.00	ug/L							U
LCS (BJL0294-BS1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:58						
Barium	135	24.7	0.114	0.500	ug/L	25.0		98.8	80-120			
Barium	137	24.4	0.0765	0.500	ug/L	25.0		97.8	80-120			
Chromium	52	25.3	0.260	0.500	ug/L	25.0		101	80-120			
Chromium	53	24.8	0.239	0.500	ug/L	25.0		99.0	80-120			
Iron	54	4850	18.2	36.0	ug/L	5000		96.9	80-120			
Iron	57	4880	6.63	36.0	ug/L	5000		97.6	80-120			
Lead	208	25.8	0.0513	0.100	ug/L	25.0		103	80-120			
Manganese	55	24.1	0.142	0.500	ug/L	25.0		96.2	80-120			
Silver	107	25.5	0.0220	0.200	ug/L	25.0		102	80-120			
Vanadium	51a	24.7	0.0556	0.200	ug/L	25.0		98.6	80-120			
Vanadium	51b	24.5	0.0521	0.200	ug/L	25.0		98.0	80-120			


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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJJ0294 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0294-BS1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:58						
Arsenic	75a	24.7	0.0373	0.200	ug/L	25.0		98.8	80-120			
Cadmium	111	24.6	0.0300	0.100	ug/L	25.0		98.3	80-120			
Cadmium	114	24.6	0.0400	0.100	ug/L	25.0		98.5	80-120			
Cobalt	59	24.3	0.0178	0.200	ug/L	25.0		97.3	80-120			
Copper	63	24.8	0.173	0.500	ug/L	25.0		99.3	80-120			
Copper	65	25.1	0.350	0.500	ug/L	25.0		101	80-120			
Nickel	60	24.2	0.0792	0.500	ug/L	25.0		96.7	80-120			
Nickel	62	24.5	0.220	0.500	ug/L	25.0		98.0	80-120			
Selenium	78	78.5	0.179	0.500	ug/L	80.0		98.1	80-120			
Zinc	66	79.0	2.92	6.00	ug/L	80.0		98.8	80-120			
Zinc	67	72.8	0.940	6.00	ug/L	80.0		91.0	80-120			
Duplicate (BJL0294-DUP1)						Source: 21L0031-01 Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 19:56						
Barium	135	6.86	0.114	0.500	ug/L		6.50			5.32	20	
Chromium	52	5.16	0.260	0.500	ug/L		4.96			3.89	20	
Iron	54	879	18.2	36.0	ug/L		839			4.54	20	
Lead	208	ND	0.0513	0.100	ug/L		ND					U
Manganese	55	20.4	0.142	0.500	ug/L		19.4			5.05	20	
Silver	107	ND	0.0220	0.200	ug/L		ND					U
Vanadium	51a	1.81	0.0556	0.200	ug/L		1.72			4.71	20	
Arsenic	75a	1.09	0.0373	0.200	ug/L		1.01			7.23	20	
Cadmium	111	ND	0.0300	0.100	ug/L		ND					U
Cobalt	59	0.0760	0.0178	0.200	ug/L		0.0570			28.60	20	L, J
Copper	63	2.05	0.173	0.500	ug/L		2.06			0.24	20	
Nickel	60	0.657	0.0792	0.500	ug/L		0.686			4.32	20	
Selenium	78	3.13	0.179	0.500	ug/L		3.36			7.15	20	
Zinc	66	ND	2.92	6.00	ug/L		ND					U
Matrix Spike (BJL0294-MS1)						Source: 21L0031-01 Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 20:02						
Barium	135	30.4	0.114	0.500	ug/L	25.0	6.50	95.8	75-125			
Chromium	52	26.7	0.260	0.500	ug/L	25.0	4.96	86.9	75-125			
Iron	54	5120	18.2	36.0	ug/L	5000	839	85.7	75-125			
Lead	208	24.6	0.0513	0.100	ug/L	25.0	ND	98.3	75-125			
Manganese	55	40.2	0.142	0.500	ug/L	25.0	19.4	83.2	75-125			
Silver	107	23.6	0.0220	0.200	ug/L	25.0	ND	94.5	75-125			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJJ0294 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Matrix Spike (BJL0294-MS1)		Source: 21L0031-01			Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 20:02							
Vanadium	51a	23.4	0.0556	0.200	ug/L	25.0	1.72	86.7	75-125			
Arsenic	75a	24.7	0.0373	0.200	ug/L	25.0	1.01	94.9	75-125			
Cadmium	111	22.7	0.0300	0.100	ug/L	25.0	ND	90.9	75-125			
Cobalt	59	25.0	0.0178	0.200	ug/L	25.0	0.0570	99.7	75-125			
Copper	63	25.6	0.173	0.500	ug/L	25.0	2.06	94.0	75-125			
Nickel	60	24.0	0.0792	0.500	ug/L	25.0	0.686	93.4	75-125			
Selenium	78	75.4	0.179	0.500	ug/L	80.0	3.36	90.1	75-125			
Zinc	66	72.8	2.92	6.00	ug/L	80.0	ND	91.0	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJL0294-MSD1)		Source: 21L0031-01			Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 20:08							
Barium	135	31.3	0.114	0.500	ug/L	25.0	6.50	99.1	75-125	2.70	20	
Chromium	52	27.1	0.260	0.500	ug/L	25.0	4.96	88.5	75-125	1.50	20	
Iron	54	5000	18.2	36.0	ug/L	5000	839	83.2	75-125	2.43	20	
Lead	208	25.1	0.0513	0.100	ug/L	25.0	ND	100	75-125	2.10	20	
Manganese	55	40.2	0.142	0.500	ug/L	25.0	19.4	83.2	75-125	0.02	20	
Silver	107	24.3	0.0220	0.200	ug/L	25.0	ND	97.3	75-125	2.92	20	
Vanadium	51a	23.4	0.0556	0.200	ug/L	25.0	1.72	86.8	75-125	0.16	20	
Arsenic	75a	25.1	0.0373	0.200	ug/L	25.0	1.01	96.2	75-125	1.32	20	
Cadmium	111	22.7	0.0300	0.100	ug/L	25.0	ND	90.6	75-125	0.33	20	
Cobalt	59	24.7	0.0178	0.200	ug/L	25.0	0.0570	98.6	75-125	1.03	20	
Copper	63	25.9	0.173	0.500	ug/L	25.0	2.06	95.5	75-125	1.43	20	
Nickel	60	24.6	0.0792	0.500	ug/L	25.0	0.686	95.7	75-125	2.42	20	
Selenium	78	75.4	0.179	0.500	ug/L	80.0	3.36	90.0	75-125	0.04	20	
Zinc	66	73.1	2.92	6.00	ug/L	80.0	ND	91.4	75-125	0.44	20	

Recovery limits for target analytes in MS/MSD QC samples are advisory only.


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0371 - TWM EPA 7470A

Instrument: HYDRA Analyst: SKD

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0371-BLK1)						Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:10					
Mercury	ND	0.000013	0.000100	mg/L							U
LCS (BJL0371-BS1)						Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:12					
Mercury	0.00187	0.000013	0.000100	mg/L	0.00200		93.5	80-120			
Duplicate (BJL0371-DUP1)						Source: 21L0031-10 Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:17					
Mercury	ND	0.000013	0.000100	mg/L		ND					U
Matrix Spike (BJL0371-MS1)						Source: 21L0031-10 Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:19					
Mercury	0.000923	0.000013	0.000100	mg/L	0.00100	ND	92.3	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Matrix Spike Dup (BJL0371-MSD1)						Source: 21L0031-10 Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:21					
Mercury	0.000977	0.000013	0.000100	mg/L	0.00100	ND	97.7	75-125	5.73	20	
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											


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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0296 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0296-BLK1)						Prepared: 13-Dec-2021 Analyzed: 13-Dec-2021 19:31						
Barium, Dissolved	135	ND	0.114	0.500	ug/L							U
Barium, Dissolved	137	ND	0.0765	0.500	ug/L							U
Chromium, Dissolved	52	ND	0.260	0.500	ug/L							U
Chromium, Dissolved	53	ND	0.239	0.500	ug/L							U
Iron, Dissolved	54	ND	18.2	36.0	ug/L							U
Iron, Dissolved	57	ND	18.2	36.0	ug/L							U
Lead, Dissolved	208	ND	0.0513	0.100	ug/L							U
Manganese, Dissolved	55	ND	0.142	0.500	ug/L							U
Silver, Dissolved	107	ND	0.0220	0.200	ug/L							U
Vanadium, Dissolved	51a	ND	0.0556	0.200	ug/L							U
Vanadium, Dissolved	51b	ND	0.0521	0.200	ug/L							U
Arsenic, Dissolved	75a	ND	0.0373	0.200	ug/L							U
Cadmium, Dissolved	111	ND	0.0300	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.0400	0.100	ug/L							U
Cobalt, Dissolved	59	ND	0.0178	0.200	ug/L							U
Copper, Dissolved	63	ND	0.173	0.500	ug/L							U
Copper, Dissolved	65	ND	0.350	0.500	ug/L							U
Nickel, Dissolved	60	ND	0.0792	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.220	0.500	ug/L							U
Selenium, Dissolved	78	0.231	0.179	0.500	ug/L							J
Zinc, Dissolved	66	ND	2.92	6.00	ug/L							U
Zinc, Dissolved	67	ND	0.940	6.00	ug/L							U

LCS (BJL0296-BS1)						Prepared: 13-Dec-2021 Analyzed: 13-Dec-2021 19:36						
Barium, Dissolved	135	23.1	0.114	0.500	ug/L	25.0		92.5	80-120			
Barium, Dissolved	137	23.5	0.0765	0.500	ug/L	25.0		94.1	80-120			
Chromium, Dissolved	52	23.7	0.260	0.500	ug/L	25.0		94.9	80-120			
Chromium, Dissolved	53	23.4	0.239	0.500	ug/L	25.0		93.8	80-120			
Iron, Dissolved	54	4820	18.2	36.0	ug/L	5000		96.4	80-120			
Iron, Dissolved	57	4780	18.2	36.0	ug/L	5000		95.7	80-120			
Lead, Dissolved	208	26.1	0.0513	0.100	ug/L	25.0		104	80-120			
Manganese, Dissolved	55	24.0	0.142	0.500	ug/L	25.0		95.8	80-120			
Silver, Dissolved	107	24.0	0.0220	0.200	ug/L	25.0		95.9	80-120			
Vanadium, Dissolved	51a	23.8	0.0556	0.200	ug/L	25.0		95.1	80-120			
Vanadium, Dissolved	51b	23.7	0.0521	0.200	ug/L	25.0		94.7	80-120			


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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJJ0296 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0296-BS1)						Prepared: 13-Dec-2021 Analyzed: 13-Dec-2021 19:36						
Arsenic, Dissolved	75a	23.2	0.0373	0.200	ug/L	25.0		93.0	80-120			
Cadmium, Dissolved	111	23.2	0.0300	0.100	ug/L	25.0		92.6	80-120			
Cadmium, Dissolved	114	23.4	0.0400	0.100	ug/L	25.0		93.5	80-120			
Cobalt, Dissolved	59	24.5	0.0178	0.200	ug/L	25.0		98.1	80-120			
Copper, Dissolved	63	24.5	0.173	0.500	ug/L	25.0		98.2	80-120			
Copper, Dissolved	65	24.5	0.350	0.500	ug/L	25.0		97.9	80-120			
Nickel, Dissolved	60	24.5	0.0792	0.500	ug/L	25.0		98.0	80-120			
Nickel, Dissolved	62	24.2	0.220	0.500	ug/L	25.0		96.8	80-120			
Selenium, Dissolved	78	71.7	0.179	0.500	ug/L	80.0		89.6	80-120			
Zinc, Dissolved	66	75.3	2.92	6.00	ug/L	80.0		94.1	80-120			
Zinc, Dissolved	67	69.2	0.940	6.00	ug/L	80.0		86.6	80-120			
Duplicate (BJL0296-DUP1)						Source: 21L0031-02 Prepared: 13-Dec-2021 Analyzed: 13-Dec-2021 22:08						
Arsenic, Dissolved	75a	0.472	0.0373	0.200	ug/L		0.498			5.36	20	
Cadmium, Dissolved	111	ND	0.0300	0.100	ug/L		0.0320					U
Cobalt, Dissolved	59	0.0530	0.0178	0.200	ug/L		0.0650			20.30	20	L, J
Copper, Dissolved	63	1.72	0.173	0.500	ug/L		1.75			1.96	20	
Nickel, Dissolved	60	0.613	0.0792	0.500	ug/L		0.696			12.70	20	
Selenium, Dissolved	78	2.84	0.179	0.500	ug/L		3.05			7.09	20	
Zinc, Dissolved	66	ND	2.92	6.00	ug/L		ND					U
Duplicate (BJL0296-DUP2)						Source: 21L0031-02 Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:16						
Barium, Dissolved	135	4.98	0.114	0.500	ug/L		5.09			2.13	20	
Chromium, Dissolved	52	0.323	0.260	0.500	ug/L		0.451			33.10	20	L, J
Iron, Dissolved	54	ND	18.2	36.0	ug/L		ND					U
Lead, Dissolved	208	ND	0.0513	0.100	ug/L		ND					U
Manganese, Dissolved	55	18.4	0.142	0.500	ug/L		19.2			4.43	20	
Silver, Dissolved	107	ND	0.0220	0.200	ug/L		ND					U
Vanadium, Dissolved	51a	1.34	0.0556	0.200	ug/L		1.41			5.18	20	
Matrix Spike (BJL0296-MS1)						Source: 21L0031-02 Prepared: 13-Dec-2021 Analyzed: 13-Dec-2021 22:13						
Arsenic, Dissolved	75a	24.7	0.0373	0.200	ug/L	25.0	0.498	96.9	75-125			
Cadmium, Dissolved	111	23.7	0.0300	0.100	ug/L	25.0	0.0320	94.7	75-125			
Cobalt, Dissolved	59	25.6	0.0178	0.200	ug/L	25.0	0.0650	102	75-125			
Copper, Dissolved	63	26.0	0.173	0.500	ug/L	25.0	1.75	97.1	75-125			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 16:33

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0296 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Matrix Spike (BJL0296-MS1)		Source: 21L0031-02			Prepared: 13-Dec-2021		Analyzed: 13-Dec-2021 22:13					
Nickel, Dissolved	60	25.6	0.0792	0.500	ug/L	25.0	0.696	99.5	75-125			
Selenium, Dissolved	78	72.7	0.179	0.500	ug/L	80.0	3.05	87.0	75-125			
Zinc, Dissolved	66	72.8	2.92	6.00	ug/L	80.0	ND	91.0	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike (BJL0296-MS2)		Source: 21L0031-02			Prepared: 13-Dec-2021		Analyzed: 14-Dec-2021 17:21					
Barium, Dissolved	135	30.6	0.114	0.500	ug/L	25.0	5.09	102	75-125			
Chromium, Dissolved	52	22.5	0.260	0.500	ug/L	25.0	0.451	88.2	75-125			
Iron, Dissolved	54	4250	18.2	36.0	ug/L	5000	ND	85.0	75-125			
Lead, Dissolved	208	24.8	0.0513	0.100	ug/L	25.0	ND	99.3	75-125			
Manganese, Dissolved	55	40.0	0.142	0.500	ug/L	25.0	19.2	83.2	75-125			
Silver, Dissolved	107	25.0	0.0220	0.200	ug/L	25.0	ND	100	75-125			
Vanadium, Dissolved	51a	23.4	0.0556	0.200	ug/L	25.0	1.41	88.1	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJL0296-MSD1)		Source: 21L0031-02			Prepared: 13-Dec-2021		Analyzed: 13-Dec-2021 22:19					
Arsenic, Dissolved	75a	24.5	0.0373	0.200	ug/L	25.0	0.498	95.9	75-125	1.05	20	
Cadmium, Dissolved	111	23.0	0.0300	0.100	ug/L	25.0	0.0320	91.7	75-125	3.27	20	
Cobalt, Dissolved	59	24.7	0.0178	0.200	ug/L	25.0	0.0650	98.4	75-125	3.60	20	
Copper, Dissolved	63	25.5	0.173	0.500	ug/L	25.0	1.75	95.0	75-125	2.08	20	
Nickel, Dissolved	60	24.9	0.0792	0.500	ug/L	25.0	0.696	96.7	75-125	2.69	20	
Selenium, Dissolved	78	73.0	0.179	0.500	ug/L	80.0	3.05	87.5	75-125	0.49	20	
Zinc, Dissolved	66	73.2	2.92	6.00	ug/L	80.0	ND	91.5	75-125	0.60	20	

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJL0296-MSD2)		Source: 21L0031-02			Prepared: 13-Dec-2021		Analyzed: 14-Dec-2021 17:26					
Barium, Dissolved	135	30.6	0.114	0.500	ug/L	25.0	5.09	102	75-125	0.28	20	
Chromium, Dissolved	52	22.6	0.260	0.500	ug/L	25.0	0.451	88.5	75-125	0.36	20	
Iron, Dissolved	54	4260	18.2	36.0	ug/L	5000	ND	85.3	75-125	0.34	20	
Lead, Dissolved	208	25.0	0.0513	0.100	ug/L	25.0	ND	100	75-125	0.77	20	
Manganese, Dissolved	55	40.6	0.142	0.500	ug/L	25.0	19.2	85.5	75-125	1.44	20	
Silver, Dissolved	107	24.8	0.0220	0.200	ug/L	25.0	ND	99.2	75-125	0.80	20	
Vanadium, Dissolved	51a	23.7	0.0556	0.200	ug/L	25.0	1.41	89.0	75-125	0.99	20	

Recovery limits for target analytes in MS/MSD QC samples are advisory only.


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

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Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0331 - TWM EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0331-BLK1)						Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 17:09					
Mercury, Dissolved	ND	0.000013	0.000100	mg/L							U
LCS (BJL0331-BS1)						Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 17:12					
Mercury, Dissolved	0.00201	0.000013	0.000100	mg/L	0.00200		100	80-120			
Duplicate (BJL0331-DUP1)						Source: 21L0031-11 Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 17:16					
Mercury, Dissolved	ND	0.000013	0.000100	mg/L		ND					U
Matrix Spike (BJL0331-MS1)						Source: 21L0031-11 Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 17:19					
Mercury, Dissolved	0.000994	0.000013	0.000100	mg/L	0.00100	ND	99.4	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Matrix Spike Dup (BJL0331-MSD1)						Source: 21L0031-11 Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 17:21					
Mercury, Dissolved	0.000973	0.000013	0.000100	mg/L	0.00100	ND	97.3	75-125	2.09	20	
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											



Analytical Report

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Certified Analyses included in this Report

Analyte	Certifications
EPA 6020B in Water	
Silver-107	WADOE,WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
Silver-107	WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
EPA 6020B UCT-KED in Water	
Arsenic-75a	WADOE,WA-DW,DoD-ELAP,ADEC,NELAP
Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Cobalt-59	NELAP,DoD-ELAP,WADOE
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	WADOE,WA-DW,DoD-ELAP
Zinc-67	WADOE,WA-DW,DoD-ELAP
Arsenic-75a	NELAP,WADOE,DoD-ELAP,ADEC


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Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Cobalt-59	DoD-ELAP,NELAP,WADOE
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	NELAP,WADOE,DoD-ELAP
Zinc-67	NELAP,WADOE,DoD-ELAP

EPA 7470A in Water

Mercury	WADOE,NELAP,DoD-ELAP
Mercury	WADOE,NELAP,DoD-ELAP

EPA 8082A in Water

Aroclor 1016	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1016 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268 [2C]	WADOE,DoD-ELAP,NELAP,ADEC

EPA 8260D in Water

Chloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,WADOE


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Acrolein	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Iodomethane	DoD-ELAP,NELAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Butanone	DoD-ELAP,NELAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE


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m,p-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
Styrene	DoD-ELAP,NELAP,WADOE
Bromoform	DoD-ELAP,NELAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE

EPA 8260D-SIM in Water

Acrylonitrile	NELAP,WADOE
Vinyl chloride	NELAP,WADOE
1,1-Dichloroethene	NELAP,WADOE
cis-1,2-Dichloroethene	NELAP,WADOE
trans-1,2-Dichloroethene	NELAP,WADOE
Trichloroethene	NELAP,WADOE
Tetrachloroethene	NELAP,WADOE
1,1,2,2-Tetrachloroethane	NELAP,WADOE


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1,2-Dichloroethane

NELAP,WADOE

Benzene

NELAP,WADOE

EPA 8270E in Water

Phenol

NELAP,DoD-ELAP

bis(2-chloroethyl) ether

NELAP,DoD-ELAP

2-Chlorophenol

NELAP,DoD-ELAP

1,3-Dichlorobenzene

NELAP,DoD-ELAP

1,4-Dichlorobenzene

NELAP,DoD-ELAP

1,2-Dichlorobenzene

NELAP,DoD-ELAP

Benzyl Alcohol

NELAP,DoD-ELAP

2,2'-Oxybis(1-chloropropane)

NELAP,DoD-ELAP

2-Methylphenol

NELAP,DoD-ELAP

Hexachloroethane

NELAP,DoD-ELAP

N-Nitroso-di-n-Propylamine

NELAP,DoD-ELAP

4-Methylphenol

NELAP,DoD-ELAP

Nitrobenzene

NELAP,DoD-ELAP

Isophorone

NELAP,DoD-ELAP

2-Nitrophenol

NELAP,DoD-ELAP

2,4-Dimethylphenol

NELAP,DoD-ELAP

Bis(2-Chloroethoxy)methane

NELAP,DoD-ELAP

2,4-Dichlorophenol

NELAP,DoD-ELAP

1,2,4-Trichlorobenzene

NELAP,DoD-ELAP

Naphthalene

NELAP,DoD-ELAP

Benzoic acid

NELAP,DoD-ELAP

4-Chloroaniline

NELAP,DoD-ELAP

Hexachlorobutadiene

NELAP,DoD-ELAP

4-Chloro-3-Methylphenol

NELAP,DoD-ELAP

2-Methylnaphthalene

NELAP,DoD-ELAP

Hexachlorocyclopentadiene

NELAP,DoD-ELAP

2,4,6-Trichlorophenol

NELAP,DoD-ELAP

2,4,5-Trichlorophenol

NELAP,DoD-ELAP

2-Chloronaphthalene

NELAP,DoD-ELAP

2-Nitroaniline

NELAP,DoD-ELAP

Acenaphthylene

NELAP,DoD-ELAP

Dimethylphthalate

NELAP,DoD-ELAP

2,6-Dinitrotoluene

NELAP,DoD-ELAP

Acenaphthene

NELAP,DoD-ELAP

3-Nitroaniline

NELAP,DoD-ELAP

2,4-Dinitrophenol

NELAP,DoD-ELAP


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Dibenzofuran	NELAP,DoD-ELAP
4-Nitrophenol	NELAP,DoD-ELAP
2,4-Dinitrotoluene	NELAP,DoD-ELAP
Fluorene	NELAP,DoD-ELAP
4-Chlorophenylphenyl ether	NELAP,DoD-ELAP
Diethyl phthalate	NELAP,DoD-ELAP
4-Nitroaniline	NELAP,DoD-ELAP
4,6-Dinitro-2-methylphenol	NELAP,DoD-ELAP
N-Nitrosodiphenylamine	NELAP,DoD-ELAP
4-Bromophenyl phenyl ether	NELAP,DoD-ELAP
Hexachlorobenzene	NELAP,DoD-ELAP
Pentachlorophenol	NELAP,DoD-ELAP
Phenanthrene	NELAP,DoD-ELAP
Anthracene	NELAP,DoD-ELAP
Carbazole	NELAP,DoD-ELAP
Di-n-Butylphthalate	NELAP,DoD-ELAP
Fluoranthene	NELAP,DoD-ELAP
Pyrene	NELAP,DoD-ELAP
Butylbenzylphthalate	NELAP,DoD-ELAP
Benzo(a)anthracene	NELAP,DoD-ELAP
3,3'-Dichlorobenzidine	NELAP,DoD-ELAP
Chrysene	NELAP,DoD-ELAP
bis(2-Ethylhexyl)phthalate	NELAP,DoD-ELAP
Di-n-Octylphthalate	NELAP,DoD-ELAP
Benzo(b)fluoranthene	NELAP,DoD-ELAP
Benzo(k)fluoranthene	NELAP,DoD-ELAP
Benzo(a)fluoranthene, Total	NELAP
Benzo(a)pyrene	NELAP,DoD-ELAP
Indeno(1,2,3-cd)pyrene	NELAP,DoD-ELAP
Dibenzo(a,h)anthracene	NELAP,DoD-ELAP
Benzo(g,h,i)perylene	NELAP,DoD-ELAP
N-Nitrosodimethylamine	NELAP,DoD-ELAP
1-Methylnaphthalene	NELAP,DoD-ELAP

EPA 8270E-SIM in Water

Naphthalene	ADEC,DoD-ELAP,NELAP,WADOE
2-Methylnaphthalene	ADEC,DoD-ELAP,NELAP
1-Methylnaphthalene	ADEC,DoD-ELAP,NELAP,WADOE
Biphenyl	NELAP
Acenaphthylene	ADEC,DoD-ELAP,NELAP,WADOE


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Acenaphthene	ADEC, DoD-ELAP, NELAP, WADOE
Dibenzofuran	ADEC, DoD-ELAP, NELAP
Fluorene	ADEC, DoD-ELAP, NELAP, WADOE
Phenanthrene	ADEC, DoD-ELAP, NELAP, WADOE
Anthracene	ADEC, DoD-ELAP, NELAP, WADOE
Carbazole	NELAP
Fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Pyrene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(a)anthracene	ADEC, DoD-ELAP, NELAP, WADOE
Chrysene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(b)fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(k)fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(j)fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(e)pyrene	NELAP
Benzo(a)pyrene	ADEC, DoD-ELAP, NELAP, WADOE
Perylene	ADEC, NELAP
Indeno(1,2,3-cd)pyrene	ADEC, DoD-ELAP, NELAP, WADOE
Dibenzo(a,h)anthracene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(g,h,i)perylene	ADEC, DoD-ELAP, NELAP, WADOE

NWTPH-Dx in Water

Diesel Range Organics (C12-C24)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C10-C25)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (Tol-C18)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C10-C24)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C10-C28)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C12-C22)	DoD-ELAP
Diesel Range Organics (C12-C25)	DoD-ELAP
Motor Oil Range Organics (C24-C38)	DoD-ELAP, NELAP, WADOE
Motor Oil Range Organics (C25-C36)	DoD-ELAP, NELAP, WADOE
Motor Oil Range Organics (C24-C40)	DoD-ELAP, NELAP, WADOE
Residual Range Organics (C23-C32)	DoD-ELAP
Mineral Spirits Range Organics (Tol-C12)	DoD-ELAP, NELAP, WADOE
Mineral Oil Range Organics (C16-C28)	DoD-ELAP, NELAP, WADOE
Kerosene Range Organics (Tol-C18)	DoD-ELAP, NELAP, WADOE
JP8 Range Organics (C8-C18)	DoD-ELAP, NELAP, WADOE
JP5 Range Organics (C10-C16)	DoD-ELAP, NELAP, WADOE
JP4 Range Organics (Tol-C14)	DoD-ELAP, NELAP, WADOE
Jet-A Range Organics (C10-C18)	DoD-ELAP, NELAP, WADOE
Creosote Range Organics (C12-C22)	DoD-ELAP, NELAP, WADOE


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Bunker C Range Organics (C10-C38)	DoD-ELAP,NELAP,WADOE
Stoddard Range Organics (C8-C12)	DoD-ELAP,NELAP,WADOE
Transformer Oil Range Organics (C12-C28)	DoD-ELAP,NELAP,WADOE

NWTPHg in Water

Gasoline Range Organics (Tol-Nap)	WADOE,DoD-ELAP
Gasoline Range Organics (2MP-TMB)	WADOE,DoD-ELAP
Gasoline Range Organics (Tol-C12)	WADOE,DoD-ELAP
Gasoline Range Organics (C6-C10)	WADOE,ADEC,DoD-ELAP
Gasoline Range Organics (C5-C12)	WADOE,DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2023
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/28/2022
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2022
WADOE	WA Dept of Ecology	C558	06/30/2022
WA-DW	Ecology - Drinking Water	C558	06/30/2022



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Reported:
21-Dec-2021 16:33

Notes and Definitions

*	Flagged value is not within established control limits.
D	The reported value is from a dilution
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
J	Estimated concentration value detected below the reporting limit.
L	Analyte concentration is ≤ 5 times the reporting limit and the replicate control limit defaults to $\pm$ RL instead of 20% RPD
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria ($< 20\%$ RSD, $< 20\%$ drift or minimum RRF)
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.



Analytical Resources, LLC
Analytical Chemists and Consultants

21 December 2021

Meg Strong
Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle, WA 98103-8636

RE: Lower Duwamish Q4

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)
21L0046

Associated SDG ID(s)
N/A

Shelly
Fishel

Digitally signed by
Shelly Fishel
Date: 2021.12.21
17:22:01 -08'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

Shelly Fishel, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

Client Project Name: LDW					Analysis Requested										Notes/Comments									
Client Project #: 21-1-12596		Samplers: DES, RMV			TPH-G	TPH-DX	BTEX	HNOCs	MTBE	PAHs	Full SVOCs	Limited SVOCs	Pesticides/Analogs	metals										
Sample ID	Date	Time	Matrix	No. Containers																				
MW-49-20210212	12/2	0941	GW	7			X	X						①			① As, Mn, Ni, Cd, Cu, Pb, Hg, Se, Ag, Zn							
MW-34-20210212	12/2	1029	GW	4	X	X											Ni, Cd, Co, Cr, Fe, Pb, Hg, Se, Ag, Zn							
MW-69-20210212	12/2	1302	GW	15	X	X	X	X			X	X		②										
MW-51-20210212	12/2	1214	GW	11	X			X			X	X												
TB-15-20210212	12/2	1152	W	5			X	X																
Comments/Special Instructions • Metals are <u>not</u> field filtered • Reference project for detection limits					Relinquished by: (Signature) <i>Rose Vogt</i>					Received by: (Signature) <i>Raven Barbera</i>					Relinquished by: (Signature)					Received by: (Signature)				
					Printed Name: <i>Rose Vogt</i>					Printed Name: <i>Raven Barbera</i>					Printed Name:					Printed Name:				
					Company: <i>Shannon & Wilson</i>					Company: <i>ARI</i>					Company:					Company:				
					Date & Time: <i>12/02/2021 1341</i>					Date & Time: <i>12/2/21 1341</i>					Date & Time:					Date & Time:				

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-49-20210212	21L0046-01	Water	02-Dec-2021 09:41	02-Dec-2021 13:41
MW-49-20210212	21L0046-02	Water	02-Dec-2021 09:41	02-Dec-2021 13:41
MW-34-20210212	21L0046-03	Water	02-Dec-2021 10:29	02-Dec-2021 13:41
MW-69-20210212	21L0046-04	Water	02-Dec-2021 13:02	02-Dec-2021 13:41
MW-69-20210212	21L0046-05	Water	02-Dec-2021 13:02	02-Dec-2021 13:41
MW-51-20210212	21L0046-06	Water	02-Dec-2021 12:14	02-Dec-2021 13:41
TB-15-20210212	21L0046-07	Water	02-Dec-2021 09:41	02-Dec-2021 13:41



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

Work Order Case Narrative

Client: Shannon & Wilson, Inc
Project: Lower Duwamish Q4
Work Order: 21L0046

Sample receipt

Samples as listed on the preceding page were received 02-Dec-2021 13:41 under ARI work order 21L0046. For details regarding sample receipt, please refer to the Cooler Receipt Form.

PCB Aroclors - EPA Method SW8082A

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Gasoline by NWTPH-q (GC/MS)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method SW8260D

The sample(s) were analyzed within the recommended holding times.


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method 8260D-SIM (Selected Ion Monitoring)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Semivolatiles - EPA Method SW8270E

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements except as follows. Benzoic Acid was out of control low and Butylbenzylphthalate was out of control high in the initial calibration verification SJL0168-ICV1. All samples which contain analyte have been flagged with a "Q" qualifier. Benzoic Acid and Pentachlorophenol were out of control low in the low concentration calibration verifications SJL0168-LCV1 and SJL0168-LCV2.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits except Phenol-d5 which was out of control low in samples 21L0046-04 and 21L0046-06 and the method blank BJL0109-BLK1. Deviations have been flagged.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD)


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

were within control limits except Benzoic Acid percent recoveries which were out of control low and have been flagged .

Total and Dissolved Metals - EPA Method 6020B

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21L0046-02 in Dissolved Metals batch BJL0327. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference (RPD) were within advisory control limits.

Total and Dissolved Mercury - EPA Method 7470/7471

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21L0046-05 in Dissolved Mercury batch BJL0381. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference (RPD) were within advisory control limits.

Diesel/Heavy Oil Range Organics - WA-Ecology Method NW-TPHDx

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.



WORK ORDER

21L0046

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Preservation Confirmation

Container ID	Container Type	pH	
21L0046-01 A	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 B	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 C	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 D	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 E	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 F	HDPE NM, 500 mL, 1:1 HNO3	< 2	Pass
21L0046-02 A	HDPE NM, 1000 mL	> 2	Fail
21L0046-03 A	VOA Vial, Clear, 40 mL, HCL		
21L0046-03 B	VOA Vial, Clear, 40 mL, HCL		
21L0046-03 C	Glass NM, Amber, 500 mL		
21L0046-03 D	Glass NM, Amber, 500 mL		
21L0046-04 A	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 B	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 C	Glass NM, Amber, 500 mL		
21L0046-04 D	Glass NM, Amber, 500 mL		
21L0046-04 E	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 F	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 G	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 H	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 I	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 J	Glass NM, Amber, 500 mL		
21L0046-04 K	Glass NM, Amber, 500 mL		
21L0046-04 L	Glass NM, Amber, 1000 mL		
21L0046-04 M	Glass NM, Amber, 1000 mL		
21L0046-04 N	HDPE NM, 500 mL, 1:1 HNO3	< 2	Pass
21L0046-05 A	HDPE NM, 1000 mL	> 2	Fail
21L0046-06 A	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 B	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 C	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 D	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 E	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 F	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 G	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 H	Glass NM, Amber, 500 mL		



WORK ORDER

21L0046

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21L0046-06 I Glass NM, Amber, 500 mL

21L0046-06 J Glass NM, Amber, 1000 mL

21L0046-06 K Glass NM, Amber, 1000 mL

21L0046-07 A VOA Vial, Clear, 40 mL, HCL

21L0046-07 B VOA Vial, Clear, 40 mL, HCL

21L0046-07 C VOA Vial, Clear, 40 mL, HCL

21L0046-07 D VOA Vial, Clear, 40 mL, HCL

21L0046-07 E VOA Vial, Clear, 40 mL, HCL

Preservation Confirmed By AP

Date 12/03/21



Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Shannon & Wilson

Project Name: LDW

COC No(s): NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 21L0046

Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES NO

Were custody papers included with the cooler? YES NO

Were custody papers properly filled out (ink, signed, etc.) YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1341

3.6 1.2

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: DOO J009708

Cooler Accepted by: AP Date: 12/2/21 Time: 1341

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? NA YES NO

How were bottles sealed in plastic bags? ... Individually Grouped Not

Did all bottles arrive in good condition (unbroken)? YES NO

Were all bottle labels complete and legible? YES NO

Did the number of containers listed on COC match with the number of containers received? YES NO

Did all bottle labels and tags agree with custody papers? YES NO

Were all bottles used correct for the requested analyses? YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... NA YES NO

Were all VOC vials free of air bubbles? NA YES NO

Was sufficient amount of sample sent in each bottle? YES NO

Date VOC Trip Blank was made at ARI: NA

Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: AP Date: 12/03/21 Time: 0946 Labels checked by: _____

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____

Date: _____



WORK ORDER

21L0046

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Preservation Confirmation

Container ID	Container Type	pH	
21L0046-01 A	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 B	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 C	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 D	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 E	VOA Vial, Clear, 40 mL, HCL		
21L0046-01 F	HDPE NM, 500 mL, 1:1 HNO3	< 2	Pass
21L0046-02 A	HDPE NM, 1000 mL	> 2	Fail ①
21L0046-03 A	VOA Vial, Clear, 40 mL, HCL		
21L0046-03 B	VOA Vial, Clear, 40 mL, HCL		
21L0046-03 C	Glass NM, Amber, 500 mL		
21L0046-03 D	Glass NM, Amber, 500 mL		
21L0046-04 A	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 B	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 C	Glass NM, Amber, 500 mL		
21L0046-04 D	Glass NM, Amber, 500 mL		
21L0046-04 E	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 F	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 G	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 H	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 I	VOA Vial, Clear, 40 mL, HCL		
21L0046-04 J	Glass NM, Amber, 500 mL		
21L0046-04 K	Glass NM, Amber, 500 mL		
21L0046-04 L	Glass NM, Amber, 1000 mL		
21L0046-04 M	Glass NM, Amber, 1000 mL		
21L0046-04 N	HDPE NM, 500 mL, 1:1 HNO3	< 2	Pass
21L0046-05 A	HDPE NM, 1000 mL	> 2	Fail ①
21L0046-06 A	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 B	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 C	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 D	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 E	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 F	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 G	VOA Vial, Clear, 40 mL, HCL		
21L0046-06 H	Glass NM, Amber, 500 mL		



WORK ORDER

21L0046

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21L0046-06 I	Glass NM, Amber, 500 mL
21L0046-06 J	Glass NM, Amber, 1000 mL
21L0046-06 K	Glass NM, Amber, 1000 mL
21L0046-07 A	VOA Vial, Clear, 40 mL, HCL
21L0046-07 B	VOA Vial, Clear, 40 mL, HCL
21L0046-07 C	VOA Vial, Clear, 40 mL, HCL
21L0046-07 D	VOA Vial, Clear, 40 mL, HCL
21L0046-07 E	VOA Vial, Clear, 40 mL, HCL

Preservation Confirmed By

AP

Date

12/03/21

① Filtered at 0.45µ

& Preserved to pH 5.2 with
0.75 mL conc. HNO₃ (J11523)

MM 12/3/21



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

MW-49-20210212

21L0046-01 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/02/2021 09:41

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 20:47

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0046-01 E

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	0.80	ug/L	
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	6.54	ug/L	
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	0.14	ug/L	J
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					<i>80-129 %</i>	<i>102 %</i>	
<i>Surrogate: Toluene-d8</i>					<i>80-120 %</i>	<i>96.9 %</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>					<i>80-120 %</i>	<i>97.8 %</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					<i>80-120 %</i>	<i>103 %</i>	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-49-20210212
21L0046-01 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/02/2021 09:41

Instrument: NT16 Analyst: KOTT

Analyzed: 12/09/2021 17:58

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0046-01 D

Preparation Batch: BJL0225

Sample Size: 10 mL

Prepared: 12/09/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	91.6	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	95.7	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				75-125 %	95.5	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-49-20210212
21L0046-01 (Water)
Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 12/02/2021 09:41

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 20:45

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0046-01 F 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Lead	7439-92-1	1	0.0513	0.100	0.0830	ug/L	J
Manganese	7439-96-5	1	0.142	0.500	36.9	ug/L	
Silver	7440-22-4	1	0.0220	0.200	ND	ug/L	U


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-49-20210212
21L0046-01 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/02/2021 09:41

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 20:45

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0046-01 F 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	1.79	ug/L	
Cadmium	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Copper	7440-50-8	1	0.173	0.500	1.76	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	1.81	ug/L	
Selenium	7782-49-2	1	0.179	0.500	0.198	ug/L	J
Zinc	7440-66-6	1	2.92	6.00	ND	ug/L	U



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

MW-49-20210212

21L0046-01 (Water)

Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 12/02/2021 09:41

Instrument: HYDRA Analyst: SKD

Analyzed: 12/20/2021 15:33

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0046-01 F

Preparation Batch: BJL0371

Sample Size: 20 mL

Prepared: 12/15/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-49-20210212
21L0046-02 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 12/02/2021 09:41

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 21:00

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0046-02 A 02

Preparation Batch: BJL0327

Sample Size: 25 mL

Filtration Batch: BJL0117

Prepared: 12/14/2021

Final Volume: 25 mL

Filtration Date: 12/03/2021 15:52

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Lead, Dissolved	7439-92-1	1	0.0513	0.100	ND	ug/L	U
Manganese, Dissolved	7439-96-5	1	0.142	0.500	2.95	ug/L	
Silver, Dissolved	7440-22-4	1	0.0220	0.200	ND	ug/L	U


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-49-20210212
21L0046-02 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/02/2021 09:41

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 21:00

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0046-02 A 02

Preparation Batch: BJL0327

Sample Size: 25 mL

Filtration Batch: BJL0117

Prepared: 12/14/2021

Final Volume: 25 mL

Filtration Date: 12/03/2021 15:52

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	0.469	ug/L	
Cadmium, Dissolved	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.173	0.500	1.26	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	1.25	ug/L	
Selenium, Dissolved	7782-49-2	1	0.179	0.500	ND	ug/L	U
Zinc, Dissolved	7440-66-6	1	2.92	6.00	ND	ug/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-49-20210212
21L0046-02 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 12/02/2021 09:41

Instrument: HYDRA Analyst: SKD

Analyzed: 12/20/2021 14:44

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0046-02 A 01

Preparation Batch: BJL0381

Sample Size: 20 mL

Filtration Batch: BJL0117

Prepared: 12/15/2021

Final Volume: 20 mL

Filtration Date: 12/03/2021 15:52

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

MW-34-20210212

21L0046-03 (Water)

Volatile Organic Compounds

Method: NWTPHg

Sampled: 12/02/2021 10:29

Instrument: NT2 Analyst: PKC

Analyzed: 12/10/2021 16:29

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0046-03 B

Preparation Batch: BJL0242

Sample Size: 10 mL

Prepared: 12/10/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
<i>Surrogate: Toluene-d8</i>			80-120 %	98.8	%	
<i>Surrogate: 4-Bromofluorobenzene</i>			80-120 %	97.5	%	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-34-20210212
21L0046-03 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 12/02/2021 10:29

Instrument: FID4 Analyst: TWC

Analyzed: 12/14/2021 04:05

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0046-03 C 01

Preparation Batch: BJL0110

Sample Size: 500 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	5	0.500	9.66	mg/L	D
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	5	1.00	2.89	mg/L	D
HC ID: MOTOR OIL						
Surrogate: o-Terphenyl			50-150 %	81.3	%	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

MW-69-20210212

21L0046-04 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/02/2021 13:02

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 21:08

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0046-04 F

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	0.14	ug/L	J
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	0.09	ug/L	J
Benzene	71-43-2	1	0.05	0.20	0.82	ug/L	
Trichloroethene	79-01-6	1	0.07	0.20	0.11	ug/L	J
Toluene	108-88-3	1	0.05	0.20	0.08	ug/L	J
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	109	%
<i>Surrogate: Toluene-d8</i>					80-120 %	98.2	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	99.4	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	99.1	%


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-69-20210212
21L0046-04 (Water)
Volatile Organic Compounds

Method: NWTPHg

Sampled: 12/02/2021 13:02

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 21:08

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0046-04 F

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	215	ug/L	
HC ID: GRO						
Surrogate: Toluene-d8			80-120 %	98.2	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	99.4	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-69-20210212
21L0046-04 (Water)
Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/02/2021 13:02

Instrument: NT10 Analyst: VTS

Analyzed: 12/11/2021 00:36

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0046-04 L 01

Preparation Batch: BJL0109

Sample Size: 1000 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	4.0	ug/L	
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	0.8	ug/L	
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U

Surrogate: 2-Fluorophenol

30-160 %

49.5 %

Surrogate: Phenol-d5

30-160 %

27.9 %

*

Surrogate: 2-Chlorophenol-d4

30-160 %

72.7 %

Surrogate: 1,2-Dichlorobenzene-d4

30-160 %

65.9 %

Surrogate: Nitrobenzene-d5

30-160 %

79.2 %

Surrogate: 2-Fluorobiphenyl

30-160 %

78.7 %

Surrogate: 2,4,6-Tribromophenol

30-160 %

83.0 %

Surrogate: p-Terphenyl-d14

30-160 %

80.8 %


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-69-20210212
21L0046-04 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 12/02/2021 13:02

Instrument: FID4 Analyst: TWC

Analyzed: 12/12/2021 05:56

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0046-04 C 01

Preparation Batch: BJL0110

Sample Size: 500 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	0.707	mg/L	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	0.403	mg/L	
HC ID: MOTOR OIL						
Surrogate: o-Terphenyl			50-150 %	103	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-69-20210212
21L0046-04 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 12/02/2021 13:02

Instrument: ECD7 Analyst: JGR

Analyzed: 12/14/2021 17:15

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0111 Prepared: 12/07/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0046-04 M 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0092 Cleaned: 14-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0046-04 M 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0090 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0046-04 M 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0091 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0046-04 M 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	65.4	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	49.4	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	66.2	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	61.2	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-69-20210212
21L0046-04 (Water)
Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 12/02/2021 13:02

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 20:50

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0046-04 N 01

Preparation Batch: BJL0294

Sample Size: 25 mL

Prepared: 12/14/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium	7440-39-3	1	0.114	0.500	7.41	ug/L	
Chromium	7440-47-3	1	0.260	0.500	1.90	ug/L	
Iron	7439-89-6	1	18.2	36.0	11200	ug/L	
Lead	7439-92-1	1	0.0513	0.100	0.121	ug/L	
Manganese	7439-96-5	10	1.42	5.00	728	ug/L	D
Silver	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium	7440-62-2	1	0.0556	0.200	12.2	ug/L	


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-69-20210212
21L0046-04 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/02/2021 13:02

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 20:50

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0046-04 N 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	0.872	ug/L	
Cadmium	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt	7440-48-4	1	0.0178	0.200	0.133	ug/L	J
Copper	7440-50-8	1	0.173	0.500	1.03	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	0.248	ug/L	J
Selenium	7782-49-2	1	0.179	0.500	0.380	ug/L	J
Zinc	7440-66-6	1	2.92	6.00	ND	ug/L	U



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

MW-69-20210212

21L0046-04 (Water)

Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 12/02/2021 13:02

Instrument: HYDRA Analyst: SKD

Analyzed: 12/20/2021 15:35

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0046-04 N

Preparation Batch: BJL0371

Sample Size: 20 mL

Prepared: 12/15/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-69-20210212
21L0046-05 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 12/02/2021 13:02

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 20:55

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0046-05 A 02

Preparation Batch: BJL0327

Sample Size: 25 mL

Filtration Batch: BJL0117

Prepared: 12/14/2021

Final Volume: 25 mL

Filtration Date: 12/03/2021 15:52

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium, Dissolved	7440-39-3	1	0.114	0.500	0.857	ug/L	
Chromium, Dissolved	7440-47-3	1	0.260	0.500	0.794	ug/L	
Iron, Dissolved	7439-89-6	1	18.2	36.0	686	ug/L	
Lead, Dissolved	7439-92-1	1	0.0513	0.100	ND	ug/L	U
Manganese, Dissolved	7439-96-5	10	1.42	5.00	660	ug/L	D
Silver, Dissolved	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium, Dissolved	7440-62-2	1	0.0556	0.200	1.46	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-69-20210212
21L0046-05 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/02/2021 13:02

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 20:55

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0046-05 A 02

Preparation Batch: BJL0327

Sample Size: 25 mL

Filtration Batch: BJL0117

Prepared: 12/14/2021

Final Volume: 25 mL

Filtration Date: 12/03/2021 15:52

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	0.478	ug/L	
Cadmium, Dissolved	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt, Dissolved	7440-48-4	1	0.0178	0.200	0.100	ug/L	J
Copper, Dissolved	7440-50-8	1	0.173	0.500	ND	ug/L	U
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	0.148	ug/L	J
Selenium, Dissolved	7782-49-2	1	0.179	0.500	ND	ug/L	U
Zinc, Dissolved	7440-66-6	1	2.92	6.00	ND	ug/L	U



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

MW-69-20210212

21L0046-05 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 12/02/2021 13:02

Instrument: HYDRA Analyst: SKD

Analyzed: 12/20/2021 15:00

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0046-05 A

Preparation Batch: BJL0381

Sample Size: 20 mL

Filtration Batch: BJL0117

Prepared: 12/15/2021

Final Volume: 20 mL

Filtration Date: 12/03/2021 15:52

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

MW-51-20210212

21L0046-06 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/02/2021 12:14

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 21:29

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0046-06 G

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	0.40	ug/L	
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	0.38	ug/L	
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	106	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	96.2	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	97.5	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	100	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-51-20210212
21L0046-06 (Water)
Volatile Organic Compounds

Method: NWTPHg

Sampled: 12/02/2021 12:14

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 21:29

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)
 Preparation Batch: BJL0204
 Prepared: 12/08/2021

 Sample Size: 10 mL
 Final Volume: 10 mL

Extract ID: 21L0046-06 G

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
<i>Surrogate: Toluene-d8</i>			80-120 %	96.2	%	
<i>Surrogate: 4-Bromofluorobenzene</i>			80-120 %	97.5	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-51-20210212
21L0046-06 (Water)
Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/02/2021 12:14

Instrument: NT10 Analyst: VTS

Analyzed: 12/11/2021 01:14

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0046-06 J 01

Preparation Batch: BJL0109

Sample Size: 1000 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	ND	ug/L	U
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U

Surrogate: 2-Fluorophenol

30-160 % 50.2 %

Surrogate: Phenol-d5

30-160 % 28.1 %

*

Surrogate: 2-Chlorophenol-d4

30-160 % 76.3 %

Surrogate: 1,2-Dichlorobenzene-d4

30-160 % 69.4 %

Surrogate: Nitrobenzene-d5

30-160 % 80.6 %

Surrogate: 2-Fluorobiphenyl

30-160 % 78.5 %

Surrogate: 2,4,6-Tribromophenol

30-160 % 87.1 %

Surrogate: p-Terphenyl-d14

30-160 % 90.0 %


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

MW-51-20210212
21L0046-06 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 12/02/2021 12:14

Instrument: ECD7 Analyst: JGR

Analyzed: 12/14/2021 17:36

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0111 Prepared: 12/07/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0046-06 K 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0092 Cleaned: 14-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0046-06 K 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0090 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0046-06 K 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0091 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0046-06 K 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	64.7	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	58.3	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	62.2	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	58.0	%	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

TB-15-20210212

21L0046-07 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/02/2021 09:41

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 16:09

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0046-07 D

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	104	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.6	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	95.3	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	101	%	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

TB-15-20210212
21L0046-07 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/02/2021 09:41

Instrument: NT16 Analyst: KOTT

Analyzed: 12/09/2021 18:40

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0046-07 B

Preparation Batch: BJL0225

Sample Size: 10 mL

Prepared: 12/09/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	97.0	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.3	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				75-125 %	95.9	%	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - Quality Control
Batch BJJ0204 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0204-BLK1)		Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 15:47								
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.86		ug/L	5.00		97.1	80-120			
Surrogate: 4-Bromofluorobenzene	4.81		ug/L	5.00		96.2	80-120			
Blank (BJL0204-BLK2)		Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 15:47								
Vinyl Chloride	ND	0.08	0.20	ug/L						U
1,1-Dichloroethene	ND	0.08	0.20	ug/L						U
trans-1,2-Dichloroethene	ND	0.07	0.20	ug/L						U
cis-1,2-Dichloroethene	ND	0.08	0.20	ug/L						U
Benzene	ND	0.05	0.20	ug/L						U
Trichloroethene	ND	0.07	0.20	ug/L						U
Toluene	ND	0.05	0.20	ug/L						U
Tetrachloroethene	ND	0.09	0.20	ug/L						U
Ethylbenzene	ND	0.05	0.20	ug/L						U
m,p-Xylene	ND	0.14	0.40	ug/L						U
o-Xylene	ND	0.08	0.20	ug/L						U
Xylenes, total	ND	0.22	0.60	ug/L						U
Surrogate: 1,2-Dichloroethane-d4	5.26		ug/L	5.00		105	80-129			
Surrogate: Toluene-d8	4.86		ug/L	5.00		97.1	80-120			
Surrogate: 4-Bromofluorobenzene	4.81		ug/L	5.00		96.2	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.05		ug/L	5.00		101	80-120			
LCS (BJL0204-BS1)		Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 14:24								
Gasoline Range Organics (Tol-Nap)	1050	100	ug/L	1000		105	72-128			
Surrogate: Toluene-d8	4.91		ug/L	5.00		98.2	80-120			
Surrogate: 4-Bromofluorobenzene	4.90		ug/L	5.00		97.9	80-120			
LCS (BJL0204-BS2)		Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 14:02								
Vinyl Chloride	10.1	0.08	0.20	ug/L	10.0	101	66-133			
1,1-Dichloroethene	10.1	0.08	0.20	ug/L	10.0	101	69-135			
trans-1,2-Dichloroethene	9.63	0.07	0.20	ug/L	10.0	96.3	78-128			
cis-1,2-Dichloroethene	9.56	0.08	0.20	ug/L	10.0	95.6	80-121			
Benzene	9.71	0.05	0.20	ug/L	10.0	97.1	80-120			
Trichloroethene	9.88	0.07	0.20	ug/L	10.0	98.8	80-120			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BJL0204 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0204-BS2)						Prepared: 08-Dec-2021	Analyzed: 08-Dec-2021 14:02				
Toluene	9.90	0.05	0.20	ug/L	10.0		99.0	80-120			
Tetrachloroethene	9.57	0.09	0.20	ug/L	10.0		95.7	80-120			
Ethylbenzene	9.56	0.05	0.20	ug/L	10.0		95.6	80-120			
m,p-Xylene	19.4	0.14	0.40	ug/L	20.0		97.0	80-121			
o-Xylene	9.54	0.08	0.20	ug/L	10.0		95.4	80-121			
Xylenes, total	28.9	0.22	0.60	ug/L	30.0		96.5	76-127			
Surrogate: 1,2-Dichloroethane-d4	5.03			ug/L	5.00		101	80-129			
Surrogate: Toluene-d8	4.96			ug/L	5.00		99.3	80-120			
Surrogate: 4-Bromofluorobenzene	4.99			ug/L	5.00		99.8	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.01			ug/L	5.00		100	80-120			
LCS Dup (BJL0204-BSD1)						Prepared: 08-Dec-2021	Analyzed: 08-Dec-2021 14:45				
Gasoline Range Organics (Tol-Nap)	1060		100	ug/L	1000		106	72-128	0.92	30	
Surrogate: Toluene-d8	5.02			ug/L	5.00		100	80-120			
Surrogate: 4-Bromofluorobenzene	4.77			ug/L	5.00		95.3	80-120			
LCS Dup (BJL0204-BSD2)						Prepared: 08-Dec-2021	Analyzed: 08-Dec-2021 15:06				
Vinyl Chloride	9.86	0.08	0.20	ug/L	10.0		98.6	66-133	2.34	30	
1,1-Dichloroethene	9.80	0.08	0.20	ug/L	10.0		98.0	69-135	2.70	30	
trans-1,2-Dichloroethene	9.20	0.07	0.20	ug/L	10.0		92.0	78-128	4.55	30	
cis-1,2-Dichloroethene	9.17	0.08	0.20	ug/L	10.0		91.7	80-121	4.19	30	
Benzene	9.23	0.05	0.20	ug/L	10.0		92.3	80-120	5.00	30	
Trichloroethene	9.49	0.07	0.20	ug/L	10.0		94.9	80-120	3.98	30	
Toluene	9.35	0.05	0.20	ug/L	10.0		93.5	80-120	5.72	30	
Tetrachloroethene	9.17	0.09	0.20	ug/L	10.0		91.7	80-120	4.31	30	
Ethylbenzene	9.14	0.05	0.20	ug/L	10.0		91.4	80-120	4.45	30	
m,p-Xylene	18.5	0.14	0.40	ug/L	20.0		92.7	80-121	4.52	30	
o-Xylene	9.26	0.08	0.20	ug/L	10.0		92.6	80-121	3.02	30	
Xylenes, total	27.8	0.22	0.60	ug/L	30.0		92.7	76-127	4.02	30	
Surrogate: 1,2-Dichloroethane-d4	5.34			ug/L	5.00		107	80-129			
Surrogate: Toluene-d8	4.91			ug/L	5.00		98.2	80-120			
Surrogate: 4-Bromofluorobenzene	5.10			ug/L	5.00		102	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.03			ug/L	5.00		101	80-120			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - Quality Control
Batch BJJ0242 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0242-BLK1)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 12:12								
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.90		ug/L	5.00		97.9	80-120			
Surrogate: 4-Bromofluorobenzene	4.75		ug/L	5.00		95.1	80-120			
LCS (BJL0242-BS1)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 10:27								
Gasoline Range Organics (Tol-Nap)	1110	100	ug/L	1000		111	72-128			
Surrogate: Toluene-d8	4.97		ug/L	5.00		99.5	80-120			
Surrogate: 4-Bromofluorobenzene	4.94		ug/L	5.00		98.8	80-120			
LCS Dup (BJL0242-BSD1)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 11:09								
Gasoline Range Organics (Tol-Nap)	1160	100	ug/L	1000		116	72-128	4.34	30	
Surrogate: Toluene-d8	5.00		ug/L	5.00		99.9	80-120			
Surrogate: 4-Bromofluorobenzene	4.88		ug/L	5.00		97.6	80-120			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - SIM - Quality Control
Batch BJL0225 - EPA 5030C (Purge and Trap)

Instrument: NT16 Analyst: KOTT

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0225-BLK1)						Prepared: 09-Dec-2021 Analyzed: 09-Dec-2021 15:52					
Vinyl chloride	ND	5.01	20.0	ng/L							U
Surrogate: 1,2-Dichloroethane-d4	4940			ng/L	5000		98.7	80-129			
Surrogate: Toluene-d8	4830			ng/L	5000		96.6	80-120			
Surrogate: 4-Bromofluorobenzene	4840			ng/L	5000		96.8	75-125			
LCS (BJL0225-BS1)						Prepared: 09-Dec-2021 Analyzed: 09-Dec-2021 13:17					
Vinyl chloride	2380	5.01	20.0	ng/L	2000		119	62-141			
Surrogate: 1,2-Dichloroethane-d4	4890			ng/L	5000		97.7	80-129			
Surrogate: Toluene-d8	5070			ng/L	5000		101	80-120			
Surrogate: 4-Bromofluorobenzene	5170			ng/L	5000		103	75-125			
LCS Dup (BJL0225-BS1)						Prepared: 09-Dec-2021 Analyzed: 09-Dec-2021 14:56					
Vinyl chloride	2760	5.01	20.0	ng/L	2000		138	62-141	14.50	30	
Surrogate: 1,2-Dichloroethane-d4	4810			ng/L	5000		96.2	80-129			
Surrogate: Toluene-d8	5020			ng/L	5000		100	80-120			
Surrogate: 4-Bromofluorobenzene	5170			ng/L	5000		103	75-125			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BJJ0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0109-BLK1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 19:35					
1,4-Dichlorobenzene	ND	0.03	0.2	ug/L							U
1,2-Dichlorobenzene	ND	0.03	0.2	ug/L							U
2,4-Dimethylphenol	ND	0.3	1.0	ug/L							U
Benzoic acid	ND	0.1	2.0	ug/L							U
N-Nitrosodiphenylamine	ND	0.03	0.2	ug/L							U
Pentachlorophenol	ND	0.1	1.0	ug/L							U
Di-n-Butylphthalate	ND	0.05	0.2	ug/L							U
Butylbenzylphthalate	ND	0.07	0.2	ug/L							U
bis(2-Ethylhexyl)phthalate	ND	0.2	0.2	ug/L							U
Surrogate: 2-Fluorophenol	3.84			ug/L	7.50		51.2	30-160			
Surrogate: Phenol-d5	2.02			ug/L	7.50		26.9	30-160			*
Surrogate: 2-Chlorophenol-d4	6.56			ug/L	7.50		87.5	30-160			
Surrogate: 1,2-Dichlorobenzene-d4	3.73			ug/L	5.00		74.7	30-160			
Surrogate: Nitrobenzene-d5	4.32			ug/L	5.00		86.3	30-160			
Surrogate: 2-Fluorobiphenyl	3.87			ug/L	5.00		77.5	30-160			
Surrogate: 2,4,6-Tribromophenol	5.18			ug/L	7.50		69.1	30-160			
Surrogate: p-Terphenyl-d14	4.54			ug/L	5.00		90.8	30-160			
LCS (BJL0109-BS1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:13					
1,4-Dichlorobenzene	4.0	0.03	0.2	ug/L	5.00		79.6	30-160			
1,2-Dichlorobenzene	3.5	0.03	0.2	ug/L	5.00		70.0	30-160			
2,4-Dimethylphenol	11.5	0.3	1.0	ug/L	13.0		88.8	30-160			
Benzoic acid	6.4	0.1	2.0	ug/L	23.0		27.7	30-160			*, Q
N-Nitrosodiphenylamine	4.0	0.03	0.2	ug/L	5.00		79.9	30-160			
Pentachlorophenol	9.4	0.1	1.0	ug/L	13.0		72.2	30-160			
Di-n-Butylphthalate	4.7	0.05	0.2	ug/L	5.00		93.2	30-160			
Butylbenzylphthalate	4.4	0.07	0.2	ug/L	5.00		87.9	30-160			Q
bis(2-Ethylhexyl)phthalate	4.4	0.2	0.2	ug/L	5.00		87.9	30-160			
Surrogate: 2-Fluorophenol	4.42			ug/L	7.50		58.9	30-160			
Surrogate: Phenol-d5	2.67			ug/L	7.50		35.5	30-160			
Surrogate: 2-Chlorophenol-d4	6.61			ug/L	7.50		88.2	30-160			
Surrogate: 1,2-Dichlorobenzene-d4	3.82			ug/L	5.00		76.4	30-160			
Surrogate: Nitrobenzene-d5	4.71			ug/L	5.00		94.2	30-160			
Surrogate: 2-Fluorobiphenyl	4.30			ug/L	5.00		86.0	30-160			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch BJL0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0109-BS1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:13					
Surrogate: 2,4,6-Tribromophenol	6.55			ug/L	7.50		87.3	30-160			
Surrogate: p-Terphenyl-d14	4.76			ug/L	5.00		95.2	30-160			
LCS Dup (BJL0109-BSD1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:50					
1,4-Dichlorobenzene	4.2	0.03	0.2	ug/L	5.00		83.0	30-160	4.19	30	
1,2-Dichlorobenzene	3.7	0.03	0.2	ug/L	5.00		73.2	30-160	4.57	30	
2,4-Dimethylphenol	11.2	0.3	1.0	ug/L	13.0		86.4	30-160	2.81	30	
Benzoic acid	6.2	0.1	2.0	ug/L	23.0		26.8	30-160	3.04	30	*, Q
N-Nitrosodiphenylamine	4.2	0.03	0.2	ug/L	5.00		84.6	30-160	5.81	30	
Pentachlorophenol	9.5	0.1	1.0	ug/L	13.0		73.0	30-160	1.12	30	
Di-n-Butylphthalate	4.9	0.05	0.2	ug/L	5.00		97.2	30-160	4.16	30	
Butylbenzylphthalate	4.7	0.07	0.2	ug/L	5.00		93.3	30-160	5.92	30	Q
bis(2-Ethylhexyl)phthalate	4.3	0.2	0.2	ug/L	5.00		86.8	30-160	1.23	30	
Surrogate: 2-Fluorophenol	4.47			ug/L	7.50		59.7	30-160			
Surrogate: Phenol-d5	2.56			ug/L	7.50		34.2	30-160			
Surrogate: 2-Chlorophenol-d4	6.51			ug/L	7.50		86.8	30-160			
Surrogate: 1,2-Dichlorobenzene-d4	3.78			ug/L	5.00		75.7	30-160			
Surrogate: Nitrobenzene-d5	4.51			ug/L	5.00		90.3	30-160			
Surrogate: 2-Fluorobiphenyl	4.11			ug/L	5.00		82.3	30-160			
Surrogate: 2,4,6-Tribromophenol	6.08			ug/L	7.50		81.0	30-160			
Surrogate: p-Terphenyl-d14	4.59			ug/L	5.00		91.7	30-160			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Petroleum Hydrocarbons - Quality Control
Batch BJL0110 - EPA 3510C SepF

Instrument: FID4 Analyst: TWC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0110-BLK1)									
				Prepared: 07-Dec-2021 Analyzed: 12-Dec-2021 03:01					
Diesel Range Organics (C12-C24)	ND	0.100	mg/L						U
Motor Oil Range Organics (C24-C38)	ND	0.200	mg/L						U
<i>Surrogate: o-Terphenyl</i>	0.221		mg/L	0.225	98.2	50-150			
LCS (BJL0110-BS1)									
				Prepared: 07-Dec-2021 Analyzed: 12-Dec-2021 03:20					
Diesel Range Organics (C12-C24)	2.46	0.100	mg/L	3.00	81.9	56-120			
<i>Surrogate: o-Terphenyl</i>	0.226		mg/L	0.225	101	50-150			
LCS Dup (BJL0110-BSD1)									
				Prepared: 07-Dec-2021 Analyzed: 12-Dec-2021 03:40					
Diesel Range Organics (C12-C24)	2.62	0.100	mg/L	3.00	87.3	56-120	6.38	30	
<i>Surrogate: o-Terphenyl</i>	0.237		mg/L	0.225	105	50-150			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC

Aroclor PCB - Quality Control

Batch BJJ0111 - EPA 3510C SepF

Instrument: ECD7 Analyst: JGR

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0111-BLK1)											
						Prepared: 07-Dec-2021 Analyzed: 14-Dec-2021 14:26					
Aroclor 1016	ND	0.002	0.010	ug/L							U
Aroclor 1221	ND	0.002	0.010	ug/L							U
Aroclor 1232	ND	0.002	0.010	ug/L							U
Aroclor 1242	ND	0.002	0.010	ug/L							U
Aroclor 1248	ND	0.002	0.010	ug/L							U
Aroclor 1254	ND	0.002	0.010	ug/L							U
Aroclor 1260	ND	0.003	0.010	ug/L							U
Aroclor 1262	ND	0.003	0.010	ug/L							U
Aroclor 1268	ND	0.003	0.010	ug/L							U
Surrogate: Decachlorobiphenyl	0.0159			ug/L	0.0200		79.4	29-120			
Surrogate: Tetrachlorometaxylene	0.0121			ug/L	0.0200		60.4	32-120			
Surrogate: Decachlorobiphenyl [2C]	0.0166			ug/L	0.0200		82.8	29-120			
Surrogate: Tetrachlorometaxylene [2C]	0.0119			ug/L	0.0200		59.4	32-120			
LCS (BJL0111-BS1)											
						Prepared: 07-Dec-2021 Analyzed: 14-Dec-2021 14:47					
Aroclor 1016 [2C]	0.039	0.002	0.010	ug/L	0.0500		78.6	54-120			
Aroclor 1260	0.038	0.003	0.010	ug/L	0.0500		75.5	51-128			
Surrogate: Decachlorobiphenyl	0.0151			ug/L	0.0200		75.3	29-120			
Surrogate: Tetrachlorometaxylene	0.0116			ug/L	0.0200		57.8	32-120			
Surrogate: Decachlorobiphenyl [2C]	0.0156			ug/L	0.0200		78.1	29-120			
Surrogate: Tetrachlorometaxylene [2C]	0.0115			ug/L	0.0200		57.7	32-120			
LCS Dup (BJL0111-BSD1)											
						Prepared: 07-Dec-2021 Analyzed: 14-Dec-2021 15:08					
Aroclor 1016 [2C]	0.041	0.002	0.010	ug/L	0.0500		82.1	54-120	4.27	30	
Aroclor 1260	0.042	0.003	0.010	ug/L	0.0500		85.0	51-128	11.80	30	
Surrogate: Decachlorobiphenyl	0.0175			ug/L	0.0200		87.3	29-120			
Surrogate: Tetrachlorometaxylene	0.0120			ug/L	0.0200		60.0	32-120			
Surrogate: Decachlorobiphenyl [2C]	0.0173			ug/L	0.0200		86.4	29-120			
Surrogate: Tetrachlorometaxylene [2C]	0.0119			ug/L	0.0200		59.7	32-120			


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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0294 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0294-BLK1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:53						
Barium	135	ND	0.114	0.500	ug/L							U
Barium	137	ND	0.0765	0.500	ug/L							U
Chromium	52	ND	0.260	0.500	ug/L							U
Chromium	53	ND	0.239	0.500	ug/L							U
Iron	54	ND	18.2	36.0	ug/L							U
Iron	57	ND	6.63	36.0	ug/L							U
Lead	208	ND	0.0513	0.100	ug/L							U
Manganese	55	ND	0.142	0.500	ug/L							U
Silver	107	ND	0.0220	0.200	ug/L							U
Vanadium	51a	ND	0.0556	0.200	ug/L							U
Vanadium	51b	ND	0.0521	0.200	ug/L							U
Arsenic	75a	ND	0.0373	0.200	ug/L							U
Cadmium	111	ND	0.0300	0.100	ug/L							U
Cadmium	114	ND	0.0400	0.100	ug/L							U
Cobalt	59	ND	0.0178	0.200	ug/L							U
Copper	63	ND	0.173	0.500	ug/L							U
Copper	65	ND	0.350	0.500	ug/L							U
Nickel	60	ND	0.0792	0.500	ug/L							U
Nickel	62	ND	0.220	0.500	ug/L							U
Selenium	78	ND	0.179	0.500	ug/L							U
Zinc	66	ND	2.92	6.00	ug/L							U
Zinc	67	ND	0.940	6.00	ug/L							U
LCS (BJL0294-BS1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:58						
Barium	135	24.7	0.114	0.500	ug/L	25.0		98.8	80-120			
Barium	137	24.4	0.0765	0.500	ug/L	25.0		97.8	80-120			
Chromium	52	25.3	0.260	0.500	ug/L	25.0		101	80-120			
Chromium	53	24.8	0.239	0.500	ug/L	25.0		99.0	80-120			
Iron	54	4850	18.2	36.0	ug/L	5000		96.9	80-120			
Iron	57	4880	6.63	36.0	ug/L	5000		97.6	80-120			
Lead	208	25.8	0.0513	0.100	ug/L	25.0		103	80-120			
Manganese	55	24.1	0.142	0.500	ug/L	25.0		96.2	80-120			
Silver	107	25.5	0.0220	0.200	ug/L	25.0		102	80-120			
Vanadium	51a	24.7	0.0556	0.200	ug/L	25.0		98.6	80-120			
Vanadium	51b	24.5	0.0521	0.200	ug/L	25.0		98.0	80-120			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0294 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0294-BS1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:58					
Arsenic	75a	24.7	0.0373	0.200	ug/L	25.0		98.8	80-120		
Cadmium	111	24.6	0.0300	0.100	ug/L	25.0		98.3	80-120		
Cadmium	114	24.6	0.0400	0.100	ug/L	25.0		98.5	80-120		
Cobalt	59	24.3	0.0178	0.200	ug/L	25.0		97.3	80-120		
Copper	63	24.8	0.173	0.500	ug/L	25.0		99.3	80-120		
Copper	65	25.1	0.350	0.500	ug/L	25.0		101	80-120		
Nickel	60	24.2	0.0792	0.500	ug/L	25.0		96.7	80-120		
Nickel	62	24.5	0.220	0.500	ug/L	25.0		98.0	80-120		
Selenium	78	78.5	0.179	0.500	ug/L	80.0		98.1	80-120		
Zinc	66	79.0	2.92	6.00	ug/L	80.0		98.8	80-120		
Zinc	67	72.8	0.940	6.00	ug/L	80.0		91.0	80-120		



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds - Quality Control

Batch BJL0371 - TWM EPA 7470A

Instrument: HYDRA Analyst: SKD

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0371-BLK1)					Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:10					
Mercury	ND	0.000013	0.000100	mg/L						U
LCS (BJL0371-BS1)					Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:12					
Mercury	0.00187	0.000013	0.000100	mg/L	0.00200		93.5	80-120		


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJJ0327 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0327-BLK1)						Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 18:03						
Barium, Dissolved	135	ND	0.114	0.500	ug/L							U
Barium, Dissolved	137	ND	0.0765	0.500	ug/L							U
Chromium, Dissolved	52	ND	0.260	0.500	ug/L							U
Chromium, Dissolved	53	ND	0.239	0.500	ug/L							U
Iron, Dissolved	54	ND	18.2	36.0	ug/L							U
Iron, Dissolved	57	ND	18.2	36.0	ug/L							U
Lead, Dissolved	208	ND	0.0513	0.100	ug/L							U
Manganese, Dissolved	55	ND	0.142	0.500	ug/L							U
Silver, Dissolved	107	ND	0.0220	0.200	ug/L							U
Vanadium, Dissolved	51a	ND	0.0556	0.200	ug/L							U
Vanadium, Dissolved	51b	ND	0.0521	0.200	ug/L							U
Arsenic, Dissolved	75a	ND	0.0373	0.200	ug/L							U
Cadmium, Dissolved	111	ND	0.0300	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.0400	0.100	ug/L							U
Cobalt, Dissolved	59	ND	0.0178	0.200	ug/L							U
Copper, Dissolved	63	ND	0.173	0.500	ug/L							U
Copper, Dissolved	65	ND	0.350	0.500	ug/L							U
Nickel, Dissolved	60	ND	0.0792	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.220	0.500	ug/L							U
Selenium, Dissolved	78	ND	0.179	0.500	ug/L							U
Zinc, Dissolved	66	ND	2.92	6.00	ug/L							U
Zinc, Dissolved	67	ND	0.940	6.00	ug/L							U

LCS (BJL0327-BS1)						Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 18:08						
Barium, Dissolved	135	24.5	0.114	0.500	ug/L	25.0		98.0	80-120			
Barium, Dissolved	137	25.0	0.0765	0.500	ug/L	25.0		100	80-120			
Chromium, Dissolved	52	25.5	0.260	0.500	ug/L	25.0		102	80-120			
Chromium, Dissolved	53	24.6	0.239	0.500	ug/L	25.0		98.5	80-120			
Iron, Dissolved	54	4950	18.2	36.0	ug/L	5000		98.9	80-120			
Iron, Dissolved	57	5020	18.2	36.0	ug/L	5000		100	80-120			
Lead, Dissolved	208	25.5	0.0513	0.100	ug/L	25.0		102	80-120			
Manganese, Dissolved	55	24.6	0.142	0.500	ug/L	25.0		98.4	80-120			
Silver, Dissolved	107	25.4	0.0220	0.200	ug/L	25.0		101	80-120			
Vanadium, Dissolved	51a	24.7	0.0556	0.200	ug/L	25.0		98.9	80-120			
Vanadium, Dissolved	51b	24.5	0.0521	0.200	ug/L	25.0		97.9	80-120			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJJ0327 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0327-BS1)						Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 18:08						
Arsenic, Dissolved	75a	24.1	0.0373	0.200	ug/L	25.0		96.4	80-120			
Cadmium, Dissolved	111	23.8	0.0300	0.100	ug/L	25.0		95.4	80-120			
Cadmium, Dissolved	114	23.4	0.0400	0.100	ug/L	25.0		93.5	80-120			
Cobalt, Dissolved	59	24.7	0.0178	0.200	ug/L	25.0		98.9	80-120			
Copper, Dissolved	63	25.2	0.173	0.500	ug/L	25.0		101	80-120			
Copper, Dissolved	65	24.5	0.350	0.500	ug/L	25.0		98.2	80-120			
Nickel, Dissolved	60	24.2	0.0792	0.500	ug/L	25.0		96.8	80-120			
Nickel, Dissolved	62	25.4	0.220	0.500	ug/L	25.0		102	80-120			
Selenium, Dissolved	78	73.8	0.179	0.500	ug/L	80.0		92.3	80-120			
Zinc, Dissolved	66	75.7	2.92	6.00	ug/L	80.0		94.7	80-120			
Zinc, Dissolved	67	70.3	0.940	6.00	ug/L	80.0		87.9	80-120			
Duplicate (BJL0327-DUP2)						Source: 21L0046-02 Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 21:05						
Barium, Dissolved	135	1.94	0.114	0.500	ug/L		1.93			0.83	20	
Chromium, Dissolved	52	0.642	0.260	0.500	ug/L		0.619			3.65	20	
Iron, Dissolved	54	81.4	18.2	36.0	ug/L		79.2			2.74	20	
Lead, Dissolved	208	ND	0.0513	0.100	ug/L		ND					U
Manganese, Dissolved	55	2.95	0.142	0.500	ug/L		2.95			0.27	20	
Silver, Dissolved	107	ND	0.0220	0.200	ug/L		ND					U
Vanadium, Dissolved	51a	2.53	0.0556	0.200	ug/L		2.44			3.34	20	
Arsenic, Dissolved	75a	0.489	0.0373	0.200	ug/L		0.469			4.18	20	
Cadmium, Dissolved	111	ND	0.0300	0.100	ug/L		ND					U
Cobalt, Dissolved	59	0.0700	0.0178	0.200	ug/L		0.0690			1.44	20	J
Copper, Dissolved	63	1.34	0.173	0.500	ug/L		1.26			6.00	20	
Nickel, Dissolved	60	1.31	0.0792	0.500	ug/L		1.25			4.07	20	
Selenium, Dissolved	78	ND	0.179	0.500	ug/L		ND					U
Zinc, Dissolved	66	ND	2.92	6.00	ug/L		ND					U
Matrix Spike (BJL0327-MS2)						Source: 21L0046-02 Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 21:10						
Barium, Dissolved	135	26.4	0.114	0.500	ug/L	25.0	1.93	97.9	75-125			
Chromium, Dissolved	52	23.8	0.260	0.500	ug/L	25.0	0.619	92.7	75-125			
Iron, Dissolved	54	4610	18.2	36.0	ug/L	5000	79.2	90.7	75-125			
Lead, Dissolved	208	25.1	0.0513	0.100	ug/L	25.0	ND	100	75-125			
Manganese, Dissolved	55	25.4	0.142	0.500	ug/L	25.0	2.95	89.7	75-125			
Silver, Dissolved	107	25.4	0.0220	0.200	ug/L	25.0	ND	102	75-125			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJJ0327 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Matrix Spike (BJL0327-MS2)		Source: 21L0046-02			Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 21:10							
Vanadium, Dissolved	51a	25.2	0.0556	0.200	ug/L	25.0	2.44	90.9	75-125			
Arsenic, Dissolved	75a	24.3	0.0373	0.200	ug/L	25.0	0.469	95.3	75-125			
Cadmium, Dissolved	111	24.1	0.0300	0.100	ug/L	25.0	ND	96.3	75-125			
Cobalt, Dissolved	59	25.0	0.0178	0.200	ug/L	25.0	0.0690	99.7	75-125			
Copper, Dissolved	63	25.8	0.173	0.500	ug/L	25.0	1.26	98.0	75-125			
Nickel, Dissolved	60	25.6	0.0792	0.500	ug/L	25.0	1.25	97.5	75-125			
Selenium, Dissolved	78	75.4	0.179	0.500	ug/L	80.0	ND	94.3	75-125			
Zinc, Dissolved	66	76.1	2.92	6.00	ug/L	80.0	ND	95.1	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJL0327-MSD2)		Source: 21L0046-02			Prepared: 14-Dec-2021 Analyzed: 14-Dec-2021 21:17							
Barium, Dissolved	135	26.9	0.114	0.500	ug/L	25.0	1.93	99.8	75-125	1.79	20	
Chromium, Dissolved	52	24.2	0.260	0.500	ug/L	25.0	0.619	94.5	75-125	1.83	20	
Iron, Dissolved	54	4610	18.2	36.0	ug/L	5000	79.2	90.7	75-125	0.02	20	
Lead, Dissolved	208	25.8	0.0513	0.100	ug/L	25.0	ND	103	75-125	2.73	20	
Manganese, Dissolved	55	25.5	0.142	0.500	ug/L	25.0	2.95	90.2	75-125	0.46	20	
Silver, Dissolved	107	25.8	0.0220	0.200	ug/L	25.0	ND	103	75-125	1.53	20	
Vanadium, Dissolved	51a	25.8	0.0556	0.200	ug/L	25.0	2.44	93.4	75-125	2.47	20	
Arsenic, Dissolved	75a	24.4	0.0373	0.200	ug/L	25.0	0.469	95.9	75-125	0.62	20	
Cadmium, Dissolved	111	24.2	0.0300	0.100	ug/L	25.0	ND	96.9	75-125	0.65	20	
Cobalt, Dissolved	59	25.3	0.0178	0.200	ug/L	25.0	0.0690	101	75-125	1.15	20	
Copper, Dissolved	63	26.1	0.173	0.500	ug/L	25.0	1.26	99.2	75-125	1.13	20	
Nickel, Dissolved	60	25.7	0.0792	0.500	ug/L	25.0	1.25	97.9	75-125	0.39	20	
Selenium, Dissolved	78	74.7	0.179	0.500	ug/L	80.0	ND	93.4	75-125	0.91	20	
Zinc, Dissolved	66	77.7	2.92	6.00	ug/L	80.0	ND	97.1	75-125	2.14	20	

Recovery limits for target analytes in MS/MSD QC samples are advisory only.


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 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 21-Dec-2021 17:00

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0381 - TWM EPA 7470A

Instrument: HYDRA Analyst: SKD

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0381-BLK1)						Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 14:37					
Mercury, Dissolved	ND	0.000013	0.000100	mg/L							U
LCS (BJL0381-BS1)						Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 14:39					
Mercury, Dissolved	0.00184	0.000013	0.000100	mg/L	0.00200		91.8	80-120			
Duplicate (BJL0381-DUP1)						Source: 21L0046-05 Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:03					
Mercury, Dissolved	ND	0.000013	0.000100	mg/L		ND					U
Matrix Spike (BJL0381-MS1)						Source: 21L0046-05 Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:05					
Mercury, Dissolved	0.000996	0.000013	0.000100	mg/L	0.00100	ND	99.6	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Matrix Spike Dup (BJL0381-MSD1)						Source: 21L0046-05 Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:07					
Mercury, Dissolved	0.000927	0.000013	0.000100	mg/L	0.00100	ND	92.7	75-125	7.16	20	
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

Certified Analyses included in this Report

Analyte	Certifications
<i>EPA 6020B in Water</i>	
Silver-107	WADOE,WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
Silver-107	WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
<i>EPA 6020B UCT-KED in Water</i>	
Arsenic-75a	WADOE,WA-DW,DoD-ELAP,ADEC,NELAP
Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Cobalt-59	NELAP,DoD-ELAP,WADOE
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	WADOE,WA-DW,DoD-ELAP
Zinc-67	WADOE,WA-DW,DoD-ELAP
Arsenic-75a	NELAP,WADOE,DoD-ELAP,ADEC


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Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Cobalt-59	DoD-ELAP,NELAP,WADOE
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	NELAP,WADOE,DoD-ELAP
Zinc-67	NELAP,WADOE,DoD-ELAP

EPA 7470A in Water

Mercury	WADOE,NELAP,DoD-ELAP
Mercury	WADOE,NELAP,DoD-ELAP

EPA 8082A in Water

Aroclor 1016	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1016 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268 [2C]	WADOE,DoD-ELAP,NELAP,ADEC

EPA 8260D in Water

Chloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,WADOE


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Acrolein	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Iodomethane	DoD-ELAP,NELAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Butanone	DoD-ELAP,NELAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE


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m,p-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
Styrene	DoD-ELAP,NELAP,WADOE
Bromoform	DoD-ELAP,NELAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE

EPA 8260D-SIM in Water

Acrylonitrile	NELAP,WADOE
Vinyl chloride	NELAP,WADOE
1,1-Dichloroethene	NELAP,WADOE
cis-1,2-Dichloroethene	NELAP,WADOE
trans-1,2-Dichloroethene	NELAP,WADOE
Trichloroethene	NELAP,WADOE
Tetrachloroethene	NELAP,WADOE
1,1,2,2-Tetrachloroethane	NELAP,WADOE


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1,2-Dichloroethane

NELAP,WADOE

Benzene

NELAP,WADOE

EPA 8270E in Water

Phenol

NELAP,DoD-ELAP

bis(2-chloroethyl) ether

NELAP,DoD-ELAP

2-Chlorophenol

NELAP,DoD-ELAP

1,3-Dichlorobenzene

NELAP,DoD-ELAP

1,4-Dichlorobenzene

NELAP,DoD-ELAP

1,2-Dichlorobenzene

NELAP,DoD-ELAP

Benzyl Alcohol

NELAP,DoD-ELAP

2,2'-Oxybis(1-chloropropane)

NELAP,DoD-ELAP

2-Methylphenol

NELAP,DoD-ELAP

Hexachloroethane

NELAP,DoD-ELAP

N-Nitroso-di-n-Propylamine

NELAP,DoD-ELAP

4-Methylphenol

NELAP,DoD-ELAP

Nitrobenzene

NELAP,DoD-ELAP

Isophorone

NELAP,DoD-ELAP

2-Nitrophenol

NELAP,DoD-ELAP

2,4-Dimethylphenol

NELAP,DoD-ELAP

Bis(2-Chloroethoxy)methane

NELAP,DoD-ELAP

2,4-Dichlorophenol

NELAP,DoD-ELAP

1,2,4-Trichlorobenzene

NELAP,DoD-ELAP

Naphthalene

NELAP,DoD-ELAP

Benzoic acid

NELAP,DoD-ELAP

4-Chloroaniline

NELAP,DoD-ELAP

Hexachlorobutadiene

NELAP,DoD-ELAP

4-Chloro-3-Methylphenol

NELAP,DoD-ELAP

2-Methylnaphthalene

NELAP,DoD-ELAP

Hexachlorocyclopentadiene

NELAP,DoD-ELAP

2,4,6-Trichlorophenol

NELAP,DoD-ELAP

2,4,5-Trichlorophenol

NELAP,DoD-ELAP

2-Chloronaphthalene

NELAP,DoD-ELAP

2-Nitroaniline

NELAP,DoD-ELAP

Acenaphthylene

NELAP,DoD-ELAP

Dimethylphthalate

NELAP,DoD-ELAP

2,6-Dinitrotoluene

NELAP,DoD-ELAP

Acenaphthene

NELAP,DoD-ELAP

3-Nitroaniline

NELAP,DoD-ELAP

2,4-Dinitrophenol

NELAP,DoD-ELAP


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Dibenzofuran	NELAP,DoD-ELAP
4-Nitrophenol	NELAP,DoD-ELAP
2,4-Dinitrotoluene	NELAP,DoD-ELAP
Fluorene	NELAP,DoD-ELAP
4-Chlorophenylphenyl ether	NELAP,DoD-ELAP
Diethyl phthalate	NELAP,DoD-ELAP
4-Nitroaniline	NELAP,DoD-ELAP
4,6-Dinitro-2-methylphenol	NELAP,DoD-ELAP
N-Nitrosodiphenylamine	NELAP,DoD-ELAP
4-Bromophenyl phenyl ether	NELAP,DoD-ELAP
Hexachlorobenzene	NELAP,DoD-ELAP
Pentachlorophenol	NELAP,DoD-ELAP
Phenanthrene	NELAP,DoD-ELAP
Anthracene	NELAP,DoD-ELAP
Carbazole	NELAP,DoD-ELAP
Di-n-Butylphthalate	NELAP,DoD-ELAP
Fluoranthene	NELAP,DoD-ELAP
Pyrene	NELAP,DoD-ELAP
Butylbenzylphthalate	NELAP,DoD-ELAP
Benzo(a)anthracene	NELAP,DoD-ELAP
3,3'-Dichlorobenzidine	NELAP,DoD-ELAP
Chrysene	NELAP,DoD-ELAP
bis(2-Ethylhexyl)phthalate	NELAP,DoD-ELAP
Di-n-Octylphthalate	NELAP,DoD-ELAP
Benzo(b)fluoranthene	NELAP,DoD-ELAP
Benzo(k)fluoranthene	NELAP,DoD-ELAP
Benzo(a)fluoranthene, Total	NELAP
Benzo(a)pyrene	NELAP,DoD-ELAP
Indeno(1,2,3-cd)pyrene	NELAP,DoD-ELAP
Dibenzo(a,h)anthracene	NELAP,DoD-ELAP
Benzo(g,h,i)perylene	NELAP,DoD-ELAP
N-Nitrosodimethylamine	NELAP,DoD-ELAP
1-Methylnaphthalene	NELAP,DoD-ELAP

NWTPH-Dx in Water

Diesel Range Organics (C12-C24)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C10-C25)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (Tol-C18)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C10-C24)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C10-C28)	DoD-ELAP,NELAP,WADOE


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Diesel Range Organics (C12-C22)	DoD-ELAP
Diesel Range Organics (C12-C25)	DoD-ELAP
Motor Oil Range Organics (C24-C38)	DoD-ELAP,NELAP,WADOE
Motor Oil Range Organics (C25-C36)	DoD-ELAP,NELAP,WADOE
Motor Oil Range Organics (C24-C40)	DoD-ELAP,NELAP,WADOE
Residual Range Organics (C23-C32)	DoD-ELAP
Mineral Spirits Range Organics (Tol-C12)	DoD-ELAP,NELAP,WADOE
Mineral Oil Range Organics (C16-C28)	DoD-ELAP,NELAP,WADOE
Kerosene Range Organics (Tol-C18)	DoD-ELAP,NELAP,WADOE
JP8 Range Organics (C8-C18)	DoD-ELAP,NELAP,WADOE
JP5 Range Organics (C10-C16)	DoD-ELAP,NELAP,WADOE
JP4 Range Organics (Tol-C14)	DoD-ELAP,NELAP,WADOE
Jet-A Range Organics (C10-C18)	DoD-ELAP,NELAP,WADOE
Creosote Range Organics (C12-C22)	DoD-ELAP,NELAP,WADOE
Bunker C Range Organics (C10-C38)	DoD-ELAP,NELAP,WADOE
Stoddard Range Organics (C8-C12)	DoD-ELAP,NELAP,WADOE
Transformer Oil Range Organics (C12-C28)	DoD-ELAP,NELAP,WADOE

NWTPHg in Water

Gasoline Range Organics (Tol-Nap)	WADOE,DoD-ELAP
Gasoline Range Organics (2MP-TMB)	WADOE,DoD-ELAP
Gasoline Range Organics (Tol-C12)	WADOE,DoD-ELAP
Gasoline Range Organics (C6-C10)	WADOE,ADEC,DoD-ELAP
Gasoline Range Organics (C5-C12)	WADOE,DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2023
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/28/2022
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2022
WADOE	WA Dept of Ecology	C558	06/30/2022
WA-DW	Ecology - Drinking Water	C558	06/30/2022



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
21-Dec-2021 17:00

Notes and Definitions

*	Flagged value is not within established control limits.
B	This analyte was detected in the method blank.
D	The reported value is from a dilution
J	Estimated concentration value detected below the reporting limit.
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20% RSD, <20% drift or minimum RRF)
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.



Analytical Resources, LLC
Analytical Chemists and Consultants

22 December 2021

Meg Strong
Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle, WA 98103-8636

RE: Lower Duwamish Q4

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)
21L0078

Associated SDG ID(s)
N/A

Shelly Fishel

Digitally signed by Shelly Fishel
Date: 2021.12.22 13:36:02
-08'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

Shelly Fishel, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 21L0078		Turn-around Requested: standard		Page: of													
ARI Client Company: Shannon + Wilson		Phone:		Date:	Ice Present? Y												
Client Contact: Shoshana Howard		No. of Coolers: 2		Cooler Temps: 4.8, 1.8													
Client Project Name: LDW		Analysis Requested				Notes/Comments											
Client Project #: 21-1-12596		Sampers: DES RMV															
Sample ID	Date	Time	Matrix	No. Containers	TPH-G	TPH-DX	BTEX	HNOCs	MTBE	PAHs	Full Slides	Limited Slides	BBs (Arachnids)	metals			
MW-32-20210312	12/03	0944	GW	10	X	X				X	X				①		① As ₂
MW-101-20210312	12/3	0959	GW	10	X	X				X	X				①		② As, Mn, Ni, Cu, Se, Zn
MW-37-20210312	12/3	1111	GW	13	X	X	X	X		X					②		③ As, Ba, Cr, Mn, Ni
TB-16-20210312	12/5	1130	W	5			X	X									Cd, Co, Cu, Fe, Pb
MW-54-20210312	12/3	1234	GW	15		X	X	X		X	X	X			③		Hg, Se, Ag, V, Zn
Comments/Special Instructions • metals are <u>not</u> field filtered • reference project for detection limit		Relinquished by: (Signature) Rose Vogt		Received by: (Signature) Raven Barbera		Relinquished by: (Signature)		Received by: (Signature)									
		Printed Name: Rose Vogt		Printed Name: Raven Barbera		Printed Name:		Printed Name:									
		Company: Shannon + Wilson		Company: ARI		Company:		Company:									
		Date & Time: 12/3/21 1337		Date & Time: 12/3/21 1337		Date & Time:		Date & Time:									



Analytical Resources, Incorporated
 Analytical Chemists and Consultants
 4611 South 134th Place, Suite 100
 Tukwila, WA 98168
 206-695-6200 206-695-6201 (fax)
 www.arilabs.com

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-32-20210312	21L0078-01	Water	03-Dec-2021 09:44	03-Dec-2021 13:37
MW-32-20210312	21L0078-02	Water	03-Dec-2021 09:44	03-Dec-2021 13:37
MW-101-20210312	21L0078-03	Water	03-Dec-2021 09:59	03-Dec-2021 13:37
MW-101-20210312	21L0078-04	Water	03-Dec-2021 09:59	03-Dec-2021 13:37
MW-37-20210312	21L0078-05	Water	03-Dec-2021 11:11	03-Dec-2021 13:37
MW-37-20210312	21L0078-06	Water	03-Dec-2021 11:11	03-Dec-2021 13:37
TB-16-20210312	21L0078-07	Water	03-Dec-2021 09:44	03-Dec-2021 13:37
MW-54-20210312	21L0078-08	Water	03-Dec-2021 12:34	03-Dec-2021 13:37
MW-54-20210312	21L0078-09	Water	03-Dec-2021 12:34	03-Dec-2021 13:37



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

Work Order Case Narrative

Client: Shannon & Wilson, Inc
Project: Lower Duwamish Q4
Work Order: 21L0078

Sample receipt

Samples as listed on the preceding page were received 03-Dec-2021 13:37 under ARI work order 21L0078. For details regarding sample receipt, please refer to the Cooler Receipt Form.

PCB Aroclors - EPA Method SW8082A

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Gasoline by NWTPH-q (GC/MS)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method SW8260D

The sample(s) were analyzed within the recommended holding times.



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method 8260D-SIM (Selected Ion Monitoring)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Semivolatiles - EPA Method SW8270E

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements except as follows:

In association with the samples in sequence SJL0191- Pentachlorophenol was out of control low and Butylbenzylphthalate and surrogate p-Terphenyl-d14 which were out of control high in the initial calibration verification SJL0191-ICV1. All samples which contain analyte have been flagged with "Q" qualifier. Benzoic Acid and Pentachlorophenol were out of control low in the low concentration calibration verification SJL0191-LCV1.

In sequence SJL0168 in association with the batch QC BJL0109-BLK1, BJL0109-BS1 and BJL0109-BSD1- Benzoic Acid was out of control low and Butylbenzylphthalate was out of control high in the initial calibration verification SJL0168-ICV1. All samples which contain analyte have been flagged with a "Q" qualifier. Benzoic Acid and Pentachlorophenol were out of control low in the low concentration calibration verifications SJL0168-LCV1 and SJL0168-LCV2.

Internal standard areas were within limits.


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

The surrogate percent recoveries were within control limits except as follows. Phenol-d5 which was out of control low in samples 21L0078-01, 21L0078-03 and 21L0078-08 and the method blank BJL0109-BLK1. p- Terphenyl was out of control high in the initial calibration verification SJL0191-ICV1. Deviations have been flagged.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits except Benzoic Acid percent recoveries which were out of control low and have been flagged .

Total and Dissolved Metals - EPA Method 6020B

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21L0078-09 in Dissolved Metals batch BJL0365. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference (RPD) were within advisory control limits.

Total and Dissolved Mercury - EPA Method 7470/7471

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21L0078-09 in Dissolved Mercury batch BJL0377. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference (RPD) were within advisory control limits.

Diesel/Heavy Oil Range Organics - WA-Ecology Method NW-TPHDx

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Polynuclear Aromatic Hydrocarbons (PAH) - EPA Method SW8270E-SIM

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.



WORK ORDER

21L0078

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Preservation Confirmation

Container ID	Container Type	pH	
21L0078-01 A	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass (P)
21L0078-01 B	Glass NM, Amber, 500 mL		
21L0078-01 C	Glass NM, Amber, 500 mL		
21L0078-01 D	Glass NM, Amber, 500 mL		
21L0078-01 E	Glass NM, Amber, 500 mL		
21L0078-01 F	Glass NM, Amber, 500 mL		
21L0078-01 G	Glass NM, Amber, 500 mL		
21L0078-01 H	VOA Vial, Clear, 40 mL, HCL		
21L0078-01 I	VOA Vial, Clear, 40 mL, HCL		
21L0078-02 A	HDPE NM, 1000 mL	>2	Fail
21L0078-03 A	HDPE NM, 500 mL, 1:1 HNO3	<2	P
21L0078-03 B	Glass NM, Amber, 500 mL		
21L0078-03 C	Glass NM, Amber, 500 mL		
21L0078-03 D	Glass NM, Amber, 500 mL		
21L0078-03 E	Glass NM, Amber, 500 mL		
21L0078-03 F	Glass NM, Amber, 500 mL		
21L0078-03 G	Glass NM, Amber, 500 mL		
21L0078-03 H	VOA Vial, Clear, 40 mL, HCL		
21L0078-03 I	VOA Vial, Clear, 40 mL, HCL		
21L0078-04 A	HDPE NM, 1000 mL	>2	Fail
21L0078-05 A	HDPE NM, 500 mL, 1:1 HNO3	<2	P
21L0078-05 B	Glass NM, Amber, 500 mL		
21L0078-05 C	Glass NM, Amber, 500 mL		
21L0078-05 D	Glass NM, Amber, 500 mL		
21L0078-05 E	Glass NM, Amber, 500 mL		
21L0078-05 F	VOA Vial, Clear, 40 mL, HCL		
21L0078-05 G	VOA Vial, Clear, 40 mL, HCL		
21L0078-05 H	VOA Vial, Clear, 40 mL, HCL		
21L0078-05 I	VOA Vial, Clear, 40 mL, HCL		
21L0078-05 J	VOA Vial, Clear, 40 mL, HCL	bubble	
21L0078-05 K	VOA Vial, Clear, 40 mL, HCL		
21L0078-05 L	VOA Vial, Clear, 40 mL, HCL		
21L0078-06 A	HDPE NM, 1000 mL	>2	Fail
21L0078-07 A	VOA Vial, Clear, 40 mL, HCL		



WORK ORDER

21L0078

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: Shannon & Wilson, Inc

Project Manager: Shelly Fishel

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

21L0078-07 B	VOA Vial, Clear, 40 mL, HCL		
21L0078-07 C	VOA Vial, Clear, 40 mL, HCL		
21L0078-07 D	VOA Vial, Clear, 40 mL, HCL		
21L0078-07 E	VOA Vial, Clear, 40 mL, HCL		
21L0078-08 A	Glass NM, Amber, 1000 mL		
21L0078-08 B	Glass NM, Amber, 1000 mL		
21L0078-08 C	HDPE NM, 500 mL, 1:1 HNO3	22	P
21L0078-08 D	Glass NM, Amber, 500 mL		
21L0078-08 E	Glass NM, Amber, 500 mL		
21L0078-08 F	Glass NM, Amber, 500 mL		
21L0078-08 G	Glass NM, Amber, 500 mL		
21L0078-08 H	Glass NM, Amber, 500 mL		
21L0078-08 I	Glass NM, Amber, 500 mL		
21L0078-08 J	VOA Vial, Clear, 40 mL, HCL		
21L0078-08 K	VOA Vial, Clear, 40 mL, HCL		
21L0078-08 L	VOA Vial, Clear, 40 mL, HCL		
21L0078-08 M	VOA Vial, Clear, 40 mL, HCL		
21L0078-08 N	VOA Vial, Clear, 40 mL, HCL		
21L0078-09 A	HDPE NM, 1000 mL	> 2	Fail

RS

Preservation Confirmed By

Date

12/6/21



Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Shannon & Wilson

Project Name: LDW

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 21L0078

Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES NO

Were custody papers included with the cooler? YES NO

Were custody papers properly filled out (ink, signed, etc.) YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1337 4.8 1.8

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: DOO 2565

Cooler Accepted by: RB Date: 12/3/21 Time: 1337

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? NA YES NO

How were bottles sealed in plastic bags? Individually Grouped Not

Did all bottles arrive in good condition (unbroken)? YES NO

Were all bottle labels complete and legible? YES NO

Did the number of containers listed on COC match with the number of containers received? YES NO

Did all bottle labels and tags agree with custody papers? YES NO

Were all bottles used correct for the requested analyses? YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... NA YES NO

Were all VOC vials free of air bubbles? NA YES NO

Was sufficient amount of sample sent in each bottle? YES NO

Date VOC Trip Blank was made at ARI: NA 11/29/21

Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: RB Date: 12/6/21 Time: 1334 Labels checked by: _____

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____ Date: _____



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

MW-32-20210312

21L0078-01 (Water)

Volatile Organic Compounds

Method: NWTPHg

Sampled: 12/03/2021 09:44

Instrument: NT2 Analyst: PKC

Analyzed: 12/10/2021 16:50

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0078-01 I

Preparation Batch: BJL0242

Sample Size: 10 mL

Prepared: 12/10/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
<i>Surrogate: Toluene-d8</i>			80-120 %	98.7	%	
<i>Surrogate: 4-Bromofluorobenzene</i>			80-120 %	95.2	%	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-32-20210312
21L0078-01 (Water)
Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/03/2021 09:44

Instrument: NT10 Analyst: VTS

Analyzed: 12/13/2021 18:52

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0078-01 B 01

Preparation Batch: BJL0109

Sample Size: 1000 mL

Prepared: 12/07/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	ND	ug/L	U
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U

Surrogate: 2-Fluorophenol

30-160 % 48.8 %

Surrogate: Phenol-d5

30-160 % 28.9 %

*

Surrogate: 2-Chlorophenol-d4

30-160 % 78.3 %

Surrogate: 1,2-Dichlorobenzene-d4

30-160 % 69.8 %

Surrogate: Nitrobenzene-d5

30-160 % 85.2 %

Surrogate: 2-Fluorobiphenyl

30-160 % 81.7 %

Surrogate: 2,4,6-Tribromophenol

30-160 % 82.4 %

Surrogate: p-Terphenyl-d14

30-160 % 85.2 % Q


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-32-20210312
21L0078-01 (Water)
Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 12/03/2021 09:44

Instrument: NT11 Analyst: VTS

Analyzed: 12/16/2021 21:29

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF	Sample Size: 500 mL	Extract ID: 21L0078-01 F 01
	Preparation Batch: BJL0177	Final Volume: 0.5 mL	
	Prepared: 12/09/2021		
Sample Cleanup:	Cleanup Method: Silica Gel	Initial Volume: 0.5 mL	Extract ID: 21L0078-01 F 01
	Cleanup Batch: CJL0089	Final Volume: 0.5 mL	
	Cleaned: 14-Dec-2021		

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.004	ug/L	J
2-Methylnaphthalene	91-57-6	1	0.001	0.010	0.003	ug/L	J
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	0.002	ug/L	J
Acenaphthylene	208-96-8	1	0.002	0.010	ND	ug/L	U
Acenaphthene	83-32-9	1	0.003	0.010	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.002	0.010	ND	ug/L	U
Fluorene	86-73-7	1	0.002	0.010	ND	ug/L	U
Phenanthrene	85-01-8	1	0.001	0.010	0.002	ug/L	J
Anthracene	120-12-7	1	0.001	0.010	ND	ug/L	U
Carbazole	86-74-8	1	0.001	0.010	0.001	ug/L	J
Fluoranthene	206-44-0	1	0.002	0.010	ND	ug/L	U
Pyrene	129-00-0	1	0.001	0.010	0.002	ug/L	J
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	ND	ug/L	U
Chrysene	218-01-9	1	0.0009	0.010	0.002	ug/L	J
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	0.0009	ug/L	J
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.002	0.010	ND	ug/L	U
Perylene	1985-5-0	1	0.006	0.010	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	ND	ug/L	U
<i>Surrogate: 2-Methylnaphthalene-d10</i>					42-120 %	78.1 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					29-120 %	81.8 %	
<i>Surrogate: Fluoranthene-d10</i>					57-120 %	91.5 %	


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-32-20210312
21L0078-01 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 12/03/2021 09:44

Instrument: FID4 Analyst: TWC

Analyzed: 12/16/2021 00:25

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0078-01 D 01

Preparation Batch: BJL0176

Sample Size: 475 mL

Prepared: 12/09/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.105	0.221	mg/L	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	1	0.211	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	85.8	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-32-20210312
21L0078-01 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/03/2021 09:44

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 23:10

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0078-01 A 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	2.61	ug/L	


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-32-20210312
21L0078-02 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/03/2021 09:44

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/15/2021 19:56

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0078-02 A 02

Preparation Batch: BJL0365

Sample Size: 25 mL

Filtration Batch: BJL0147

Prepared: 12/15/2021

Final Volume: 25 mL

Filtration Date: 12/06/2021 16:45

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	1.13	ug/L	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-101-20210312
21L0078-03 (Water)
Volatile Organic Compounds

Method: NWTPHg

Sampled: 12/03/2021 09:59

Instrument: NT2 Analyst: PKC

Analyzed: 12/10/2021 17:10

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0078-03 I

Preparation Batch: BJL0242

Sample Size: 10 mL

Prepared: 12/10/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
<i>Surrogate: Toluene-d8</i>			80-120 %	97.8	%	
<i>Surrogate: 4-Bromofluorobenzene</i>			80-120 %	94.0	%	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

MW-101-20210312

21L0078-03 (Water)

Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/03/2021 09:59

Instrument: NT10 Analyst: VTS

Analyzed: 12/13/2021 19:30

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJJ0109
Prepared: 12/07/2021

Sample Size: 1000 mL
Final Volume: 1 mL

Extract ID: 21L0078-03 B 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	ND	ug/L	U
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U

Surrogate: 2-Fluorophenol

30-160 % 49.0 %

Surrogate: Phenol-d5

30-160 % 27.6 % *

Surrogate: 2-Chlorophenol-d4

30-160 % 75.3 %

Surrogate: 1,2-Dichlorobenzene-d4

30-160 % 68.6 %

Surrogate: Nitrobenzene-d5

30-160 % 84.0 %

Surrogate: 2-Fluorobiphenyl

30-160 % 78.4 %

Surrogate: 2,4,6-Tribromophenol

30-160 % 85.2 %

Surrogate: p-Terphenyl-d14

30-160 % 92.7 % Q


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-101-20210312
21L0078-03 (Water)
Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 12/03/2021 09:59

Instrument: NT11 Analyst: VTS

Analyzed: 12/16/2021 21:59

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF	Sample Size: 500 mL	Extract ID: 21L0078-03 F 01
	Preparation Batch: BJL0177	Final Volume: 0.5 mL	
	Prepared: 12/09/2021		
Sample Cleanup:	Cleanup Method: Silica Gel	Initial Volume: 0.5 mL	Extract ID: 21L0078-03 F 01
	Cleanup Batch: CJL0089	Final Volume: 0.5 mL	
	Cleaned: 14-Dec-2021		

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.005	ug/L	J
2-Methylnaphthalene	91-57-6	1	0.001	0.010	0.003	ug/L	J
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	0.002	ug/L	J
Acenaphthylene	208-96-8	1	0.002	0.010	ND	ug/L	U
Acenaphthene	83-32-9	1	0.003	0.010	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.002	0.010	ND	ug/L	U
Fluorene	86-73-7	1	0.002	0.010	ND	ug/L	U
Phenanthrene	85-01-8	1	0.001	0.010	0.002	ug/L	J
Anthracene	120-12-7	1	0.001	0.010	ND	ug/L	U
Carbazole	86-74-8	1	0.001	0.010	ND	ug/L	U
Fluoranthene	206-44-0	1	0.002	0.010	ND	ug/L	U
Pyrene	129-00-0	1	0.001	0.010	0.002	ug/L	J
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	ND	ug/L	U
Chrysene	218-01-9	1	0.0009	0.010	0.002	ug/L	J
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	0.001	ug/L	J
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.002	0.010	ND	ug/L	U
Perylene	1985-5-0	1	0.006	0.010	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	ND	ug/L	U
<i>Surrogate: 2-Methylnaphthalene-d10</i>					42-120 %	79.2 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					29-120 %	82.6 %	
<i>Surrogate: Fluoranthene-d10</i>					57-120 %	93.0 %	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-101-20210312
21L0078-03 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 12/03/2021 09:59

Instrument: FID4 Analyst: TWC

Analyzed: 12/16/2021 00:44

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0078-03 D 01

Preparation Batch: BJL0176

Sample Size: 475 mL

Prepared: 12/09/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.105	0.257	mg/L	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	1	0.211	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	102	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-101-20210312
21L0078-03 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/03/2021 09:59

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 23:15

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0078-03 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	1	0.0373	0.200	2.89	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-101-20210312
21L0078-04 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/03/2021 09:59

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/15/2021 20:01

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0078-04 A 02

Preparation Batch: BJL0365

Sample Size: 25 mL

Filtration Batch: BJL0147

Prepared: 12/15/2021

Final Volume: 25 mL

Filtration Date: 12/06/2021 16:45

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	1.24	ug/L	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
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Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

MW-37-20210312

21L0078-05 (Water)

Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/03/2021 11:11

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 23:58

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0078-05 I

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	109	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.1	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	99.9	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	99.9	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-37-20210312
21L0078-05 (Water)
Volatile Organic Compounds

Method: NWTPHg

Sampled: 12/03/2021 11:11

Instrument: NT2 Analyst: PKC

Analyzed: 12/10/2021 17:31

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0078-05 G

Preparation Batch: BJL0242

Sample Size: 10 mL

Prepared: 12/10/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
<i>Surrogate: Toluene-d8</i>			80-120 %	97.0	%	
<i>Surrogate: 4-Bromofluorobenzene</i>			80-120 %	97.8	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-37-20210312
21L0078-05 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/03/2021 11:11

Instrument: NT16 Analyst: KOTT

Analyzed: 12/10/2021 13:50

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0078-05 F

Preparation Batch: BJL0245

Sample Size: 10 mL

Prepared: 12/10/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	97.7	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	95.5	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				75-125 %	95.9	%	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

MW-37-20210312

21L0078-05 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 12/03/2021 11:11

Instrument: NT11 Analyst: VTS

Analyzed: 12/16/2021 22:29

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0177 Prepared: 12/09/2021	Sample Size: 500 mL Final Volume: 0.5 mL	Extract ID: 21L0078-05 D 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0089 Cleaned: 14-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0078-05 D 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.004	ug/L	J
2-Methylnaphthalene	91-57-6	1	0.001	0.010	0.002	ug/L	J
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	0.001	ug/L	J
Acenaphthylene	208-96-8	1	0.002	0.010	ND	ug/L	U
Acenaphthene	83-32-9	1	0.003	0.010	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.002	0.010	ND	ug/L	U
Fluorene	86-73-7	1	0.002	0.010	ND	ug/L	U
Phenanthrene	85-01-8	1	0.001	0.010	0.002	ug/L	J
Anthracene	120-12-7	1	0.001	0.010	0.002	ug/L	J
Carbazole	86-74-8	1	0.001	0.010	ND	ug/L	U
Fluoranthene	206-44-0	1	0.002	0.010	ND	ug/L	U
Pyrene	129-00-0	1	0.001	0.010	0.002	ug/L	J
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	ND	ug/L	U
Chrysene	218-01-9	1	0.0009	0.010	0.002	ug/L	J
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	0.001	ug/L	J
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.002	0.010	ND	ug/L	U
Perylene	1985-5-0	1	0.006	0.010	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	ND	ug/L	U
Surrogate: 2-Methylnaphthalene-d10				42-120 %	73.2	%	
Surrogate: Dibenzo[a,h]anthracene-d14				29-120 %	77.1	%	
Surrogate: Fluoranthene-d10				57-120 %	85.4	%	


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-37-20210312
21L0078-05 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 12/03/2021 11:11

Instrument: FID4 Analyst: TWC

Analyzed: 12/16/2021 01:04

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0078-05 B 01

Preparation Batch: BJL0176

Sample Size: 475 mL

Prepared: 12/09/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.105	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.211	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			<i>50-150 %</i>	<i>87.5</i>	<i>%</i>	



Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

MW-37-20210312

21L0078-05 (Water)

Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 12/03/2021 11:11

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 21:49

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO₃ matrix
Preparation Batch: BJL0294 Sample Size: 25 mL
Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0078-05 A 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Manganese	7439-96-5	1	0.142	0.500	9.64	ug/L	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-37-20210312
21L0078-05 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/03/2021 11:11

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 21:49

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0078-05 A 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	0.307	ug/L	
Copper	7440-50-8	1	0.173	0.500	1.36	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	5.54	ug/L	
Selenium	7782-49-2	1	0.179	0.500	1.09	ug/L	
Zinc	7440-66-6	1	2.92	6.00	ND	ug/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-37-20210312
21L0078-06 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 12/03/2021 11:11

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/15/2021 20:50

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0078-06 A 02

Preparation Batch: BJL0365

Sample Size: 25 mL

Filtration Batch: BJL0147

Prepared: 12/15/2021

Final Volume: 25 mL

Filtration Date: 12/06/2021 16:45

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Manganese, Dissolved	7439-96-5	1	0.142	0.500	0.490	ug/L	J


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-37-20210312
21L0078-06 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/03/2021 11:11

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/15/2021 20:50

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0365 Sample Size: 25 mL
 Prepared: 12/15/2021 Final Volume: 25 mL

 Extract ID: 21L0078-06 A 02
 Filtration Batch: BJL0147
 Filtration Date: 12/06/2021 16:45

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	0.250	ug/L	
Copper, Dissolved	7440-50-8	1	0.173	0.500	0.968	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	4.75	ug/L	
Selenium, Dissolved	7782-49-2	1	0.179	0.500	0.897	ug/L	
Zinc, Dissolved	7440-66-6	1	2.92	6.00	ND	ug/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

TB-16-20210312
21L0078-07 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/03/2021 09:44

Instrument: NT2 Analyst: LH

Analyzed: 12/08/2021 16:52

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0078-07 C

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	102	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.0	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	95.8	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	98.5	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

TB-16-20210312
21L0078-07 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/03/2021 09:44

Instrument: NT16 Analyst: KOTT

Analyzed: 12/10/2021 14:11

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0078-07 A

Preparation Batch: BJL0245

Sample Size: 10 mL

Prepared: 12/10/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	96.1	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	96.4	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				75-125 %	95.6	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-08 (Water)
Volatile Organic Compounds

Method: EPA 8260D

Sampled: 12/03/2021 12:34

Instrument: NT2 Analyst: LH

Analyzed: 12/09/2021 00:18

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0078-08 L

Preparation Batch: BJL0204

Sample Size: 10 mL

Prepared: 12/08/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	0.15	ug/L	J
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	111	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.4	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	97.0	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	99.2	%	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
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MW-54-20210312
21L0078-08 (Water)
Volatile Organic Compounds - SIM

Method: EPA 8260D-SIM

Sampled: 12/03/2021 12:34

Instrument: NT16 Analyst: KOTT

Analyzed: 12/10/2021 14:32

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap)

Extract ID: 21L0078-08 J

Preparation Batch: BJL0245

Sample Size: 10 mL

Prepared: 12/10/2021

Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl chloride	75-01-4	1	5.01	20.0	ND	ng/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	98.4	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	94.1	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				75-125 %	95.3	%	



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

MW-54-20210312

21L0078-08 (Water)

Semivolatile Organic Compounds

Method: EPA 8270E

Sampled: 12/03/2021 12:34

Instrument: NT10 Analyst: VTS

Analyzed: 12/13/2021 20:07

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJL0109
Prepared: 12/07/2021

Sample Size: 1000 mL
Final Volume: 1 mL

Extract ID: 21L0078-08 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
1,4-Dichlorobenzene	106-46-7	1	0.03	0.2	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.03	0.2	ND	ug/L	U
2,4-Dimethylphenol	105-67-9	1	0.3	1.0	ND	ug/L	U
Benzoic acid	65-85-0	1	0.1	2.0	ND	ug/L	U
N-Nitrosodiphenylamine	86-30-6	1	0.03	0.2	ND	ug/L	U
Pentachlorophenol	87-86-5	1	0.1	1.0	ND	ug/L	U
Di-n-Butylphthalate	84-74-2	1	0.05	0.2	ND	ug/L	U
Butylbenzylphthalate	85-68-7	1	0.07	0.2	ND	ug/L	U
bis(2-Ethylhexyl)phthalate	117-81-7	1	0.2	0.2	ND	ug/L	U

Surrogate: 2-Fluorophenol

30-160 % 47.0 %

Surrogate: Phenol-d5

30-160 % 25.6 % *

Surrogate: 2-Chlorophenol-d4

30-160 % 72.8 %

Surrogate: 1,2-Dichlorobenzene-d4

30-160 % 68.3 %

Surrogate: Nitrobenzene-d5

30-160 % 78.1 %

Surrogate: 2-Fluorobiphenyl

30-160 % 75.3 %

Surrogate: 2,4,6-Tribromophenol

30-160 % 79.0 %

Surrogate: p-Terphenyl-d14

30-160 % 85.5 % Q


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Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-08 (Water)
Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM

Sampled: 12/03/2021 12:34

Instrument: NT11 Analyst: VTS

Analyzed: 12/16/2021 22:59

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF	Sample Size: 500 mL	Extract ID: 21L0078-08 F 01
	Preparation Batch: BJL0177	Final Volume: 0.5 mL	
	Prepared: 12/09/2021		
Sample Cleanup:	Cleanup Method: Silica Gel	Initial Volume: 0.5 mL	Extract ID: 21L0078-08 F 01
	Cleanup Batch: CJL0089	Final Volume: 0.5 mL	
	Cleaned: 14-Dec-2021		

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Naphthalene	91-20-3	1	0.001	0.010	0.003	ug/L	J
2-Methylnaphthalene	91-57-6	1	0.001	0.010	0.002	ug/L	J
1-Methylnaphthalene	90-12-0	1	0.0009	0.010	0.001	ug/L	J
Acenaphthylene	208-96-8	1	0.002	0.010	ND	ug/L	U
Acenaphthene	83-32-9	1	0.003	0.010	ND	ug/L	U
Dibenzofuran	132-64-9	1	0.002	0.010	ND	ug/L	U
Fluorene	86-73-7	1	0.002	0.010	ND	ug/L	U
Phenanthrene	85-01-8	1	0.001	0.010	ND	ug/L	U
Anthracene	120-12-7	1	0.001	0.010	ND	ug/L	U
Carbazole	86-74-8	1	0.001	0.010	ND	ug/L	U
Fluoranthene	206-44-0	1	0.002	0.010	ND	ug/L	U
Pyrene	129-00-0	1	0.001	0.010	0.002	ug/L	J
Benzo(a)anthracene	56-55-3	1	0.0008	0.010	ND	ug/L	U
Chrysene	218-01-9	1	0.0009	0.010	0.002	ug/L	J
Benzo(b)fluoranthene	205-99-2	1	0.0005	0.010	0.001	ug/L	J
Benzo(k)fluoranthene	207-08-9	1	0.003	0.010	ND	ug/L	U
Benzo(j)fluoranthene	205-82-3	1	0.002	0.010	ND	ug/L	U
Benzo(a)pyrene	50-32-8	1	0.002	0.010	ND	ug/L	U
Perylene	1985-5-0	1	0.006	0.010	ND	ug/L	U
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.001	0.010	ND	ug/L	U
Dibenzo(a,h)anthracene	53-70-3	1	0.001	0.010	ND	ug/L	U
Benzo(g,h,i)perylene	191-24-2	1	0.001	0.010	ND	ug/L	U
<i>Surrogate: 2-Methylnaphthalene-d10</i>					42-120 %	77.4 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					29-120 %	79.6 %	
<i>Surrogate: Fluoranthene-d10</i>					57-120 %	90.1 %	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
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Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-08 (Water)
Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 12/03/2021 12:34

Instrument: FID4 Analyst: TWC

Analyzed: 12/16/2021 01:23

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21L0078-08 D 01

Preparation Batch: BJL0176

Sample Size: 475 mL

Prepared: 12/09/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.105	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.211	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			50-150 %	83.4	%	


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 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-08 (Water)
Aroclor PCB

Method: EPA 8082A

Sampled: 12/03/2021 12:34

Instrument: ECD7 Analyst: JGR

Analyzed: 12/14/2021 17:57

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJL0111 Prepared: 12/07/2021	Sample Size: 1000 mL Final Volume: 0.5 mL	Extract ID: 21L0078-08 B 01
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJL0092 Cleaned: 14-Dec-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL	Extract ID: 21L0078-08 B 01
Sample Cleanup:	Cleanup Method: Sulfuric Acid Cleanup Batch: CJL0090 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0078-08 B 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJL0091 Cleaned: 14-Dec-2021	Initial Volume: 0.5 uL Final Volume: 0.5 uL	Extract ID: 21L0078-08 B 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aroclor 1016	12674-11-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1221	11104-28-2	1	0.002	0.010	ND	ug/L	U
Aroclor 1232	11141-16-5	1	0.002	0.010	ND	ug/L	U
Aroclor 1242	53469-21-9	1	0.002	0.010	ND	ug/L	U
Aroclor 1248	12672-29-6	1	0.002	0.010	ND	ug/L	U
Aroclor 1254	11097-69-1	1	0.002	0.010	ND	ug/L	U
Aroclor 1260	11096-82-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1262	37324-23-5	1	0.003	0.010	ND	ug/L	U
Aroclor 1268	11100-14-4	1	0.003	0.010	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				29-120 %	82.5	%	
<i>Surrogate: Tetrachlorometaxylene</i>				32-120 %	62.3	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>				29-120 %	84.4	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				32-120 %	61.9	%	


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 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-08 (Water)
Metals and Metallic Compounds

Method: EPA 6020B

Sampled: 12/03/2021 12:34

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 21:54

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0078-08 C 01

Preparation Batch: BJL0294

Sample Size: 25 mL

Prepared: 12/14/2021

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium	7440-39-3	1	0.114	0.500	3.71	ug/L	
Chromium	7440-47-3	1	0.260	0.500	0.764	ug/L	
Iron	7439-89-6	1	18.2	36.0	23.5	ug/L	J
Lead	7439-92-1	1	0.0513	0.100	ND	ug/L	U
Manganese	7439-96-5	1	0.142	0.500	1.80	ug/L	
Silver	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium	7440-62-2	1	0.0556	0.200	5.37	ug/L	


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-08 (Water)
Metals and Metallic Compounds

Method: EPA 6020B UCT-KED

Sampled: 12/03/2021 12:34

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/14/2021 21:54

Analysis by: Analytical Resources, LLC

 Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
 Preparation Batch: BJL0294 Sample Size: 25 mL
 Prepared: 12/14/2021 Final Volume: 25 mL

Extract ID: 21L0078-08 C 01

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic	7440-38-2	1	0.0373	0.200	2.67	ug/L	
Cadmium	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt	7440-48-4	1	0.0178	0.200	0.0290	ug/L	J
Copper	7440-50-8	1	0.173	0.500	1.42	ug/L	
Nickel	7440-02-0	1	0.0792	0.500	0.513	ug/L	
Selenium	7782-49-2	1	0.179	0.500	1.59	ug/L	
Zinc	7440-66-6	1	2.92	6.00	ND	ug/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-08 (Water)
Metals and Metallic Compounds

Method: EPA 7470A

Sampled: 12/03/2021 12:34

Instrument: HYDRA Analyst: SKD

Analyzed: 12/20/2021 15:38

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0078-08 C

Preparation Batch: B JL0371

Sample Size: 20 mL

Prepared: 12/15/2021

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000013	0.000100	ND	mg/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-09 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B

Sampled: 12/03/2021 12:34

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/15/2021 20:56

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0078-09 A 02

Preparation Batch: BJL0365

Sample Size: 25 mL

Filtration Batch: BJL0147

Prepared: 12/15/2021

Final Volume: 25 mL

Filtration Date: 12/06/2021 16:45

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Barium, Dissolved	7440-39-3	1	0.114	0.500	3.51	ug/L	
Chromium, Dissolved	7440-47-3	1	0.260	0.500	0.612	ug/L	
Iron, Dissolved	7439-89-6	1	18.2	36.0	ND	ug/L	U
Lead, Dissolved	7439-92-1	1	0.0513	0.100	ND	ug/L	U
Manganese, Dissolved	7439-96-5	1	0.142	0.500	0.385	ug/L	J
Silver, Dissolved	7440-22-4	1	0.0220	0.200	ND	ug/L	U
Vanadium, Dissolved	7440-62-2	1	0.0556	0.200	4.86	ug/L	


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-09 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 6020B UCT-KED

Sampled: 12/03/2021 12:34

Instrument: ICPMS2 Analyst: MCB

Analyzed: 12/15/2021 20:56

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Extract ID: 21L0078-09 A 02

Preparation Batch: BJL0365

Sample Size: 25 mL

Filtration Batch: BJL0147

Prepared: 12/15/2021

Final Volume: 25 mL

Filtration Date: 12/06/2021 16:45

Analyte	CAS Number	Dilution	Detection	Reporting	Result	Units	Notes
			Limit	Limit			
Arsenic, Dissolved	7440-38-2	1	0.0373	0.200	2.66	ug/L	
Cadmium, Dissolved	7440-43-9	1	0.0300	0.100	ND	ug/L	U
Cobalt, Dissolved	7440-48-4	1	0.0178	0.200	0.0200	ug/L	J
Copper, Dissolved	7440-50-8	1	0.173	0.500	1.05	ug/L	
Nickel, Dissolved	7440-02-0	1	0.0792	0.500	0.440	ug/L	J
Selenium, Dissolved	7782-49-2	1	0.179	0.500	1.31	ug/L	
Zinc, Dissolved	7440-66-6	1	2.92	6.00	ND	ug/L	U


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

MW-54-20210312
21L0078-09 (Water)
Metals and Metallic Compounds (dissolved)

Method: EPA 7470A

Sampled: 12/03/2021 12:34

Instrument: HYDRA Analyst: SKD

Analyzed: 12/20/2021 16:10

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: TWM EPA 7470A

Extract ID: 21L0078-09 A 01

Preparation Batch: BJL0377

Sample Size: 20 mL

Filtration Batch: BJL0147

Prepared: 12/15/2021

Final Volume: 20 mL

Filtration Date: 12/06/2021 16:45

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury, Dissolved	7439-97-6	1	0.000013	0.000100	ND	mg/L	U



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BJJ0204 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0204-BLK2)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 15:47					
Vinyl Chloride	ND	0.08	0.20	ug/L							U
1,1-Dichloroethene	ND	0.08	0.20	ug/L							U
trans-1,2-Dichloroethene	ND	0.07	0.20	ug/L							U
cis-1,2-Dichloroethene	ND	0.08	0.20	ug/L							U
Benzene	ND	0.05	0.20	ug/L							U
Trichloroethene	ND	0.07	0.20	ug/L							U
Toluene	ND	0.05	0.20	ug/L							U
Tetrachloroethene	ND	0.09	0.20	ug/L							U
Ethylbenzene	ND	0.05	0.20	ug/L							U
m,p-Xylene	ND	0.14	0.40	ug/L							U
o-Xylene	ND	0.08	0.20	ug/L							U
Xylenes, total	ND	0.22	0.60	ug/L							U
<i>Surrogate: 1,2-Dichloroethane-d4</i>	5.26			ug/L	5.00		105	80-129			
<i>Surrogate: Toluene-d8</i>	4.86			ug/L	5.00		97.1	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.81			ug/L	5.00		96.2	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	5.05			ug/L	5.00		101	80-120			
LCS (BJL0204-BS2)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 14:02					
Vinyl Chloride	10.1	0.08	0.20	ug/L	10.0		101	66-133			
1,1-Dichloroethene	10.1	0.08	0.20	ug/L	10.0		101	69-135			
trans-1,2-Dichloroethene	9.63	0.07	0.20	ug/L	10.0		96.3	78-128			
cis-1,2-Dichloroethene	9.56	0.08	0.20	ug/L	10.0		95.6	80-121			
Benzene	9.71	0.05	0.20	ug/L	10.0		97.1	80-120			
Trichloroethene	9.88	0.07	0.20	ug/L	10.0		98.8	80-120			
Toluene	9.90	0.05	0.20	ug/L	10.0		99.0	80-120			
Tetrachloroethene	9.57	0.09	0.20	ug/L	10.0		95.7	80-120			
Ethylbenzene	9.56	0.05	0.20	ug/L	10.0		95.6	80-120			
m,p-Xylene	19.4	0.14	0.40	ug/L	20.0		97.0	80-121			
o-Xylene	9.54	0.08	0.20	ug/L	10.0		95.4	80-121			
Xylenes, total	28.9	0.22	0.60	ug/L	30.0		96.5	76-127			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	5.03			ug/L	5.00		101	80-129			
<i>Surrogate: Toluene-d8</i>	4.96			ug/L	5.00		99.3	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.99			ug/L	5.00		99.8	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	5.01			ug/L	5.00		100	80-120			


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - Quality Control
Batch BJJ0204 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJJ0204-BSD2)						Prepared: 08-Dec-2021 Analyzed: 08-Dec-2021 15:06					
Vinyl Chloride	9.86	0.08	0.20	ug/L	10.0		98.6	66-133	2.34	30	
1,1-Dichloroethene	9.80	0.08	0.20	ug/L	10.0		98.0	69-135	2.70	30	
trans-1,2-Dichloroethene	9.20	0.07	0.20	ug/L	10.0		92.0	78-128	4.55	30	
cis-1,2-Dichloroethene	9.17	0.08	0.20	ug/L	10.0		91.7	80-121	4.19	30	
Benzene	9.23	0.05	0.20	ug/L	10.0		92.3	80-120	5.00	30	
Trichloroethene	9.49	0.07	0.20	ug/L	10.0		94.9	80-120	3.98	30	
Toluene	9.35	0.05	0.20	ug/L	10.0		93.5	80-120	5.72	30	
Tetrachloroethene	9.17	0.09	0.20	ug/L	10.0		91.7	80-120	4.31	30	
Ethylbenzene	9.14	0.05	0.20	ug/L	10.0		91.4	80-120	4.45	30	
m,p-Xylene	18.5	0.14	0.40	ug/L	20.0		92.7	80-121	4.52	30	
o-Xylene	9.26	0.08	0.20	ug/L	10.0		92.6	80-121	3.02	30	
Xylenes, total	27.8	0.22	0.60	ug/L	30.0		92.7	76-127	4.02	30	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	5.34			ug/L	5.00		107	80-129			
<i>Surrogate: Toluene-d8</i>	4.91			ug/L	5.00		98.2	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	5.10			ug/L	5.00		102	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	5.03			ug/L	5.00		101	80-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - Quality Control
Batch BJL0242 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0242-BLK1)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 12:12								
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.90		ug/L	5.00		97.9	80-120			
Surrogate: 4-Bromofluorobenzene	4.75		ug/L	5.00		95.1	80-120			
LCS (BJL0242-BS1)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 10:27								
Gasoline Range Organics (Tol-Nap)	1110	100	ug/L	1000		111	72-128			
Surrogate: Toluene-d8	4.97		ug/L	5.00		99.5	80-120			
Surrogate: 4-Bromofluorobenzene	4.94		ug/L	5.00		98.8	80-120			
LCS Dup (BJL0242-BSD1)		Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 11:09								
Gasoline Range Organics (Tol-Nap)	1160	100	ug/L	1000		116	72-128	4.34	30	
Surrogate: Toluene-d8	5.00		ug/L	5.00		99.9	80-120			
Surrogate: 4-Bromofluorobenzene	4.88		ug/L	5.00		97.6	80-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Volatile Organic Compounds - SIM - Quality Control
Batch BJL0245 - EPA 5030C (Purge and Trap)

Instrument: NT16 Analyst: KOTT

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0245-BLK1)						Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 13:29					
Vinyl chloride	ND	5.01	20.0	ng/L							U
Surrogate: 1,2-Dichloroethane-d4	4810			ng/L	5000		96.2	80-129			
Surrogate: Toluene-d8	4790			ng/L	5000		95.9	80-120			
Surrogate: 4-Bromofluorobenzene	4840			ng/L	5000		96.9	75-125			
LCS (BJL0245-BS1)						Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 12:16					
Vinyl chloride	2300	5.01	20.0	ng/L	2000		115	62-141			
Surrogate: 1,2-Dichloroethane-d4	4790			ng/L	5000		95.7	80-129			
Surrogate: Toluene-d8	5020			ng/L	5000		100	80-120			
Surrogate: 4-Bromofluorobenzene	5100			ng/L	5000		102	75-125			
LCS Dup (BJL0245-BS1)						Prepared: 10-Dec-2021 Analyzed: 10-Dec-2021 12:37					
Vinyl chloride	1840	5.01	20.0	ng/L	2000		92.0	62-141	22.50	30	
Surrogate: 1,2-Dichloroethane-d4	4770			ng/L	5000		95.5	80-129			
Surrogate: Toluene-d8	4940			ng/L	5000		98.9	80-120			
Surrogate: 4-Bromofluorobenzene	5120			ng/L	5000		102	75-125			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BJJ0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0109-BLK1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 19:35					
1,4-Dichlorobenzene	ND	0.03	0.2	ug/L							U
1,2-Dichlorobenzene	ND	0.03	0.2	ug/L							U
2,4-Dimethylphenol	ND	0.3	1.0	ug/L							U
Benzoic acid	ND	0.1	2.0	ug/L							U
N-Nitrosodiphenylamine	ND	0.03	0.2	ug/L							U
Pentachlorophenol	ND	0.1	1.0	ug/L							U
Di-n-Butylphthalate	ND	0.05	0.2	ug/L							U
Butylbenzylphthalate	ND	0.07	0.2	ug/L							U
bis(2-Ethylhexyl)phthalate	ND	0.2	0.2	ug/L							U
Surrogate: 2-Fluorophenol	3.84			ug/L	7.50		51.2	30-160			
Surrogate: Phenol-d5	2.02			ug/L	7.50		26.9	30-160			*
Surrogate: 2-Chlorophenol-d4	6.56			ug/L	7.50		87.5	30-160			
Surrogate: 1,2-Dichlorobenzene-d4	3.73			ug/L	5.00		74.7	30-160			
Surrogate: Nitrobenzene-d5	4.32			ug/L	5.00		86.3	30-160			
Surrogate: 2-Fluorobiphenyl	3.87			ug/L	5.00		77.5	30-160			
Surrogate: 2,4,6-Tribromophenol	5.18			ug/L	7.50		69.1	30-160			
Surrogate: p-Terphenyl-d14	4.54			ug/L	5.00		90.8	30-160			
LCS (BJL0109-BS1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:13					
1,4-Dichlorobenzene	4.0	0.03	0.2	ug/L	5.00		79.6	30-160			
1,2-Dichlorobenzene	3.5	0.03	0.2	ug/L	5.00		70.0	30-160			
2,4-Dimethylphenol	11.5	0.3	1.0	ug/L	13.0		88.8	30-160			
Benzoic acid	6.4	0.1	2.0	ug/L	23.0		27.7	30-160			*, Q
N-Nitrosodiphenylamine	4.0	0.03	0.2	ug/L	5.00		79.9	30-160			
Pentachlorophenol	9.4	0.1	1.0	ug/L	13.0		72.2	30-160			
Di-n-Butylphthalate	4.7	0.05	0.2	ug/L	5.00		93.2	30-160			
Butylbenzylphthalate	4.4	0.07	0.2	ug/L	5.00		87.9	30-160			Q
bis(2-Ethylhexyl)phthalate	4.4	0.2	0.2	ug/L	5.00		87.9	30-160			
Surrogate: 2-Fluorophenol	4.42			ug/L	7.50		58.9	30-160			
Surrogate: Phenol-d5	2.67			ug/L	7.50		35.5	30-160			
Surrogate: 2-Chlorophenol-d4	6.61			ug/L	7.50		88.2	30-160			
Surrogate: 1,2-Dichlorobenzene-d4	3.82			ug/L	5.00		76.4	30-160			
Surrogate: Nitrobenzene-d5	4.71			ug/L	5.00		94.2	30-160			
Surrogate: 2-Fluorobiphenyl	4.30			ug/L	5.00		86.0	30-160			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - Quality Control
Batch BJL0109 - EPA 3510C SepF

Instrument: NT10 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0109-BS1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:13					
Surrogate: 2,4,6-Tribromophenol	6.55			ug/L	7.50		87.3	30-160			
Surrogate: p-Terphenyl-d14	4.76			ug/L	5.00		95.2	30-160			
LCS Dup (BJL0109-BSD1)						Prepared: 07-Dec-2021 Analyzed: 10-Dec-2021 20:50					
1,4-Dichlorobenzene	4.2	0.03	0.2	ug/L	5.00		83.0	30-160	4.19	30	
1,2-Dichlorobenzene	3.7	0.03	0.2	ug/L	5.00		73.2	30-160	4.57	30	
2,4-Dimethylphenol	11.2	0.3	1.0	ug/L	13.0		86.4	30-160	2.81	30	
Benzoic acid	6.2	0.1	2.0	ug/L	23.0		26.8	30-160	3.04	30	*, Q
N-Nitrosodiphenylamine	4.2	0.03	0.2	ug/L	5.00		84.6	30-160	5.81	30	
Pentachlorophenol	9.5	0.1	1.0	ug/L	13.0		73.0	30-160	1.12	30	
Di-n-Butylphthalate	4.9	0.05	0.2	ug/L	5.00		97.2	30-160	4.16	30	
Butylbenzylphthalate	4.7	0.07	0.2	ug/L	5.00		93.3	30-160	5.92	30	Q
bis(2-Ethylhexyl)phthalate	4.3	0.2	0.2	ug/L	5.00		86.8	30-160	1.23	30	
Surrogate: 2-Fluorophenol	4.47			ug/L	7.50		59.7	30-160			
Surrogate: Phenol-d5	2.56			ug/L	7.50		34.2	30-160			
Surrogate: 2-Chlorophenol-d4	6.51			ug/L	7.50		86.8	30-160			
Surrogate: 1,2-Dichlorobenzene-d4	3.78			ug/L	5.00		75.7	30-160			
Surrogate: Nitrobenzene-d5	4.51			ug/L	5.00		90.3	30-160			
Surrogate: 2-Fluorobiphenyl	4.11			ug/L	5.00		82.3	30-160			
Surrogate: 2,4,6-Tribromophenol	6.08			ug/L	7.50		81.0	30-160			
Surrogate: p-Terphenyl-d14	4.59			ug/L	5.00		91.7	30-160			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJJ0177 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0177-BLK1)						Prepared: 09-Dec-2021 Analyzed: 16-Dec-2021 19:59					
Naphthalene	0.002	0.001	0.010	ug/L							J
2-Methylnaphthalene	0.001	0.001	0.010	ug/L							J
1-Methylnaphthalene	ND	0.0009	0.010	ug/L							U
Acenaphthylene	ND	0.002	0.010	ug/L							U
Acenaphthene	ND	0.003	0.010	ug/L							U
Dibenzofuran	ND	0.002	0.010	ug/L							U
Fluorene	ND	0.002	0.010	ug/L							U
Phenanthrene	ND	0.001	0.010	ug/L							U
Anthracene	ND	0.001	0.010	ug/L							U
Carbazole	ND	0.001	0.010	ug/L							U
Fluoranthene	ND	0.002	0.010	ug/L							U
Pyrene	0.002	0.001	0.010	ug/L							J
Benzo(a)anthracene	ND	0.0008	0.010	ug/L							U
Chrysene	0.002	0.0009	0.010	ug/L							J
Benzo(b)fluoranthene	0.0008	0.0005	0.010	ug/L							J
Benzo(k)fluoranthene	ND	0.003	0.010	ug/L							U
Benzo(j)fluoranthene	ND	0.002	0.010	ug/L							U
Benzo(a)pyrene	ND	0.002	0.010	ug/L							U
Indeno(1,2,3-cd)pyrene	ND	0.001	0.010	ug/L							U
Dibenzo(a,h)anthracene	ND	0.001	0.010	ug/L							U
Benzo(g,h,i)perylene	ND	0.001	0.010	ug/L							U
Surrogate: 2-Methylnaphthalene-d10	0.216			ug/L	0.300		71.9	42-120			
Surrogate: Dibenzo[a,h]anthracene-d14	0.219			ug/L	0.300		73.1	29-120			
Surrogate: Fluoranthene-d10	0.244			ug/L	0.300		81.4	57-120			

LCS (BJL0177-BS1)						Prepared: 09-Dec-2021 Analyzed: 16-Dec-2021 20:29					
Naphthalene	0.201	0.001	0.010	ug/L	0.300		67.0	37-120			
2-Methylnaphthalene	0.209	0.001	0.010	ug/L	0.300		69.5	37-120			
1-Methylnaphthalene	0.208	0.0009	0.010	ug/L	0.300		69.2	29-120			
Acenaphthylene	0.201	0.002	0.010	ug/L	0.300		67.1	41-120			
Acenaphthene	0.201	0.003	0.010	ug/L	0.300		67.0	41-120			
Dibenzofuran	0.193	0.002	0.010	ug/L	0.300		64.5	38-120			
Fluorene	0.211	0.002	0.010	ug/L	0.300		70.4	43-120			


 Shannon & Wilson, Inc
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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJL0177 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0177-BS1)						Prepared: 09-Dec-2021 Analyzed: 16-Dec-2021 20:29					
Phenanthrene	0.209	0.001	0.010	ug/L	0.300		69.7	41-120			
Anthracene	0.202	0.001	0.010	ug/L	0.300		67.3	40-120			
Carbazole	0.222	0.001	0.010	ug/L	0.300		74.0	30-160			
Fluoranthene	0.221	0.002	0.010	ug/L	0.300		73.8	45-120			
Pyrene	0.225	0.001	0.010	ug/L	0.300		74.9	41-120			
Benzo(a)anthracene	0.222	0.0008	0.010	ug/L	0.300		74.1	42-120			
Chrysene	0.209	0.0009	0.010	ug/L	0.300		69.6	44-120			
Benzo(b)fluoranthene	0.215	0.0005	0.010	ug/L	0.300		71.6	44-120			
Benzo(k)fluoranthene	0.216	0.003	0.010	ug/L	0.300		72.0	50-120			
Benzo(j)fluoranthene	0.209	0.002	0.010	ug/L	0.300		69.6	39-160			
Benzofluoranthenes, Total	0.640	0.004	0.010	ug/L	0.900		71.1	46-120			
Benzo(a)pyrene	0.199	0.002	0.010	ug/L	0.300		66.2	35-120			
Perylene	0.198	0.006	0.010	ug/L	0.300		66.0	30-160			
Indeno(1,2,3-cd)pyrene	0.208	0.001	0.010	ug/L	0.300		69.4	37-120			
Dibenzo(a,h)anthracene	0.209	0.001	0.010	ug/L	0.300		69.5	34-120			
Benzo(g,h,i)perylene	0.199	0.001	0.010	ug/L	0.300		66.2	38-120			
Surrogate: 2-Methylnaphthalene-d10	0.223			ug/L	0.300		74.4	42-120			
Surrogate: Dibenzo[a,h]anthracene-d14	0.232			ug/L	0.300		77.3	29-120			
Surrogate: Fluoranthene-d10	0.247			ug/L	0.300		82.2	57-120			
LCS Dup (BJL0177-BSD1)						Prepared: 09-Dec-2021 Analyzed: 16-Dec-2021 20:59					
Naphthalene	0.225	0.001	0.010	ug/L	0.300		75.1	37-120	11.50	30	
2-Methylnaphthalene	0.235	0.001	0.010	ug/L	0.300		78.3	37-120	11.80	30	
1-Methylnaphthalene	0.231	0.0009	0.010	ug/L	0.300		77.1	29-120	10.80	30	
Acenaphthylene	0.226	0.002	0.010	ug/L	0.300		75.3	41-120	11.50	30	
Acenaphthene	0.227	0.003	0.010	ug/L	0.300		75.5	41-120	12.00	30	
Dibenzofuran	0.219	0.002	0.010	ug/L	0.300		73.1	38-120	12.50	30	
Fluorene	0.241	0.002	0.010	ug/L	0.300		80.5	43-120	13.40	30	
Phenanthrene	0.237	0.001	0.010	ug/L	0.300		79.2	41-120	12.70	30	
Anthracene	0.234	0.001	0.010	ug/L	0.300		77.9	40-120	14.60	30	
Carbazole	0.254	0.001	0.010	ug/L	0.300		84.7	30-160	13.50	30	
Fluoranthene	0.252	0.002	0.010	ug/L	0.300		84.1	45-120	13.00	30	
Pyrene	0.259	0.001	0.010	ug/L	0.300		86.2	41-120	14.00	30	
Benzo(a)anthracene	0.255	0.0008	0.010	ug/L	0.300		85.1	42-120	13.70	30	
Chrysene	0.238	0.0009	0.010	ug/L	0.300		79.4	44-120	13.10	30	


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Semivolatile Organic Compounds - SIM - Quality Control
Batch BJL0177 - EPA 3510C SepF

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJL0177-BS01)						Prepared: 09-Dec-2021 Analyzed: 16-Dec-2021 20:59					
Benzo(b)fluoranthene	0.244	0.0005	0.010	ug/L	0.300		81.3	44-120	12.60	30	
Benzo(k)fluoranthene	0.247	0.003	0.010	ug/L	0.300		82.4	50-120	13.50	30	
Benzo(j)fluoranthene	0.241	0.002	0.010	ug/L	0.300		80.3	39-160	14.30	30	
Benzo(a)fluoranthene, Total	0.732	0.004	0.010	ug/L	0.900		81.3	46-120	13.50	30	
Benzo(a)pyrene	0.230	0.002	0.010	ug/L	0.300		76.7	35-120	14.70	30	
Perylene	0.226	0.006	0.010	ug/L	0.300		75.2	30-160	13.10	30	
Indeno(1,2,3-cd)pyrene	0.234	0.001	0.010	ug/L	0.300		78.0	37-120	11.60	30	
Dibenzo(a,h)anthracene	0.236	0.001	0.010	ug/L	0.300		78.5	34-120	12.20	30	
Benzo(g,h,i)perylene	0.223	0.001	0.010	ug/L	0.300		74.2	38-120	11.40	30	
<i>Surrogate: 2-Methylnaphthalene-d10</i>	0.239			ug/L	0.300		79.5	42-120			
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>	0.250			ug/L	0.300		83.4	29-120			
<i>Surrogate: Fluoranthene-d10</i>	0.268			ug/L	0.300		89.3	57-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Petroleum Hydrocarbons - Quality Control
Batch BJL0176 - EPA 3510C SepF

Instrument: FID4 Analyst: TWC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0176-BLK1)									
				Prepared: 09-Dec-2021 Analyzed: 15-Dec-2021 23:27					
Diesel Range Organics (C12-C24)	ND	0.100	mg/L						U
Motor Oil Range Organics (C24-C38)	ND	0.200	mg/L						U
<i>Surrogate: o-Terphenyl</i>	0.194		mg/L	0.225	86.1	50-150			
LCS (BJL0176-BS1)									
				Prepared: 09-Dec-2021 Analyzed: 15-Dec-2021 23:46					
Diesel Range Organics (C12-C24)	2.52	0.100	mg/L	3.00	84.1	56-120			
<i>Surrogate: o-Terphenyl</i>	0.231		mg/L	0.225	103	50-150			
LCS Dup (BJL0176-BSD1)									
				Prepared: 09-Dec-2021 Analyzed: 16-Dec-2021 00:05					
Diesel Range Organics (C12-C24)	2.38	0.100	mg/L	3.00	79.4	56-120	5.68	30	
<i>Surrogate: o-Terphenyl</i>	0.211		mg/L	0.225	94.0	50-150			



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC

Aroclor PCB - Quality Control

Batch BJJ0111 - EPA 3510C SepF

Instrument: ECD7 Analyst: JGR

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0111-BLK1)											
						Prepared: 07-Dec-2021 Analyzed: 14-Dec-2021 14:26					
Aroclor 1016	ND	0.002	0.010	ug/L							U
Aroclor 1221	ND	0.002	0.010	ug/L							U
Aroclor 1232	ND	0.002	0.010	ug/L							U
Aroclor 1242	ND	0.002	0.010	ug/L							U
Aroclor 1248	ND	0.002	0.010	ug/L							U
Aroclor 1254	ND	0.002	0.010	ug/L							U
Aroclor 1260	ND	0.003	0.010	ug/L							U
Aroclor 1262	ND	0.003	0.010	ug/L							U
Aroclor 1268	ND	0.003	0.010	ug/L							U
Surrogate: Decachlorobiphenyl	0.0159			ug/L	0.0200		79.4	29-120			
Surrogate: Tetrachlorometaxylene	0.0121			ug/L	0.0200		60.4	32-120			
Surrogate: Decachlorobiphenyl [2C]	0.0166			ug/L	0.0200		82.8	29-120			
Surrogate: Tetrachlorometaxylene [2C]	0.0119			ug/L	0.0200		59.4	32-120			
LCS (BJL0111-BS1)											
						Prepared: 07-Dec-2021 Analyzed: 14-Dec-2021 14:47					
Aroclor 1016 [2C]	0.039	0.002	0.010	ug/L	0.0500		78.6	54-120			
Aroclor 1260	0.038	0.003	0.010	ug/L	0.0500		75.5	51-128			
Surrogate: Decachlorobiphenyl	0.0151			ug/L	0.0200		75.3	29-120			
Surrogate: Tetrachlorometaxylene	0.0116			ug/L	0.0200		57.8	32-120			
Surrogate: Decachlorobiphenyl [2C]	0.0156			ug/L	0.0200		78.1	29-120			
Surrogate: Tetrachlorometaxylene [2C]	0.0115			ug/L	0.0200		57.7	32-120			
LCS Dup (BJL0111-BSD1)											
						Prepared: 07-Dec-2021 Analyzed: 14-Dec-2021 15:08					
Aroclor 1016 [2C]	0.041	0.002	0.010	ug/L	0.0500		82.1	54-120	4.27	30	
Aroclor 1260	0.042	0.003	0.010	ug/L	0.0500		85.0	51-128	11.80	30	
Surrogate: Decachlorobiphenyl	0.0175			ug/L	0.0200		87.3	29-120			
Surrogate: Tetrachlorometaxylene	0.0120			ug/L	0.0200		60.0	32-120			
Surrogate: Decachlorobiphenyl [2C]	0.0173			ug/L	0.0200		86.4	29-120			
Surrogate: Tetrachlorometaxylene [2C]	0.0119			ug/L	0.0200		59.7	32-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJJ0294 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0294-BLK1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:53						
Barium	135	ND	0.114	0.500	ug/L							U
Barium	137	ND	0.0765	0.500	ug/L							U
Chromium	52	ND	0.260	0.500	ug/L							U
Chromium	53	ND	0.239	0.500	ug/L							U
Iron	54	ND	18.2	36.0	ug/L							U
Iron	57	ND	6.63	36.0	ug/L							U
Lead	208	ND	0.0513	0.100	ug/L							U
Manganese	55	ND	0.142	0.500	ug/L							U
Silver	107	ND	0.0220	0.200	ug/L							U
Vanadium	51a	ND	0.0556	0.200	ug/L							U
Vanadium	51b	ND	0.0521	0.200	ug/L							U
Arsenic	75a	ND	0.0373	0.200	ug/L							U
Cadmium	111	ND	0.0300	0.100	ug/L							U
Cadmium	114	ND	0.0400	0.100	ug/L							U
Cobalt	59	ND	0.0178	0.200	ug/L							U
Copper	63	ND	0.173	0.500	ug/L							U
Copper	65	ND	0.350	0.500	ug/L							U
Nickel	60	ND	0.0792	0.500	ug/L							U
Nickel	62	ND	0.220	0.500	ug/L							U
Selenium	78	ND	0.179	0.500	ug/L							U
Zinc	66	ND	2.92	6.00	ug/L							U
Zinc	67	ND	0.940	6.00	ug/L							U
LCS (BJL0294-BS1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:58						
Barium	135	24.7	0.114	0.500	ug/L	25.0		98.8	80-120			
Barium	137	24.4	0.0765	0.500	ug/L	25.0		97.8	80-120			
Chromium	52	25.3	0.260	0.500	ug/L	25.0		101	80-120			
Chromium	53	24.8	0.239	0.500	ug/L	25.0		99.0	80-120			
Iron	54	4850	18.2	36.0	ug/L	5000		96.9	80-120			
Iron	57	4880	6.63	36.0	ug/L	5000		97.6	80-120			
Lead	208	25.8	0.0513	0.100	ug/L	25.0		103	80-120			
Manganese	55	24.1	0.142	0.500	ug/L	25.0		96.2	80-120			
Silver	107	25.5	0.0220	0.200	ug/L	25.0		102	80-120			
Vanadium	51a	24.7	0.0556	0.200	ug/L	25.0		98.6	80-120			
Vanadium	51b	24.5	0.0521	0.200	ug/L	25.0		98.0	80-120			


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 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0294 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0294-BS1)						Prepared: 13-Dec-2021 Analyzed: 14-Dec-2021 17:58						
Arsenic	75a	24.7	0.0373	0.200	ug/L	25.0		98.8	80-120			
Cadmium	111	24.6	0.0300	0.100	ug/L	25.0		98.3	80-120			
Cadmium	114	24.6	0.0400	0.100	ug/L	25.0		98.5	80-120			
Cobalt	59	24.3	0.0178	0.200	ug/L	25.0		97.3	80-120			
Copper	63	24.8	0.173	0.500	ug/L	25.0		99.3	80-120			
Copper	65	25.1	0.350	0.500	ug/L	25.0		101	80-120			
Nickel	60	24.2	0.0792	0.500	ug/L	25.0		96.7	80-120			
Nickel	62	24.5	0.220	0.500	ug/L	25.0		98.0	80-120			
Selenium	78	78.5	0.179	0.500	ug/L	80.0		98.1	80-120			
Zinc	66	79.0	2.92	6.00	ug/L	80.0		98.8	80-120			
Zinc	67	72.8	0.940	6.00	ug/L	80.0		91.0	80-120			


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds - Quality Control
Batch BJL0371 - TWM EPA 7470A

Instrument: HYDRA Analyst: SKD

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0371-BLK1)					Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:10					
Mercury	ND	0.000013	0.000100	mg/L						U
LCS (BJL0371-BS1)					Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 15:12					
Mercury	0.00187	0.000013	0.000100	mg/L	0.00200		93.5 80-120			


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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0365 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0365-BLK1)						Prepared: 15-Dec-2021 Analyzed: 15-Dec-2021 17:54						
Barium, Dissolved	135	ND	0.114	0.500	ug/L							U
Barium, Dissolved	137	ND	0.0765	0.500	ug/L							U
Chromium, Dissolved	52	ND	0.260	0.500	ug/L							U
Chromium, Dissolved	53	ND	0.239	0.500	ug/L							U
Iron, Dissolved	54	ND	18.2	36.0	ug/L							U
Iron, Dissolved	57	ND	18.2	36.0	ug/L							U
Lead, Dissolved	208	ND	0.0513	0.100	ug/L							U
Manganese, Dissolved	55	ND	0.142	0.500	ug/L							U
Silver, Dissolved	107	ND	0.0220	0.200	ug/L							U
Vanadium, Dissolved	51a	ND	0.0556	0.200	ug/L							U
Vanadium, Dissolved	51b	ND	0.0521	0.200	ug/L							U
Arsenic, Dissolved	75a	ND	0.0373	0.200	ug/L							U
Cadmium, Dissolved	111	ND	0.0300	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.0400	0.100	ug/L							U
Cobalt, Dissolved	59	ND	0.0178	0.200	ug/L							U
Copper, Dissolved	63	ND	0.173	0.500	ug/L							U
Copper, Dissolved	65	ND	0.350	0.500	ug/L							U
Nickel, Dissolved	60	ND	0.0792	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.220	0.500	ug/L							U
Selenium, Dissolved	78	ND	0.179	0.500	ug/L							U
Zinc, Dissolved	66	ND	2.92	6.00	ug/L							U
Zinc, Dissolved	67	ND	0.940	6.00	ug/L							U
LCS (BJL0365-BS1)						Prepared: 15-Dec-2021 Analyzed: 15-Dec-2021 17:59						
Barium, Dissolved	135	23.7	0.114	0.500	ug/L	25.0		94.6	80-120			
Barium, Dissolved	137	23.8	0.0765	0.500	ug/L	25.0		95.2	80-120			
Chromium, Dissolved	52	23.5	0.260	0.500	ug/L	25.0		94.1	80-120			
Chromium, Dissolved	53	23.0	0.239	0.500	ug/L	25.0		92.0	80-120			
Iron, Dissolved	54	4850	18.2	36.0	ug/L	5000		96.9	80-120			
Iron, Dissolved	57	4890	18.2	36.0	ug/L	5000		97.8	80-120			
Lead, Dissolved	208	25.0	0.0513	0.100	ug/L	25.0		99.9	80-120			
Manganese, Dissolved	55	22.6	0.142	0.500	ug/L	25.0		90.5	80-120			
Silver, Dissolved	107	25.0	0.0220	0.200	ug/L	25.0		100	80-120			
Vanadium, Dissolved	51a	22.5	0.0556	0.200	ug/L	25.0		90.0	80-120			
Vanadium, Dissolved	51b	22.4	0.0521	0.200	ug/L	25.0		89.5	80-120			


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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0365 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJL0365-BS1)						Prepared: 15-Dec-2021 Analyzed: 15-Dec-2021 17:59						
Arsenic, Dissolved	75a	23.4	0.0373	0.200	ug/L	25.0		93.8	80-120			
Cadmium, Dissolved	111	23.6	0.0300	0.100	ug/L	25.0		94.2	80-120			
Cadmium, Dissolved	114	24.1	0.0400	0.100	ug/L	25.0		96.5	80-120			
Cobalt, Dissolved	59	24.7	0.0178	0.200	ug/L	25.0		99.0	80-120			
Copper, Dissolved	63	24.4	0.173	0.500	ug/L	25.0		97.5	80-120			
Copper, Dissolved	65	24.8	0.350	0.500	ug/L	25.0		99.0	80-120			
Nickel, Dissolved	60	24.7	0.0792	0.500	ug/L	25.0		98.8	80-120			
Nickel, Dissolved	62	24.3	0.220	0.500	ug/L	25.0		97.2	80-120			
Selenium, Dissolved	78	73.8	0.179	0.500	ug/L	80.0		92.2	80-120			
Zinc, Dissolved	66	76.6	2.92	6.00	ug/L	80.0		95.8	80-120			
Zinc, Dissolved	67	71.1	0.940	6.00	ug/L	80.0		88.9	80-120			
Duplicate (BJL0365-DUP1)						Source: 21L0078-09 Prepared: 15-Dec-2021 Analyzed: 15-Dec-2021 21:01						
Barium, Dissolved	135	3.41	0.114	0.500	ug/L		3.51			2.77	20	
Chromium, Dissolved	52	0.695	0.260	0.500	ug/L		0.612			12.70	20	
Iron, Dissolved	54	ND	18.2	36.0	ug/L		ND					U
Lead, Dissolved	208	ND	0.0513	0.100	ug/L		ND					U
Manganese, Dissolved	55	0.382	0.142	0.500	ug/L		0.385			0.78	20	J
Silver, Dissolved	107	ND	0.0220	0.200	ug/L		ND					U
Vanadium, Dissolved	51a	4.90	0.0556	0.200	ug/L		4.86			0.82	20	
Arsenic, Dissolved	75a	2.57	0.0373	0.200	ug/L		2.66			3.75	20	
Cadmium, Dissolved	111	ND	0.0300	0.100	ug/L		ND					U
Cobalt, Dissolved	59	0.0280	0.0178	0.200	ug/L		0.0200			33.30	20	L, J
Copper, Dissolved	63	1.04	0.173	0.500	ug/L		1.05			0.87	20	
Nickel, Dissolved	60	0.415	0.0792	0.500	ug/L		0.440			5.85	20	J
Selenium, Dissolved	78	1.26	0.179	0.500	ug/L		1.31			4.28	20	
Zinc, Dissolved	66	ND	2.92	6.00	ug/L		ND					U
Matrix Spike (BJL0365-MS1)						Source: 21L0078-09 Prepared: 15-Dec-2021 Analyzed: 15-Dec-2021 21:06						
Barium, Dissolved	135	28.1	0.114	0.500	ug/L	25.0	3.51	98.5	75-125			
Chromium, Dissolved	52	21.2	0.260	0.500	ug/L	25.0	0.612	82.2	75-125			
Iron, Dissolved	54	4390	18.2	36.0	ug/L	5000	ND	87.8	75-125			
Lead, Dissolved	208	24.9	0.0513	0.100	ug/L	25.0	ND	99.7	75-125			
Manganese, Dissolved	55	19.7	0.142	0.500	ug/L	25.0	0.385	77.5	75-125			
Silver, Dissolved	107	23.9	0.0220	0.200	ug/L	25.0	ND	95.4	75-125			


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0365 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Matrix Spike (BJL0365-MS1)		Source: 21L0078-09			Prepared: 15-Dec-2021 Analyzed: 15-Dec-2021 21:06							
Vanadium, Dissolved	51a	24.9	0.0556	0.200	ug/L	25.0	4.86	80.0	75-125			
Arsenic, Dissolved	75a	26.6	0.0373	0.200	ug/L	25.0	2.66	95.9	75-125			
Cadmium, Dissolved	111	22.9	0.0300	0.100	ug/L	25.0	ND	91.6	75-125			
Cobalt, Dissolved	59	25.0	0.0178	0.200	ug/L	25.0	0.0200	99.9	75-125			
Copper, Dissolved	63	25.4	0.173	0.500	ug/L	25.0	1.05	97.6	75-125			
Nickel, Dissolved	60	24.6	0.0792	0.500	ug/L	25.0	0.440	96.7	75-125			
Selenium, Dissolved	78	74.2	0.179	0.500	ug/L	80.0	1.31	91.1	75-125			
Zinc, Dissolved	66	72.5	2.92	6.00	ug/L	80.0	ND	90.7	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJL0365-MSD1)		Source: 21L0078-09			Prepared: 15-Dec-2021 Analyzed: 15-Dec-2021 21:13							
Barium, Dissolved	135	28.1	0.114	0.500	ug/L	25.0	3.51	98.3	75-125	0.25	20	
Chromium, Dissolved	52	21.0	0.260	0.500	ug/L	25.0	0.612	81.6	75-125	0.81	20	
Iron, Dissolved	54	4310	18.2	36.0	ug/L	5000	ND	86.3	75-125	1.75	20	
Lead, Dissolved	208	24.8	0.0513	0.100	ug/L	25.0	ND	99.2	75-125	0.50	20	
Manganese, Dissolved	55	20.1	0.142	0.500	ug/L	25.0	0.385	78.7	75-125	1.52	20	
Silver, Dissolved	107	23.6	0.0220	0.200	ug/L	25.0	ND	94.3	75-125	1.15	20	
Vanadium, Dissolved	51a	24.8	0.0556	0.200	ug/L	25.0	4.86	79.9	75-125	0.13	20	
Arsenic, Dissolved	75a	26.0	0.0373	0.200	ug/L	25.0	2.66	93.3	75-125	2.47	20	
Cadmium, Dissolved	111	23.2	0.0300	0.100	ug/L	25.0	ND	92.9	75-125	1.36	20	
Cobalt, Dissolved	59	24.0	0.0178	0.200	ug/L	25.0	0.0200	95.8	75-125	4.16	20	
Copper, Dissolved	63	24.4	0.173	0.500	ug/L	25.0	1.05	93.5	75-125	4.12	20	
Nickel, Dissolved	60	24.2	0.0792	0.500	ug/L	25.0	0.440	95.0	75-125	1.76	20	
Selenium, Dissolved	78	71.7	0.179	0.500	ug/L	80.0	1.31	88.0	75-125	3.45	20	
Zinc, Dissolved	66	69.9	2.92	6.00	ug/L	80.0	ND	87.4	75-125	3.67	20	

Recovery limits for target analytes in MS/MSD QC samples are advisory only.


 Shannon & Wilson, Inc
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 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Analysis by: Analytical Resources, LLC
Metals and Metallic Compounds (dissolved) - Quality Control
Batch BJL0377 - TWM EPA 7470A

Instrument: HYDRA Analyst: SKD

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJL0377-BLK1)						Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 16:05					
Mercury, Dissolved	ND	0.000013	0.000100	mg/L							U
LCS (BJL0377-BS1)						Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 16:08					
Mercury, Dissolved	0.00180	0.000013	0.000100	mg/L	0.00200		90.0	80-120			
Duplicate (BJL0377-DUP1)						Source: 21L0078-09 Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 16:12					
Mercury, Dissolved	ND	0.000013	0.000100	mg/L		ND					U
Matrix Spike (BJL0377-MS1)						Source: 21L0078-09 Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 16:15					
Mercury, Dissolved	0.000903	0.000013	0.000100	mg/L	0.00100	ND	90.3	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Matrix Spike Dup (BJL0377-MSD1)						Source: 21L0078-09 Prepared: 15-Dec-2021 Analyzed: 20-Dec-2021 16:17					
Mercury, Dissolved	0.000926	0.000013	0.000100	mg/L	0.00100	ND	92.6	75-125	2.47	20	
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											



Analytical Report

Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
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Certified Analyses included in this Report

Analyte	Certifications
<i>EPA 6020B in Water</i>	
Silver-107	WADOE,WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
Silver-107	WA-DW,DoD-ELAP,NELAP
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-52	NELAP,WADOE,DoD-ELAP,ADEC
Chromium-53	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
Lead-208	NELAP,WADOE,DoD-ELAP,ADEC
Vanadium-51a	NELAP,DoD-ELAP,WADOE,ADEC
Vanadium-51b	NELAP,DoD-ELAP,WADOE,ADEC
<i>EPA 6020B UCT-KED in Water</i>	
Arsenic-75a	WADOE,WA-DW,DoD-ELAP,ADEC,NELAP
Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Cobalt-59	NELAP,DoD-ELAP,WADOE
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	WADOE,WA-DW,DoD-ELAP
Zinc-67	WADOE,WA-DW,DoD-ELAP
Arsenic-75a	NELAP,WADOE,DoD-ELAP,ADEC


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Cadmium-111	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium-114	NELAP,WADOE,DoD-ELAP,ADEC
Cobalt-59	DoD-ELAP,NELAP,WADOE
Copper-63	NELAP,WADOE,DoD-ELAP
Copper-65	NELAP,WADOE,DoD-ELAP
Nickel-60	NELAP,WADOE,DoD-ELAP,ADEC
Nickel-62	NELAP,WADOE,DoD-ELAP,ADEC
Selenium-78	NELAP,WADOE,DoD-ELAP
Zinc-66	NELAP,WADOE,DoD-ELAP
Zinc-67	NELAP,WADOE,DoD-ELAP

EPA 7470A in Water

Mercury	WADOE,NELAP,DoD-ELAP
Mercury	WADOE,NELAP,DoD-ELAP

EPA 8082A in Water

Aroclor 1016	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1016 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1221 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1232 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1242 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1248 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1254 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1260 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1262 [2C]	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268	WADOE,DoD-ELAP,NELAP,ADEC
Aroclor 1268 [2C]	WADOE,DoD-ELAP,NELAP,ADEC

EPA 8260D in Water

Chloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,WADOE


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Acrolein	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Iodomethane	DoD-ELAP,NELAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Butanone	DoD-ELAP,NELAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE


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m,p-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
Styrene	DoD-ELAP,NELAP,WADOE
Bromoform	DoD-ELAP,NELAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE

EPA 8260D-SIM in Water

Acrylonitrile	NELAP,WADOE
Vinyl chloride	NELAP,WADOE
1,1-Dichloroethene	NELAP,WADOE
cis-1,2-Dichloroethene	NELAP,WADOE
trans-1,2-Dichloroethene	NELAP,WADOE
Trichloroethene	NELAP,WADOE
Tetrachloroethene	NELAP,WADOE
1,1,2,2-Tetrachloroethane	NELAP,WADOE


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1,2-Dichloroethane

NELAP,WADOE

Benzene

NELAP,WADOE

EPA 8270E in Water

Phenol

NELAP,DoD-ELAP

bis(2-chloroethyl) ether

NELAP,DoD-ELAP

2-Chlorophenol

NELAP,DoD-ELAP

1,3-Dichlorobenzene

NELAP,DoD-ELAP

1,4-Dichlorobenzene

NELAP,DoD-ELAP

1,2-Dichlorobenzene

NELAP,DoD-ELAP

Benzyl Alcohol

NELAP,DoD-ELAP

2,2'-Oxybis(1-chloropropane)

NELAP,DoD-ELAP

2-Methylphenol

NELAP,DoD-ELAP

Hexachloroethane

NELAP,DoD-ELAP

N-Nitroso-di-n-Propylamine

NELAP,DoD-ELAP

4-Methylphenol

NELAP,DoD-ELAP

Nitrobenzene

NELAP,DoD-ELAP

Isophorone

NELAP,DoD-ELAP

2-Nitrophenol

NELAP,DoD-ELAP

2,4-Dimethylphenol

NELAP,DoD-ELAP

Bis(2-Chloroethoxy)methane

NELAP,DoD-ELAP

2,4-Dichlorophenol

NELAP,DoD-ELAP

1,2,4-Trichlorobenzene

NELAP,DoD-ELAP

Naphthalene

NELAP,DoD-ELAP

Benzoic acid

NELAP,DoD-ELAP

4-Chloroaniline

NELAP,DoD-ELAP

Hexachlorobutadiene

NELAP,DoD-ELAP

4-Chloro-3-Methylphenol

NELAP,DoD-ELAP

2-Methylnaphthalene

NELAP,DoD-ELAP

Hexachlorocyclopentadiene

NELAP,DoD-ELAP

2,4,6-Trichlorophenol

NELAP,DoD-ELAP

2,4,5-Trichlorophenol

NELAP,DoD-ELAP

2-Chloronaphthalene

NELAP,DoD-ELAP

2-Nitroaniline

NELAP,DoD-ELAP

Acenaphthylene

NELAP,DoD-ELAP

Dimethylphthalate

NELAP,DoD-ELAP

2,6-Dinitrotoluene

NELAP,DoD-ELAP

Acenaphthene

NELAP,DoD-ELAP

3-Nitroaniline

NELAP,DoD-ELAP

2,4-Dinitrophenol

NELAP,DoD-ELAP


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Dibenzofuran	NELAP,DoD-ELAP
4-Nitrophenol	NELAP,DoD-ELAP
2,4-Dinitrotoluene	NELAP,DoD-ELAP
Fluorene	NELAP,DoD-ELAP
4-Chlorophenylphenyl ether	NELAP,DoD-ELAP
Diethyl phthalate	NELAP,DoD-ELAP
4-Nitroaniline	NELAP,DoD-ELAP
4,6-Dinitro-2-methylphenol	NELAP,DoD-ELAP
N-Nitrosodiphenylamine	NELAP,DoD-ELAP
4-Bromophenyl phenyl ether	NELAP,DoD-ELAP
Hexachlorobenzene	NELAP,DoD-ELAP
Pentachlorophenol	NELAP,DoD-ELAP
Phenanthrene	NELAP,DoD-ELAP
Anthracene	NELAP,DoD-ELAP
Carbazole	NELAP,DoD-ELAP
Di-n-Butylphthalate	NELAP,DoD-ELAP
Fluoranthene	NELAP,DoD-ELAP
Pyrene	NELAP,DoD-ELAP
Butylbenzylphthalate	NELAP,DoD-ELAP
Benzo(a)anthracene	NELAP,DoD-ELAP
3,3'-Dichlorobenzidine	NELAP,DoD-ELAP
Chrysene	NELAP,DoD-ELAP
bis(2-Ethylhexyl)phthalate	NELAP,DoD-ELAP
Di-n-Octylphthalate	NELAP,DoD-ELAP
Benzo(b)fluoranthene	NELAP,DoD-ELAP
Benzo(k)fluoranthene	NELAP,DoD-ELAP
Benzo(a)fluoranthene, Total	NELAP
Benzo(a)pyrene	NELAP,DoD-ELAP
Indeno(1,2,3-cd)pyrene	NELAP,DoD-ELAP
Dibenzo(a,h)anthracene	NELAP,DoD-ELAP
Benzo(g,h,i)perylene	NELAP,DoD-ELAP
N-Nitrosodimethylamine	NELAP,DoD-ELAP
1-Methylnaphthalene	NELAP,DoD-ELAP

EPA 8270E-SIM in Water

Naphthalene	ADEC,DoD-ELAP,NELAP,WADOE
2-Methylnaphthalene	ADEC,DoD-ELAP,NELAP
1-Methylnaphthalene	ADEC,DoD-ELAP,NELAP,WADOE
Biphenyl	NELAP
Acenaphthylene	ADEC,DoD-ELAP,NELAP,WADOE


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

 Project: Lower Duwamish Q4
 Project Number: 21-1-12596-012
 Project Manager: Meg Strong

Reported:
 22-Dec-2021 13:10

Acenaphthene	ADEC, DoD-ELAP, NELAP, WADOE
Dibenzofuran	ADEC, DoD-ELAP, NELAP
Fluorene	ADEC, DoD-ELAP, NELAP, WADOE
Phenanthrene	ADEC, DoD-ELAP, NELAP, WADOE
Anthracene	ADEC, DoD-ELAP, NELAP, WADOE
Carbazole	NELAP
Fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Pyrene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(a)anthracene	ADEC, DoD-ELAP, NELAP, WADOE
Chrysene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(b)fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(k)fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(j)fluoranthene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(e)pyrene	NELAP
Benzo(a)pyrene	ADEC, DoD-ELAP, NELAP, WADOE
Perylene	ADEC, NELAP
Indeno(1,2,3-cd)pyrene	ADEC, DoD-ELAP, NELAP, WADOE
Dibenzo(a,h)anthracene	ADEC, DoD-ELAP, NELAP, WADOE
Benzo(g,h,i)perylene	ADEC, DoD-ELAP, NELAP, WADOE

NWTPH-Dx in Water

Diesel Range Organics (C12-C24)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C10-C25)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (Tol-C18)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C10-C24)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C10-C28)	DoD-ELAP, NELAP, WADOE
Diesel Range Organics (C12-C22)	DoD-ELAP
Diesel Range Organics (C12-C25)	DoD-ELAP
Motor Oil Range Organics (C24-C38)	DoD-ELAP, NELAP, WADOE
Motor Oil Range Organics (C25-C36)	DoD-ELAP, NELAP, WADOE
Motor Oil Range Organics (C24-C40)	DoD-ELAP, NELAP, WADOE
Residual Range Organics (C23-C32)	DoD-ELAP
Mineral Spirits Range Organics (Tol-C12)	DoD-ELAP, NELAP, WADOE
Mineral Oil Range Organics (C16-C28)	DoD-ELAP, NELAP, WADOE
Kerosene Range Organics (Tol-C18)	DoD-ELAP, NELAP, WADOE
JP8 Range Organics (C8-C18)	DoD-ELAP, NELAP, WADOE
JP5 Range Organics (C10-C16)	DoD-ELAP, NELAP, WADOE
JP4 Range Organics (Tol-C14)	DoD-ELAP, NELAP, WADOE
Jet-A Range Organics (C10-C18)	DoD-ELAP, NELAP, WADOE
Creosote Range Organics (C12-C22)	DoD-ELAP, NELAP, WADOE


 Shannon & Wilson, Inc
 400 N 34th St., Suite 100
 Seattle WA, 98103-8636

Project: Lower Duwamish Q4

Project Number: 21-1-12596-012

Project Manager: Meg Strong

Reported:

22-Dec-2021 13:10

Bunker C Range Organics (C10-C38)	DoD-ELAP,NELAP,WADOE
Stoddard Range Organics (C8-C12)	DoD-ELAP,NELAP,WADOE
Transformer Oil Range Organics (C12-C28)	DoD-ELAP,NELAP,WADOE

NWTPHg in Water

Gasoline Range Organics (Tol-Nap)	WADOE,DoD-ELAP
Gasoline Range Organics (2MP-TMB)	WADOE,DoD-ELAP
Gasoline Range Organics (Tol-C12)	WADOE,DoD-ELAP
Gasoline Range Organics (C6-C10)	WADOE,ADEC,DoD-ELAP
Gasoline Range Organics (C5-C12)	WADOE,DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2023
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/28/2022
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2022
WADOE	WA Dept of Ecology	C558	06/30/2022
WA-DW	Ecology - Drinking Water	C558	06/30/2022



Shannon & Wilson, Inc
400 N 34th St., Suite 100
Seattle WA, 98103-8636

Project: Lower Duwamish Q4
Project Number: 21-1-12596-012
Project Manager: Meg Strong

Reported:
22-Dec-2021 13:10

Notes and Definitions

*	Flagged value is not within established control limits.
B	This analyte was detected in the method blank.
D	The reported value is from a dilution
H	Hold time violation - Hold time was exceeded.
J	Estimated concentration value detected below the reporting limit.
L	Analyte concentration is ≤ 5 times the reporting limit and the replicate control limit defaults to $\pm$ RL instead of 20% RPD
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria ($< 20\%$ RSD, $< 20\%$ drift or minimum RRF)
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.



Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

Laboratory Job ID: 320-81991-1

Client Project/Site: LDW

For:

Shannon & Wilson, Inc
400 N. 34th Suite 100
PO BOX 300303
Seattle, Washington 98103

Attn: Shoshana Howard

Authorized for release by:
12/6/2021 11:54:33 AM

David Alltucker, Project Manager I
(916)374-4383
David.Alltucker@Eurofinset.com

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The test results in this report meet all 2003 NELAC, 2009 TNI, and 2016 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

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.

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Definitions/Glossary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Qualifiers

LCMS

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.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
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)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
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)
TNTC	Too Numerous To Count

Case Narrative

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Job ID: 320-81991-1

Laboratory: Eurofins TestAmerica, Sacramento

Narrative

Job Narrative 320-81991-1

Receipt

The samples were received on 11/19/2021 10:50 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 5.2° C.

LCMS

Method EPA 537(Mod): Results for sample MW-43-20211611 (320-81991-1) was reported from the analysis of a diluted extract due to high concentration of the target analyte in the analysis of the undiluted extract. The dilution factor was applied to the labeled internal standard area counts and these area counts were within acceptance limits.

Method EPA 537(Mod): Results for samples MW-64-20211611 (320-81991-5), MW-8-20211711 (320-81991-6) and MW-60-20211711 (320-81991-7) were reported from the analysis of a diluted extract due to high concentration and matrix interference of the target analyte in the analysis of the undiluted extract. The dilution factor was applied to the labeled internal standard area counts and these area counts were within acceptance limits.

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

Organic Prep

Method 3535: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 320-545464.

Method 3535: The following samples are yellow and contain floating particulates in the sample bottle prior to extraction: MW-43-20211611 (320-81991-1), MW-71-20211611 (320-81991-2), MW-63-20211611 (320-81991-4), MW-64-20211611 (320-81991-5), MW-8-20211711 (320-81991-6) and MW-60-20211711 (320-81991-7).

Method 3535: The following samples are yellow after final voluming: MW-43-20211611 (320-81991-1), MW-64-20211611 (320-81991-5) and MW-8-20211711 (320-81991-6).

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

Detection Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-43-20211611

Lab Sample ID: 320-81991-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	36		1.8	0.23	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	65		1.8	0.77	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	170		1.8	0.18	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	60		1.8	0.49	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	860		18	5.2	ng/L	10		EPA 537(Mod)	Total/NA
- DL									

Client Sample ID: MW-71-20211611

Lab Sample ID: 320-81991-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	1.7		1.7	0.22	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	3.4		1.7	0.74	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.82	J	1.7	0.17	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	2.2		1.7	0.49	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	5.5		1.7	0.47	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: EB-2-20211611

Lab Sample ID: 320-81991-3

No Detections.

Client Sample ID: MW-63-20211611

Lab Sample ID: 320-81991-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	5.7		1.8	0.23	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	10		1.8	0.78	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	6.2		1.8	0.18	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	76		1.8	0.52	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	54		1.8	0.50	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: MW-64-20211611

Lab Sample ID: 320-81991-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	6.5	J	9.3	1.2	ng/L	5		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	13		9.3	4.0	ng/L	5		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	10		9.3	0.93	ng/L	5		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	140		9.3	2.7	ng/L	5		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	700		9.3	2.5	ng/L	5		EPA 537(Mod)	Total/NA

Client Sample ID: MW-8-20211711

Lab Sample ID: 320-81991-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctanoic acid (PFOA)	3.7	J	8.7	3.7	ng/L	5		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	2.6	J	8.7	0.87	ng/L	5		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	32		8.7	2.5	ng/L	5		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	140		8.7	2.3	ng/L	5		EPA 537(Mod)	Total/NA

Client Sample ID: MW-60-20211711

Lab Sample ID: 320-81991-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	39		19	2.4	ng/L	10		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	61		19	8.2	ng/L	10		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	56		19	1.9	ng/L	10		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	840		19	5.5	ng/L	10		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	1200		19	5.2	ng/L	10		EPA 537(Mod)	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Sacramento

Detection Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-72-20211711

Lab Sample ID: 320-81991-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	0.67	J	1.7	0.22	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	3.0		1.7	0.74	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	1.3	J	1.7	0.17	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	4.7		1.7	0.50	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	6.8		1.7	0.47	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: MW-68-20211711

Lab Sample ID: 320-81991-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctanoic acid (PFOA)	2.2		1.8	0.75	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	2.5		1.8	0.51	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	8.0		1.8	0.48	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: FB-1-20211711

Lab Sample ID: 320-81991-10

No Detections.

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Sacramento

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-43-20211611

Lab Sample ID: 320-81991-1

Date Collected: 11/16/21 09:45

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	36		1.8	0.23	ng/L		11/23/21 19:15	11/28/21 20:58	1
Perfluorooctanoic acid (PFOA)	65		1.8	0.77	ng/L		11/23/21 19:15	11/28/21 20:58	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.25	ng/L		11/23/21 19:15	11/28/21 20:58	1
Perfluorobutanesulfonic acid (PFBS)	170		1.8	0.18	ng/L		11/23/21 19:15	11/28/21 20:58	1
Perfluorooctanesulfonic acid (PFOS)	60		1.8	0.49	ng/L		11/23/21 19:15	11/28/21 20:58	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	58		50 - 150				11/23/21 19:15	11/28/21 20:58	1
13C4 PFOA	101		50 - 150				11/23/21 19:15	11/28/21 20:58	1
13C5 PFNA	71		50 - 150				11/23/21 19:15	11/28/21 20:58	1
13C3 PFBS	70		50 - 150				11/23/21 19:15	11/28/21 20:58	1
13C4 PFOS	97		50 - 150				11/23/21 19:15	11/28/21 20:58	1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15 - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	860		18	5.2	ng/L		11/23/21 19:15	11/30/21 15:31	10
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	84		50 - 150				11/23/21 19:15	11/30/21 15:31	10

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-71-20211611

Lab Sample ID: 320-81991-2

Date Collected: 11/16/21 11:40

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	1.7		1.7	0.22	ng/L		11/23/21 19:15	11/28/21 21:08	1
Perfluorooctanoic acid (PFOA)	3.4		1.7	0.74	ng/L		11/23/21 19:15	11/28/21 21:08	1
Perfluorononanoic acid (PFNA)	ND		1.7	0.23	ng/L		11/23/21 19:15	11/28/21 21:08	1
Perfluorobutanesulfonic acid (PFBS)	0.82	J	1.7	0.17	ng/L		11/23/21 19:15	11/28/21 21:08	1
Perfluorohexanesulfonic acid (PFHxS)	2.2		1.7	0.49	ng/L		11/23/21 19:15	11/28/21 21:08	1
Perfluorooctanesulfonic acid (PFOS)	5.5		1.7	0.47	ng/L		11/23/21 19:15	11/28/21 21:08	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	80		50 - 150				11/23/21 19:15	11/28/21 21:08	1
13C4 PFOA	104		50 - 150				11/23/21 19:15	11/28/21 21:08	1
13C5 PFNA	84		50 - 150				11/23/21 19:15	11/28/21 21:08	1
13C3 PFBS	94		50 - 150				11/23/21 19:15	11/28/21 21:08	1
18O2 PFHxS	100		50 - 150				11/23/21 19:15	11/28/21 21:08	1
13C4 PFOS	92		50 - 150				11/23/21 19:15	11/28/21 21:08	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: EB-2-20211611

Lab Sample ID: 320-81991-3

Date Collected: 11/16/21 11:50

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	ND		1.8	0.23	ng/L		11/23/21 19:15	11/28/21 21:19	1
Perfluorooctanoic acid (PFOA)	ND		1.8	0.77	ng/L		11/23/21 19:15	11/28/21 21:19	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.24	ng/L		11/23/21 19:15	11/28/21 21:19	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.8	0.18	ng/L		11/23/21 19:15	11/28/21 21:19	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.8	0.52	ng/L		11/23/21 19:15	11/28/21 21:19	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.8	0.49	ng/L		11/23/21 19:15	11/28/21 21:19	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
¹³ C4 PFHpA	94		50 - 150				11/23/21 19:15	11/28/21 21:19	1
¹³ C4 PFOA	102		50 - 150				11/23/21 19:15	11/28/21 21:19	1
¹³ C5 PFNA	92		50 - 150				11/23/21 19:15	11/28/21 21:19	1
¹³ C3 PFBS	96		50 - 150				11/23/21 19:15	11/28/21 21:19	1
¹⁸ O2 PFHxS	98		50 - 150				11/23/21 19:15	11/28/21 21:19	1
¹³ C4 PFOS	100		50 - 150				11/23/21 19:15	11/28/21 21:19	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-63-20211611

Lab Sample ID: 320-81991-4

Date Collected: 11/16/21 13:40

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	5.7		1.8	0.23	ng/L		11/23/21 19:15	11/28/21 21:29	1
Perfluorooctanoic acid (PFOA)	10		1.8	0.78	ng/L		11/23/21 19:15	11/28/21 21:29	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.25	ng/L		11/23/21 19:15	11/28/21 21:29	1
Perfluorobutanesulfonic acid (PFBS)	6.2		1.8	0.18	ng/L		11/23/21 19:15	11/28/21 21:29	1
Perfluorohexanesulfonic acid (PFHxS)	76		1.8	0.52	ng/L		11/23/21 19:15	11/28/21 21:29	1
Perfluorooctanesulfonic acid (PFOS)	54		1.8	0.50	ng/L		11/23/21 19:15	11/28/21 21:29	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	58		50 - 150				11/23/21 19:15	11/28/21 21:29	1
13C4 PFOA	94		50 - 150				11/23/21 19:15	11/28/21 21:29	1
13C5 PFNA	70		50 - 150				11/23/21 19:15	11/28/21 21:29	1
13C3 PFBS	70		50 - 150				11/23/21 19:15	11/28/21 21:29	1
18O2 PFHxS	78		50 - 150				11/23/21 19:15	11/28/21 21:29	1
13C4 PFOS	87		50 - 150				11/23/21 19:15	11/28/21 21:29	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-64-20211611

Lab Sample ID: 320-81991-5

Date Collected: 11/16/21 14:50

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	6.5	J	9.3	1.2	ng/L		11/23/21 19:15	11/30/21 15:10	5
Perfluorooctanoic acid (PFOA)	13		9.3	4.0	ng/L		11/23/21 19:15	11/30/21 15:10	5
Perfluorononanoic acid (PFNA)	ND		9.3	1.3	ng/L		11/23/21 19:15	11/30/21 15:10	5
Perfluorobutanesulfonic acid (PFBS)	10		9.3	0.93	ng/L		11/23/21 19:15	11/30/21 15:10	5
Perfluorohexanesulfonic acid (PFHxS)	140		9.3	2.7	ng/L		11/23/21 19:15	11/30/21 15:10	5
Perfluorooctanesulfonic acid (PFOS)	700		9.3	2.5	ng/L		11/23/21 19:15	11/30/21 15:10	5
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	63		50 - 150				11/23/21 19:15	11/30/21 15:10	5
13C4 PFOA	96		50 - 150				11/23/21 19:15	11/30/21 15:10	5
13C5 PFNA	73		50 - 150				11/23/21 19:15	11/30/21 15:10	5
13C3 PFBS	84		50 - 150				11/23/21 19:15	11/30/21 15:10	5
18O2 PFHxS	91		50 - 150				11/23/21 19:15	11/30/21 15:10	5
13C4 PFOS	82		50 - 150				11/23/21 19:15	11/30/21 15:10	5

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-8-20211711

Lab Sample ID: 320-81991-6

Date Collected: 11/17/21 13:10

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	ND		8.7	1.1	ng/L		11/23/21 19:15	11/30/21 15:20	5
Perfluorooctanoic acid (PFOA)	3.7	J	8.7	3.7	ng/L		11/23/21 19:15	11/30/21 15:20	5
Perfluorononanoic acid (PFNA)	ND		8.7	1.2	ng/L		11/23/21 19:15	11/30/21 15:20	5
Perfluorobutanesulfonic acid (PFBS)	2.6	J	8.7	0.87	ng/L		11/23/21 19:15	11/30/21 15:20	5
Perfluorohexanesulfonic acid (PFHxS)	32		8.7	2.5	ng/L		11/23/21 19:15	11/30/21 15:20	5
Perfluorooctanesulfonic acid (PFOS)	140		8.7	2.3	ng/L		11/23/21 19:15	11/30/21 15:20	5
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	75		50 - 150				11/23/21 19:15	11/30/21 15:20	5
13C4 PFOA	100		50 - 150				11/23/21 19:15	11/30/21 15:20	5
13C5 PFNA	75		50 - 150				11/23/21 19:15	11/30/21 15:20	5
13C3 PFBS	88		50 - 150				11/23/21 19:15	11/30/21 15:20	5
18O2 PFHxS	93		50 - 150				11/23/21 19:15	11/30/21 15:20	5
13C4 PFOS	82		50 - 150				11/23/21 19:15	11/30/21 15:20	5

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-60-20211711

Lab Sample ID: 320-81991-7

Date Collected: 11/17/21 10:30

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	39		19	2.4	ng/L		11/23/21 19:15	11/30/21 15:41	10
Perfluorooctanoic acid (PFOA)	61		19	8.2	ng/L		11/23/21 19:15	11/30/21 15:41	10
Perfluorononanoic acid (PFNA)	ND		19	2.6	ng/L		11/23/21 19:15	11/30/21 15:41	10
Perfluorobutanesulfonic acid (PFBS)	56		19	1.9	ng/L		11/23/21 19:15	11/30/21 15:41	10
Perfluorohexanesulfonic acid (PFHxS)	840		19	5.5	ng/L		11/23/21 19:15	11/30/21 15:41	10
Perfluorooctanesulfonic acid (PFOS)	1200		19	5.2	ng/L		11/23/21 19:15	11/30/21 15:41	10
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	57		50 - 150				11/23/21 19:15	11/30/21 15:41	10
13C4 PFOA	75		50 - 150				11/23/21 19:15	11/30/21 15:41	10
13C5 PFNA	52		50 - 150				11/23/21 19:15	11/30/21 15:41	10
13C3 PFBS	59		50 - 150				11/23/21 19:15	11/30/21 15:41	10
18O2 PFHxS	58		50 - 150				11/23/21 19:15	11/30/21 15:41	10
13C4 PFOS	61		50 - 150				11/23/21 19:15	11/30/21 15:41	10

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-72-20211711

Lab Sample ID: 320-81991-8

Date Collected: 11/17/21 12:06

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	0.67	J	1.7	0.22	ng/L		11/23/21 19:15	11/28/21 22:32	1
Perfluorooctanoic acid (PFOA)	3.0		1.7	0.74	ng/L		11/23/21 19:15	11/28/21 22:32	1
Perfluorononanoic acid (PFNA)	ND		1.7	0.24	ng/L		11/23/21 19:15	11/28/21 22:32	1
Perfluorobutanesulfonic acid (PFBS)	1.3	J	1.7	0.17	ng/L		11/23/21 19:15	11/28/21 22:32	1
Perfluorohexanesulfonic acid (PFHxS)	4.7		1.7	0.50	ng/L		11/23/21 19:15	11/28/21 22:32	1
Perfluorooctanesulfonic acid (PFOS)	6.8		1.7	0.47	ng/L		11/23/21 19:15	11/28/21 22:32	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	73		50 - 150				11/23/21 19:15	11/28/21 22:32	1
13C4 PFOA	99		50 - 150				11/23/21 19:15	11/28/21 22:32	1
13C5 PFNA	73		50 - 150				11/23/21 19:15	11/28/21 22:32	1
13C3 PFBS	86		50 - 150				11/23/21 19:15	11/28/21 22:32	1
18O2 PFHxS	85		50 - 150				11/23/21 19:15	11/28/21 22:32	1
13C4 PFOS	87		50 - 150				11/23/21 19:15	11/28/21 22:32	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-68-20211711

Lab Sample ID: 320-81991-9

Date Collected: 11/17/21 14:10

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	ND		1.8	0.22	ng/L		11/23/21 19:15	11/28/21 22:42	1
Perfluorooctanoic acid (PFOA)	2.2		1.8	0.75	ng/L		11/23/21 19:15	11/28/21 22:42	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.24	ng/L		11/23/21 19:15	11/28/21 22:42	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.8	0.18	ng/L		11/23/21 19:15	11/28/21 22:42	1
Perfluorohexanesulfonic acid (PFHxS)	2.5		1.8	0.51	ng/L		11/23/21 19:15	11/28/21 22:42	1
Perfluorooctanesulfonic acid (PFOS)	8.0		1.8	0.48	ng/L		11/23/21 19:15	11/28/21 22:42	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
<i>13C4 PFHpA</i>	74		50 - 150	11/23/21 19:15	11/28/21 22:42	1
<i>13C4 PFOA</i>	100		50 - 150	11/23/21 19:15	11/28/21 22:42	1
<i>13C5 PFNA</i>	69		50 - 150	11/23/21 19:15	11/28/21 22:42	1
<i>13C3 PFBS</i>	100		50 - 150	11/23/21 19:15	11/28/21 22:42	1
<i>18O2 PFHxS</i>	90		50 - 150	11/23/21 19:15	11/28/21 22:42	1
<i>13C4 PFOS</i>	84		50 - 150	11/23/21 19:15	11/28/21 22:42	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: FB-1-20211711

Lab Sample ID: 320-81991-10

Date Collected: 11/17/21 12:00

Matrix: Water

Date Received: 11/19/21 10:50

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	ND		1.8	0.22	ng/L		11/23/21 19:15	11/28/21 22:52	1
Perfluorooctanoic acid (PFOA)	ND		1.8	0.75	ng/L		11/23/21 19:15	11/28/21 22:52	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.24	ng/L		11/23/21 19:15	11/28/21 22:52	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.8	0.18	ng/L		11/23/21 19:15	11/28/21 22:52	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.8	0.50	ng/L		11/23/21 19:15	11/28/21 22:52	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.8	0.48	ng/L		11/23/21 19:15	11/28/21 22:52	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	81		50 - 150				11/23/21 19:15	11/28/21 22:52	1
13C4 PFOA	100		50 - 150				11/23/21 19:15	11/28/21 22:52	1
13C5 PFNA	89		50 - 150				11/23/21 19:15	11/28/21 22:52	1
13C3 PFBS	93		50 - 150				11/23/21 19:15	11/28/21 22:52	1
18O2 PFHxS	92		50 - 150				11/23/21 19:15	11/28/21 22:52	1
13C4 PFOS	91		50 - 150				11/23/21 19:15	11/28/21 22:52	1

Isotope Dilution Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Isotope Dilution Recovery (Acceptance Limits)					
		C4PFHA (50-150)	PFOA (50-150)	PFNA (50-150)	C3PFBS (50-150)	PFHxS (50-150)	PFOS (50-150)
320-81991-1	MW-43-20211611	58	101	71	70		97
320-81991-1 - DL	MW-43-20211611					84	
320-81991-2	MW-71-20211611	80	104	84	94	100	92
320-81991-3	EB-2-20211611	94	102	92	96	98	100
320-81991-4	MW-63-20211611	58	94	70	70	78	87
320-81991-5	MW-64-20211611	63	96	73	84	91	82
320-81991-6	MW-8-20211711	75	100	75	88	93	82
320-81991-7	MW-60-20211711	57	75	52	59	58	61
320-81991-8	MW-72-20211711	73	99	73	86	85	87
320-81991-9	MW-68-20211711	74	100	69	100	90	84
320-81991-10	FB-1-20211711	81	100	89	93	92	91
LCS 320-545464/2-A	Lab Control Sample	96	101	98	103	94	98
LCSD 320-545464/3-A	Lab Control Sample Dup	94	107	100	115	100	107
MB 320-545464/1-A	Method Blank	93	101	94	102	92	99

Surrogate Legend

C4PFHA = 13C4 PFHpA

PFOA = 13C4 PFOA

PFNA = 13C5 PFNA

C3PFBS = 13C3 PFBS

PFHxS = 18O2 PFHxS

PFOS = 13C4 PFOS

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Lab Sample ID: MB 320-545464/1-A

Matrix: Water

Analysis Batch: 546580

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 545464

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.25	ng/L		11/23/21 19:15	11/28/21 20:27	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.85	ng/L		11/23/21 19:15	11/28/21 20:27	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.27	ng/L		11/23/21 19:15	11/28/21 20:27	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.20	ng/L		11/23/21 19:15	11/28/21 20:27	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.57	ng/L		11/23/21 19:15	11/28/21 20:27	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.54	ng/L		11/23/21 19:15	11/28/21 20:27	1

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	93		50 - 150	11/23/21 19:15	11/28/21 20:27	1
13C4 PFOA	101		50 - 150	11/23/21 19:15	11/28/21 20:27	1
13C5 PFNA	94		50 - 150	11/23/21 19:15	11/28/21 20:27	1
13C3 PFBS	102		50 - 150	11/23/21 19:15	11/28/21 20:27	1
18O2 PFHxS	92		50 - 150	11/23/21 19:15	11/28/21 20:27	1
13C4 PFOS	99		50 - 150	11/23/21 19:15	11/28/21 20:27	1

Lab Sample ID: LCS 320-545464/2-A

Matrix: Water

Analysis Batch: 546580

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 545464

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Perfluoroheptanoic acid (PFHpA)	40.0	35.3		ng/L		88	72 - 130
Perfluorooctanoic acid (PFOA)	40.0	36.9		ng/L		92	71 - 133
Perfluorononanoic acid (PFNA)	40.0	36.5		ng/L		91	69 - 130
Perfluorobutanesulfonic acid (PFBS)	35.4	30.8		ng/L		87	72 - 130
Perfluorohexanesulfonic acid (PFHxS)	36.4	36.6		ng/L		101	68 - 131
Perfluorooctanesulfonic acid (PFOS)	37.1	35.1		ng/L		95	65 - 140

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C4 PFHpA	96		50 - 150
13C4 PFOA	101		50 - 150
13C5 PFNA	98		50 - 150
13C3 PFBS	103		50 - 150
18O2 PFHxS	94		50 - 150
13C4 PFOS	98		50 - 150

Lab Sample ID: LCSD 320-545464/3-A

Matrix: Water

Analysis Batch: 546580

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 545464

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Perfluoroheptanoic acid (PFHpA)	40.0	38.5		ng/L		96	72 - 130	8	30
Perfluorooctanoic acid (PFOA)	40.0	37.2		ng/L		93	71 - 133	1	30
Perfluorononanoic acid (PFNA)	40.0	39.4		ng/L		98	69 - 130	8	30
Perfluorobutanesulfonic acid (PFBS)	35.4	27.5		ng/L		78	72 - 130	12	30
Perfluorohexanesulfonic acid (PFHxS)	36.4	37.0		ng/L		102	68 - 131	1	30

Eurofins TestAmerica, Sacramento

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15 (Continued)

Lab Sample ID: LCSD 320-545464/3-A

Matrix: Water

Analysis Batch: 546580

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 545464

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perfluorooctanesulfonic acid (PFOS)	37.1	33.6		ng/L		91	65 - 140	4	30
Isotope Dilution	LCSD %Recovery	LCSD Qualifier	LCSD Limits						
¹³ C4 PFHpA	94		50 - 150						
¹³ C4 PFOA	107		50 - 150						
¹³ C5 PFNA	100		50 - 150						
¹³ C3 PFBS	115		50 - 150						
¹⁸ O2 PFHxS	100		50 - 150						
¹³ C4 PFOS	107		50 - 150						

QC Association Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

LCMS

Prep Batch: 545464

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-81991-1	MW-43-20211611	Total/NA	Water	3535	
320-81991-1 - DL	MW-43-20211611	Total/NA	Water	3535	
320-81991-2	MW-71-20211611	Total/NA	Water	3535	
320-81991-3	EB-2-20211611	Total/NA	Water	3535	
320-81991-4	MW-63-20211611	Total/NA	Water	3535	
320-81991-5	MW-64-20211611	Total/NA	Water	3535	
320-81991-6	MW-8-20211711	Total/NA	Water	3535	
320-81991-7	MW-60-20211711	Total/NA	Water	3535	
320-81991-8	MW-72-20211711	Total/NA	Water	3535	
320-81991-9	MW-68-20211711	Total/NA	Water	3535	
320-81991-10	FB-1-20211711	Total/NA	Water	3535	
MB 320-545464/1-A	Method Blank	Total/NA	Water	3535	
LCS 320-545464/2-A	Lab Control Sample	Total/NA	Water	3535	
LCSD 320-545464/3-A	Lab Control Sample Dup	Total/NA	Water	3535	

Analysis Batch: 546580

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-81991-1	MW-43-20211611	Total/NA	Water	EPA 537(Mod)	545464
320-81991-2	MW-71-20211611	Total/NA	Water	EPA 537(Mod)	545464
320-81991-3	EB-2-20211611	Total/NA	Water	EPA 537(Mod)	545464
320-81991-4	MW-63-20211611	Total/NA	Water	EPA 537(Mod)	545464
320-81991-8	MW-72-20211711	Total/NA	Water	EPA 537(Mod)	545464
320-81991-9	MW-68-20211711	Total/NA	Water	EPA 537(Mod)	545464
320-81991-10	FB-1-20211711	Total/NA	Water	EPA 537(Mod)	545464
MB 320-545464/1-A	Method Blank	Total/NA	Water	EPA 537(Mod)	545464
LCS 320-545464/2-A	Lab Control Sample	Total/NA	Water	EPA 537(Mod)	545464
LCSD 320-545464/3-A	Lab Control Sample Dup	Total/NA	Water	EPA 537(Mod)	545464

Analysis Batch: 546975

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-81991-1 - DL	MW-43-20211611	Total/NA	Water	EPA 537(Mod)	545464
320-81991-5	MW-64-20211611	Total/NA	Water	EPA 537(Mod)	545464
320-81991-6	MW-8-20211711	Total/NA	Water	EPA 537(Mod)	545464
320-81991-7	MW-60-20211711	Total/NA	Water	EPA 537(Mod)	545464

Lab Chronicle

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-43-20211611

Lab Sample ID: 320-81991-1

Date Collected: 11/16/21 09:45

Matrix: Water

Date Received: 11/19/21 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			275.4 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			546580	11/28/21 20:58	S1M	TAL SAC
Total/NA	Prep	3535	DL		275.4 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)	DL	10			546975	11/30/21 15:31	S1M	TAL SAC

Client Sample ID: MW-71-20211611

Lab Sample ID: 320-81991-2

Date Collected: 11/16/21 11:40

Matrix: Water

Date Received: 11/19/21 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			288.3 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			546580	11/28/21 21:08	S1M	TAL SAC

Client Sample ID: EB-2-20211611

Lab Sample ID: 320-81991-3

Date Collected: 11/16/21 11:50

Matrix: Water

Date Received: 11/19/21 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			275.8 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			546580	11/28/21 21:19	S1M	TAL SAC

Client Sample ID: MW-63-20211611

Lab Sample ID: 320-81991-4

Date Collected: 11/16/21 13:40

Matrix: Water

Date Received: 11/19/21 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			271.7 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			546580	11/28/21 21:29	S1M	TAL SAC

Client Sample ID: MW-64-20211611

Lab Sample ID: 320-81991-5

Date Collected: 11/16/21 14:50

Matrix: Water

Date Received: 11/19/21 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			268 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		5			546975	11/30/21 15:10	S1M	TAL SAC

Client Sample ID: MW-8-20211711

Lab Sample ID: 320-81991-6

Date Collected: 11/17/21 13:10

Matrix: Water

Date Received: 11/19/21 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			287.4 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		5			546975	11/30/21 15:20	S1M	TAL SAC

Lab Chronicle

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Client Sample ID: MW-60-20211711**Lab Sample ID: 320-81991-7****Date Collected: 11/17/21 10:30****Matrix: Water****Date Received: 11/19/21 10:50**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			258.8 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		10			546975	11/30/21 15:41	S1M	TAL SAC

Client Sample ID: MW-72-20211711**Lab Sample ID: 320-81991-8****Date Collected: 11/17/21 12:06****Matrix: Water****Date Received: 11/19/21 10:50**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			287.1 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			546580	11/28/21 22:32	S1M	TAL SAC

Client Sample ID: MW-68-20211711**Lab Sample ID: 320-81991-9****Date Collected: 11/17/21 14:10****Matrix: Water****Date Received: 11/19/21 10:50**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			281.9 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			546580	11/28/21 22:42	S1M	TAL SAC

Client Sample ID: FB-1-20211711**Lab Sample ID: 320-81991-10****Date Collected: 11/17/21 12:00****Matrix: Water****Date Received: 11/19/21 10:50**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			282.5 mL	10.0 mL	545464	11/23/21 19:15	PV	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			546580	11/28/21 22:52	S1M	TAL SAC

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Laboratory: Eurofins TestAmerica, Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	17-020	02-20-24

Method Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Method	Method Description	Protocol	Laboratory
EPA 537(Mod) 3535	PFAS for QSM 5.3, Table B-15 Solid-Phase Extraction (SPE)	EPA SW846	TAL SAC TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-81991-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-81991-1	MW-43-20211611	Water	11/16/21 09:45	11/19/21 10:50
320-81991-2	MW-71-20211611	Water	11/16/21 11:40	11/19/21 10:50
320-81991-3	EB-2-20211611	Water	11/16/21 11:50	11/19/21 10:50
320-81991-4	MW-63-20211611	Water	11/16/21 13:40	11/19/21 10:50
320-81991-5	MW-64-20211611	Water	11/16/21 14:50	11/19/21 10:50
320-81991-6	MW-8-20211711	Water	11/17/21 13:10	11/19/21 10:50
320-81991-7	MW-60-20211711	Water	11/17/21 10:30	11/19/21 10:50
320-81991-8	MW-72-20211711	Water	11/17/21 12:06	11/19/21 10:50
320-81991-9	MW-68-20211711	Water	11/17/21 14:10	11/19/21 10:50
320-81991-10	FB-1-20211711	Water	11/17/21 12:00	11/19/21 10:50

Chain of Custody Record

576591

Environment Testing
TestAmerica

Draft for Public Comment

Client Contact		Regulatory Program:		Project Manager:		Site Contact:		COC No.:	
Company Name: Shannon & Wilkin, Inc.		☐ DW ☐ NPDES ☐ RCRA ☐ Other:		Shoshana Howard		Shoshana Howard		1 of 1 COCs	
Address: 400 N. 34th St., Suite 100		Tel/Email: SKATE@shannonwil.com		Date: 11/17/2021		Carrier: FedEx		Sampler: GTC, RMV	
City/State/Zip: Seattle, WA 98103		Analysis Turnaround Time		Perform MS / MSD (Y / N)		For Lab Use Only:		Walk-in Client:	
Phone: 206-632-8020		☒ CALENDAR DAYS ☐ WORKING DAYS		Filtered Sample (Y / N)		Lab Sampling:		Job / SDG No.:	
Fax: 206-695-6777		TAT if different from Below		Matrix		Sample Specific Notes:			
Project Name: LDW		2 weeks		Sample Date					
Site: LDW		1 week		Sample Time					
PO # 21-1-12596		2 days		Sample Type (C=Comp, G=Grab)					
		1 day		# of Cont.					
MW-43-20211611	11/16	0945	G	GW	2				
MW-71-20211611	11/16	1140	G	GW	2				
EB-2-20211611	11/16	1150	G	W	2				
MW-63-20211611	11/16	1340	G	GW	2				
MW-64-20211611	11/16	1450	G	GW	2				
MW-8-20211711	11/17	1310	G	GW	2				
MW-60-20211711	11/17	1030	G	GW	2				
MW-72-20211711	11/17	1206	G	GW	2				
MW-68-20211711	11/17	1410	G	GW	2				
FB-1-20211711	11/17	1200	G	W	2				
Barcode: 320-81991 Chain of Custody									
Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4= HNO3, 5= NaOH, 6= Other									
Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.									
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown									
Special Instructions/QC Requirements & Comments:									
Custody Seal No.: 1707886, 1707887									
Custody Seal Intact: ☒ Yes ☐ No									
Relinquished by: Christian Canfield									
Relinquished by: Shannon & Wilkin									
Relinquished by: Shannon & Wilkin									
Relinquished by: Shannon & Wilkin									

DISC 101

Login Sample Receipt Checklist

Client: Shannon & Wilson, Inc

Job Number: 320-81991-1

Login Number: 81991**List Source: Eurofins TestAmerica, Sacramento****List Number: 1****Creator: Oropeza, Salvador**

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	1707886/1707887
Sample custody seals, if present, are intact.	N/A	
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 $<6\text{mm}$ (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

Laboratory Job ID: 320-82516-1
Client Project/Site: LDW

For:

Shannon & Wilson, Inc
400 N. 34th Suite 100
PO BOX 300303
Seattle, Washington 98103

Attn: Meg Strong

Authorized for release by:
12/14/2021 2:45:39 PM

David Alltucker, Project Manager I
(916)374-4383
David.Alltucker@Eurofinset.com

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The test results in this report meet all 2003 NELAC, 2009 TNI, and 2016 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

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.

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Definitions/Glossary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Qualifiers

LCMS

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.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
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)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
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)
TNTC	Too Numerous To Count

Case Narrative

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Job ID: 320-82516-1

Laboratory: Eurofins TestAmerica, Sacramento

Narrative

Job Narrative 320-82516-1

Receipt

The samples were received on 12/6/2021 10:00 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 1.1° C.

LCMS

Method EPA 537(Mod): Results for sample MW-74-20210312 (320-82516-3) were reported from the analysis of a diluted extract due to high concentration of the target analyte in the analysis of the undiluted extract. The dilution factor was applied to the labeled internal standard area counts and these area counts were within acceptance limits

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

Organic Prep

Method 3535: The following samples contained floating particulates in the sample bottle prior to extraction: MW-74-20210312 (320-82516-3).

Method 3535: The following samples were brown prior to extraction: MW-200-20210312 (320-82516-1), MW-36-20210312 (320-82516-2) and MW-74-20210312 (320-82516-3).

Method 3535: The following samples contained a thin layer of sediment at the bottom of the bottle prior to extraction: MW-200-20210312 (320-82516-1) and MW-36-20210312 (320-82516-2).

Method 3535: The following samples were light yellow after extraction/final volume: MW-200-20210312 (320-82516-1), MW-36-20210312 (320-82516-2) and MW-74-20210312 (320-82516-3).

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

Detection Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Client Sample ID: MW-200-20210312

Lab Sample ID: 320-82516-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	9.5		2.0	0.25	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	7.1		2.0	0.83	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	16		2.0	0.20	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	110		2.0	0.56	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	60		2.0	0.53	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: MW-36-20210312

Lab Sample ID: 320-82516-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	10		1.9	0.24	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	6.7		1.9	0.82	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	15		1.9	0.19	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	110		1.9	0.55	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	52		1.9	0.52	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: MW-74-20210312

Lab Sample ID: 320-82516-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	140		1.9	0.23	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	350		1.9	0.79	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorononanoic acid (PFNA)	0.49	J	1.9	0.25	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS) - DL	380		190	19	ng/L	100		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	3800		190	53	ng/L	100		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	15000		190	50	ng/L	100		EPA 537(Mod)	Total/NA

Client Sample ID: EB-2-20210312

Lab Sample ID: 320-82516-4

No Detections.

Client Sample ID: FB-2-20210312

Lab Sample ID: 320-82516-5

No Detections.

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Sacramento

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Client Sample ID: MW-200-20210312

Lab Sample ID: 320-82516-1

Date Collected: 12/03/21 14:05

Matrix: Water

Date Received: 12/06/21 10:00

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	9.5		2.0	0.25	ng/L		12/08/21 04:43	12/11/21 01:12	1
Perfluorooctanoic acid (PFOA)	7.1		2.0	0.83	ng/L		12/08/21 04:43	12/11/21 01:12	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.26	ng/L		12/08/21 04:43	12/11/21 01:12	1
Perfluorobutanesulfonic acid (PFBS)	16		2.0	0.20	ng/L		12/08/21 04:43	12/11/21 01:12	1
Perfluorohexanesulfonic acid (PFHxS)	110		2.0	0.56	ng/L		12/08/21 04:43	12/11/21 01:12	1
Perfluorooctanesulfonic acid (PFOS)	60		2.0	0.53	ng/L		12/08/21 04:43	12/11/21 01:12	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	74		50 - 150				12/08/21 04:43	12/11/21 01:12	1
13C4 PFOA	93		50 - 150				12/08/21 04:43	12/11/21 01:12	1
13C5 PFNA	99		50 - 150				12/08/21 04:43	12/11/21 01:12	1
13C3 PFBS	86		50 - 150				12/08/21 04:43	12/11/21 01:12	1
18O2 PFHxS	76		50 - 150				12/08/21 04:43	12/11/21 01:12	1
13C4 PFOS	96		50 - 150				12/08/21 04:43	12/11/21 01:12	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Client Sample ID: MW-36-20210312

Lab Sample ID: 320-82516-2

Date Collected: 12/03/21 13:50

Matrix: Water

Date Received: 12/06/21 10:00

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	10		1.9	0.24	ng/L		12/08/21 04:43	12/11/21 01:23	1
Perfluorooctanoic acid (PFOA)	6.7		1.9	0.82	ng/L		12/08/21 04:43	12/11/21 01:23	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.26	ng/L		12/08/21 04:43	12/11/21 01:23	1
Perfluorobutanesulfonic acid (PFBS)	15		1.9	0.19	ng/L		12/08/21 04:43	12/11/21 01:23	1
Perfluorohexanesulfonic acid (PFHxS)	110		1.9	0.55	ng/L		12/08/21 04:43	12/11/21 01:23	1
Perfluorooctanesulfonic acid (PFOS)	52		1.9	0.52	ng/L		12/08/21 04:43	12/11/21 01:23	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	72		50 - 150				12/08/21 04:43	12/11/21 01:23	1
13C4 PFOA	88		50 - 150				12/08/21 04:43	12/11/21 01:23	1
13C5 PFNA	99		50 - 150				12/08/21 04:43	12/11/21 01:23	1
13C3 PFBS	90		50 - 150				12/08/21 04:43	12/11/21 01:23	1
18O2 PFHxS	75		50 - 150				12/08/21 04:43	12/11/21 01:23	1
13C4 PFOS	98		50 - 150				12/08/21 04:43	12/11/21 01:23	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Client Sample ID: MW-74-20210312

Lab Sample ID: 320-82516-3

Date Collected: 12/03/21 14:50

Matrix: Water

Date Received: 12/06/21 10:00

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	140		1.9	0.23	ng/L		12/08/21 04:43	12/11/21 01:33	1
Perfluorooctanoic acid (PFOA)	350		1.9	0.79	ng/L		12/08/21 04:43	12/11/21 01:33	1
Perfluorononanoic acid (PFNA)	0.49	J	1.9	0.25	ng/L		12/08/21 04:43	12/11/21 01:33	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	60		50 - 150				12/08/21 04:43	12/11/21 01:33	1
13C4 PFOA	95		50 - 150				12/08/21 04:43	12/11/21 01:33	1
13C5 PFNA	79		50 - 150				12/08/21 04:43	12/11/21 01:33	1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15 - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	380		190	19	ng/L		12/08/21 04:43	12/13/21 11:28	100
Perfluorohexanesulfonic acid (PFHxS)	3800		190	53	ng/L		12/08/21 04:43	12/13/21 11:28	100
Perfluorooctanesulfonic acid (PFOS)	15000		190	50	ng/L		12/08/21 04:43	12/13/21 11:28	100
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C3 PFBS	92		50 - 150				12/08/21 04:43	12/13/21 11:28	100
18O2 PFHxS	81		50 - 150				12/08/21 04:43	12/13/21 11:28	100
13C4 PFOS	63		50 - 150				12/08/21 04:43	12/13/21 11:28	100

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Client Sample ID: EB-2-20210312

Lab Sample ID: 320-82516-4

Date Collected: 12/03/21 12:30

Matrix: Water

Date Received: 12/06/21 10:00

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.23	ng/L		12/08/21 04:43	12/11/21 01:44	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.80	ng/L		12/08/21 04:43	12/11/21 01:44	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.25	ng/L		12/08/21 04:43	12/11/21 01:44	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.19	ng/L		12/08/21 04:43	12/11/21 01:44	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.54	ng/L		12/08/21 04:43	12/11/21 01:44	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.51	ng/L		12/08/21 04:43	12/11/21 01:44	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	72		50 - 150				12/08/21 04:43	12/11/21 01:44	1
13C4 PFOA	82		50 - 150				12/08/21 04:43	12/11/21 01:44	1
13C5 PFNA	93		50 - 150				12/08/21 04:43	12/11/21 01:44	1
13C3 PFBS	92		50 - 150				12/08/21 04:43	12/11/21 01:44	1
18O2 PFHxS	68		50 - 150				12/08/21 04:43	12/11/21 01:44	1
13C4 PFOS	85		50 - 150				12/08/21 04:43	12/11/21 01:44	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Client Sample ID: FB-2-20210312

Lab Sample ID: 320-82516-5

Date Collected: 12/03/21 12:35

Matrix: Water

Date Received: 12/06/21 10:00

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.24	ng/L		12/08/21 04:43	12/11/21 01:54	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.81	ng/L		12/08/21 04:43	12/11/21 01:54	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.26	ng/L		12/08/21 04:43	12/11/21 01:54	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.19	ng/L		12/08/21 04:43	12/11/21 01:54	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.55	ng/L		12/08/21 04:43	12/11/21 01:54	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.52	ng/L		12/08/21 04:43	12/11/21 01:54	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
¹³ C4 PFHpA	72		50 - 150				12/08/21 04:43	12/11/21 01:54	1
¹³ C4 PFOA	86		50 - 150				12/08/21 04:43	12/11/21 01:54	1
¹³ C5 PFNA	88		50 - 150				12/08/21 04:43	12/11/21 01:54	1
¹³ C3 PFBS	85		50 - 150				12/08/21 04:43	12/11/21 01:54	1
¹⁸ O2 PFHxS	73		50 - 150				12/08/21 04:43	12/11/21 01:54	1
¹³ C4 PFOS	84		50 - 150				12/08/21 04:43	12/11/21 01:54	1

Isotope Dilution Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Isotope Dilution Recovery (Acceptance Limits)					
		C4PFHA (50-150)	PFOA (50-150)	PFNA (50-150)	C3PFBS (50-150)	PFHxS (50-150)	PFOS (50-150)
320-82516-1	MW-200-20210312	74	93	99	86	76	96
320-82516-2	MW-36-20210312	72	88	99	90	75	98
320-82516-3	MW-74-20210312	60	95	79			
320-82516-3 - DL	MW-74-20210312				92	81	63
320-82516-4	EB-2-20210312	72	82	93	92	68	85
320-82516-5	FB-2-20210312	72	86	88	85	73	84
LCS 320-548960/2-A	Lab Control Sample	84	92	96	103	82	92
LCSD 320-548960/3-A	Lab Control Sample Dup	77	98	92	109	85	87
MB 320-548960/1-A	Method Blank	86	95	92	97	80	85

Surrogate Legend

C4PFHA = 13C4 PFHpA

PFOA = 13C4 PFOA

PFNA = 13C5 PFNA

C3PFBS = 13C3 PFBS

PFHxS = 18O2 PFHxS

PFOS = 13C4 PFOS

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Lab Sample ID: MB 320-548960/1-A

Matrix: Water

Analysis Batch: 549984

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 548960

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.25	ng/L		12/08/21 04:43	12/10/21 22:57	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.85	ng/L		12/08/21 04:43	12/10/21 22:57	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.27	ng/L		12/08/21 04:43	12/10/21 22:57	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.20	ng/L		12/08/21 04:43	12/10/21 22:57	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.57	ng/L		12/08/21 04:43	12/10/21 22:57	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.54	ng/L		12/08/21 04:43	12/10/21 22:57	1

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	86		50 - 150	12/08/21 04:43	12/10/21 22:57	1
13C4 PFOA	95		50 - 150	12/08/21 04:43	12/10/21 22:57	1
13C5 PFNA	92		50 - 150	12/08/21 04:43	12/10/21 22:57	1
13C3 PFBS	97		50 - 150	12/08/21 04:43	12/10/21 22:57	1
18O2 PFHxS	80		50 - 150	12/08/21 04:43	12/10/21 22:57	1
13C4 PFOS	85		50 - 150	12/08/21 04:43	12/10/21 22:57	1

Lab Sample ID: LCS 320-548960/2-A

Matrix: Water

Analysis Batch: 549984

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 548960

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Perfluoroheptanoic acid (PFHpA)	40.0	35.3		ng/L		88	72 - 130
Perfluorooctanoic acid (PFOA)	40.0	37.3		ng/L		93	71 - 133
Perfluorononanoic acid (PFNA)	40.0	38.1		ng/L		95	69 - 130
Perfluorobutanesulfonic acid (PFBS)	35.4	28.8		ng/L		82	72 - 130
Perfluorohexanesulfonic acid (PFHxS)	36.4	34.5		ng/L		95	68 - 131
Perfluorooctanesulfonic acid (PFOS)	37.1	29.1		ng/L		79	65 - 140

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C4 PFHpA	84		50 - 150
13C4 PFOA	92		50 - 150
13C5 PFNA	96		50 - 150
13C3 PFBS	103		50 - 150
18O2 PFHxS	82		50 - 150
13C4 PFOS	92		50 - 150

Lab Sample ID: LCSD 320-548960/3-A

Matrix: Water

Analysis Batch: 549984

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 548960

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Perfluoroheptanoic acid (PFHpA)	40.0	41.3		ng/L		103	72 - 130	16	30
Perfluorooctanoic acid (PFOA)	40.0	37.1		ng/L		93	71 - 133	0	30
Perfluorononanoic acid (PFNA)	40.0	42.0		ng/L		105	69 - 130	10	30
Perfluorobutanesulfonic acid (PFBS)	35.4	29.5		ng/L		83	72 - 130	2	30
Perfluorohexanesulfonic acid (PFHxS)	36.4	34.3		ng/L		94	68 - 131	1	30

Eurofins TestAmerica, Sacramento

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15 (Continued)

Lab Sample ID: LCSD 320-548960/3-A

Matrix: Water

Analysis Batch: 549984

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 548960

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perfluorooctanesulfonic acid (PFOS)	37.1	31.9		ng/L		86	65 - 140	9	30
Isotope Dilution	LCSD %Recovery	LCSD Qualifier	LCSD Limits						
¹³ C4 PFHpA	77		50 - 150						
¹³ C4 PFOA	98		50 - 150						
¹³ C5 PFNA	92		50 - 150						
¹³ C3 PFBS	109		50 - 150						
¹⁸ O2 PFHxS	85		50 - 150						
¹³ C4 PFOS	87		50 - 150						

QC Association Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

LCMS

Prep Batch: 548960

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-82516-1	MW-200-20210312	Total/NA	Water	3535	
320-82516-2	MW-36-20210312	Total/NA	Water	3535	
320-82516-3 - DL	MW-74-20210312	Total/NA	Water	3535	
320-82516-3	MW-74-20210312	Total/NA	Water	3535	
320-82516-4	EB-2-20210312	Total/NA	Water	3535	
320-82516-5	FB-2-20210312	Total/NA	Water	3535	
MB 320-548960/1-A	Method Blank	Total/NA	Water	3535	
LCS 320-548960/2-A	Lab Control Sample	Total/NA	Water	3535	
LCSD 320-548960/3-A	Lab Control Sample Dup	Total/NA	Water	3535	

Analysis Batch: 549984

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-82516-1	MW-200-20210312	Total/NA	Water	EPA 537(Mod)	548960
320-82516-2	MW-36-20210312	Total/NA	Water	EPA 537(Mod)	548960
320-82516-3	MW-74-20210312	Total/NA	Water	EPA 537(Mod)	548960
320-82516-4	EB-2-20210312	Total/NA	Water	EPA 537(Mod)	548960
320-82516-5	FB-2-20210312	Total/NA	Water	EPA 537(Mod)	548960
MB 320-548960/1-A	Method Blank	Total/NA	Water	EPA 537(Mod)	548960
LCS 320-548960/2-A	Lab Control Sample	Total/NA	Water	EPA 537(Mod)	548960
LCSD 320-548960/3-A	Lab Control Sample Dup	Total/NA	Water	EPA 537(Mod)	548960

Analysis Batch: 550484

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-82516-3 - DL	MW-74-20210312	Total/NA	Water	EPA 537(Mod)	548960

Lab Chronicle

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Client Sample ID: MW-200-20210312

Lab Sample ID: 320-82516-1

Date Collected: 12/03/21 14:05

Matrix: Water

Date Received: 12/06/21 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			255.1 mL	10.0 mL	548960	12/08/21 04:43	EG	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			549984	12/11/21 01:12	AF	TAL SAC

Client Sample ID: MW-36-20210312

Lab Sample ID: 320-82516-2

Date Collected: 12/03/21 13:50

Matrix: Water

Date Received: 12/06/21 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			259.7 mL	10.0 mL	548960	12/08/21 04:43	EG	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			549984	12/11/21 01:23	AF	TAL SAC

Client Sample ID: MW-74-20210312

Lab Sample ID: 320-82516-3

Date Collected: 12/03/21 14:50

Matrix: Water

Date Received: 12/06/21 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			267.6 mL	10.0 mL	548960	12/08/21 04:43	EG	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			549984	12/11/21 01:33	AF	TAL SAC
Total/NA	Prep	3535	DL		267.6 mL	10.0 mL	548960	12/08/21 04:43	EG	TAL SAC
Total/NA	Analysis	EPA 537(Mod)	DL	100			550484	12/13/21 11:28	S1M	TAL SAC

Client Sample ID: EB-2-20210312

Lab Sample ID: 320-82516-4

Date Collected: 12/03/21 12:30

Matrix: Water

Date Received: 12/06/21 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			266.3 mL	10.0 mL	548960	12/08/21 04:43	EG	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			549984	12/11/21 01:44	AF	TAL SAC

Client Sample ID: FB-2-20210312

Lab Sample ID: 320-82516-5

Date Collected: 12/03/21 12:35

Matrix: Water

Date Received: 12/06/21 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			261.3 mL	10.0 mL	548960	12/08/21 04:43	EG	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			549984	12/11/21 01:54	AF	TAL SAC

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Laboratory: Eurofins TestAmerica, Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	17-020	02-20-24

Method Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Method	Method Description	Protocol	Laboratory
EPA 537(Mod) 3535	PFAS for QSM 5.3, Table B-15 Solid-Phase Extraction (SPE)	EPA SW846	TAL SAC TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-82516-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-82516-1	MW-200-20210312	Water	12/03/21 14:05	12/06/21 10:00
320-82516-2	MW-36-20210312	Water	12/03/21 13:50	12/06/21 10:00
320-82516-3	MW-74-20210312	Water	12/03/21 14:50	12/06/21 10:00
320-82516-4	EB-2-20210312	Water	12/03/21 12:30	12/06/21 10:00
320-82516-5	FB-2-20210312	Water	12/03/21 12:35	12/06/21 10:00

Address:

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:		Project Manager: Meg Strong Tel>Email: meg.strong@shaw.com Analyst's Turnaround Time ☐ CALENDAR DAYS ☐ WORKING DAYS TAT if different from Below: ☒ 2 weeks ☐ 1 week ☐ 2 days ☐ 1 day Standard TAS		Client Contact Company Name: Shannon & Wilson, Inc. Address: 400 N. 34th St., Suite 600 City/State/Zip: Seattle, WA 98103 Phone: 206-632-8620 Fax: 206-695-6777 Project Name: LDW Site: LDW P.O.# 21-1-12596		Site Contact: Shoshana Howard Lab Contact: David Alticker Date: 12/3/2021 Carrier: FedEx COC No: 576592 1 of 1 COCs Sampler: Christina Canfield For Lab Use Only: Walk-in Client: Lab Sampling: Job / SDG No.: Sample Specific Notes:		
		 320-82516 Chain of Custody						
Sample Identification		Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)
MW-200-20210312		12/3/21	1405	G	GW	2	N	X
MW-36-20210312		12/3/21	1350	G	GW	2	N	X
MW-74-20210312		12/3/21	1450	G	GW	2	N	X
EB-2-20210312		12/3/21	1230	G	W	1	N	X
EB-2-20210312		12/3/21	1235	G	W	2	N	X
X								
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____ Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.								
Special Instructions/QC Requirements & Comments: ☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Return to Client ☒ Disposal by Lab ☐ Archive for _____ Months								
Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)								
Custody Seal No: 184245		Custody Seal No: 1812494		Cooler Temp. (°C): Obs'd: 1.1		Therm ID No: C-04		
Company: SWS		Company: EETSAC		Received by: Chas		Date/Time: 12-6-21/1000		
Relinquished by: Christina Canfield		Relinquished by:		Received in Laboratory by:		Date/Time:		
Relinquished by:		Relinquished by:		Received in Laboratory by:		Date/Time:		

Login Sample Receipt Checklist

Client: Shannon & Wilson, Inc

Job Number: 320-82516-1

Login Number: 82516**List Source: Eurofins TestAmerica, Sacramento****List Number: 1****Creator: Cahill, Nicholas P**

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	1842494/1842495
Sample custody seals, if present, are intact.	N/A	
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 $<6\text{mm}$ (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



Environment Testing America

ANALYTICAL REPORT

Eurofins Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

Laboratory Job ID: 320-83346-1

Client Project/Site: LDW

For:

Shannon & Wilson, Inc
400 N. 34th Suite 100
PO BOX 300303
Seattle, Washington 98103

Attn: Meg Strong

Authorized for release by:

1/6/2022 10:13:36 AM

David Alltucker, Project Manager I
(916)374-4383

David.Alltucker@Eurofinset.com

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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.

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Definitions/Glossary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Qualifiers

LCMS

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.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
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)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
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)
TNTC	Too Numerous To Count

Case Narrative

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Job ID: 320-83346-1

Laboratory: Eurofins Sacramento

Narrative

Job Narrative 320-83346-1

Receipt

The samples were received on 12/23/2021 10:45 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 1.5° C.

LCMS

Method EPA 537(Mod): Results for sample LDW-DRUM-5 (320-83346-5) were reported from the analysis of a diluted extract due to high concentration of the target analyte in the analysis of the undiluted extract. The dilution factor was applied to the labeled internal standard area counts and these area counts were within acceptance limits

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

Organic Prep

Method 3535: The following samples were light orange with orange particulates in the sample bottle prior to extraction: LDW-DRUM-1 (320-83346-1), LDW-DRUM-2 (320-83346-2), LDW-DRUM-3 (320-83346-3), LDW-DRUM-4 (320-83346-4), LDW-DRUM-5 (320-83346-5) and LDW-DRUM-6 (320-83346-6).
preparation batch 320-554613

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

Detection Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Client Sample ID: LDW-DRUM-1

Lab Sample ID: 320-83346-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	7.0		1.9	0.23	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	6.1		1.9	0.79	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorononanoic acid (PFNA)	0.51	J	1.9	0.25	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	5.1		1.9	0.19	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	54		1.9	0.53	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	90		1.9	0.50	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: LDW-DRUM-2

Lab Sample ID: 320-83346-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	35		1.9	0.24	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	21		1.9	0.80	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorononanoic acid (PFNA)	0.45	J	1.9	0.26	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	35		1.9	0.19	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	280		1.9	0.54	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	240		1.9	0.51	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: LDW-DRUM-3

Lab Sample ID: 320-83346-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	12		2.0	0.26	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	16		2.0	0.87	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorononanoic acid (PFNA)	0.57	J	2.0	0.28	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	15		2.0	0.20	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	140		2.0	0.58	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	240		2.0	0.55	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: LDW-DRUM-4

Lab Sample ID: 320-83346-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	16		1.9	0.24	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	15		1.9	0.81	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorononanoic acid (PFNA)	0.76	J	1.9	0.26	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	15		1.9	0.19	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	160		1.9	0.55	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	330		1.9	0.52	ng/L	1		EPA 537(Mod)	Total/NA

Client Sample ID: LDW-DRUM-5

Lab Sample ID: 320-83346-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	46		1.8	0.23	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	44		1.8	0.78	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorononanoic acid (PFNA)	0.54	J	1.8	0.25	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	75		1.8	0.18	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	660		9.2	2.6	ng/L	5		EPA 537(Mod)	Total/NA
- DL Perfluorooctanesulfonic acid (PFOS) - DL	910		9.2	2.5	ng/L	5		EPA 537(Mod)	Total/NA

Client Sample ID: LDW-DRUM-6

Lab Sample ID: 320-83346-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	8.7		1.9	0.24	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanoic acid (PFOA)	12		1.9	0.81	ng/L	1		EPA 537(Mod)	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins Sacramento

Detection Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Client Sample ID: LDW-DRUM-6 (Continued)

Lab Sample ID: 320-83346-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorononanoic acid (PFNA)	1.1	J	1.9	0.26	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	17		1.9	0.19	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	110		1.9	0.55	ng/L	1		EPA 537(Mod)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	160		1.9	0.52	ng/L	1		EPA 537(Mod)	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins Sacramento

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Client Sample ID: LDW-DRUM-1

Lab Sample ID: 320-83346-1

Date Collected: 12/20/21 16:00

Matrix: Water

Date Received: 12/23/21 10:45

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	7.0		1.9	0.23	ng/L		12/29/21 05:51	01/01/22 00:47	1
Perfluorooctanoic acid (PFOA)	6.1		1.9	0.79	ng/L		12/29/21 05:51	01/01/22 00:47	1
Perfluorononanoic acid (PFNA)	0.51	J	1.9	0.25	ng/L		12/29/21 05:51	01/01/22 00:47	1
Perfluorobutanesulfonic acid (PFBS)	5.1		1.9	0.19	ng/L		12/29/21 05:51	01/01/22 00:47	1
Perfluorohexanesulfonic acid (PFHxS)	54		1.9	0.53	ng/L		12/29/21 05:51	01/01/22 00:47	1
Perfluorooctanesulfonic acid (PFOS)	90		1.9	0.50	ng/L		12/29/21 05:51	01/01/22 00:47	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	91		50 - 150				12/29/21 05:51	01/01/22 00:47	1
13C4 PFOA	108		50 - 150				12/29/21 05:51	01/01/22 00:47	1
13C5 PFNA	104		50 - 150				12/29/21 05:51	01/01/22 00:47	1
13C3 PFBS	112		50 - 150				12/29/21 05:51	01/01/22 00:47	1
18O2 PFHxS	94		50 - 150				12/29/21 05:51	01/01/22 00:47	1
13C4 PFOS	96		50 - 150				12/29/21 05:51	01/01/22 00:47	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Client Sample ID: LDW-DRUM-2

Lab Sample ID: 320-83346-2

Date Collected: 12/20/21 16:05

Matrix: Water

Date Received: 12/23/21 10:45

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	35		1.9	0.24	ng/L		12/29/21 05:51	01/01/22 00:57	1
Perfluorooctanoic acid (PFOA)	21		1.9	0.80	ng/L		12/29/21 05:51	01/01/22 00:57	1
Perfluorononanoic acid (PFNA)	0.45	J	1.9	0.26	ng/L		12/29/21 05:51	01/01/22 00:57	1
Perfluorobutanesulfonic acid (PFBS)	35		1.9	0.19	ng/L		12/29/21 05:51	01/01/22 00:57	1
Perfluorohexanesulfonic acid (PFHxS)	280		1.9	0.54	ng/L		12/29/21 05:51	01/01/22 00:57	1
Perfluorooctanesulfonic acid (PFOS)	240		1.9	0.51	ng/L		12/29/21 05:51	01/01/22 00:57	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	98		50 - 150				12/29/21 05:51	01/01/22 00:57	1
13C4 PFOA	113		50 - 150				12/29/21 05:51	01/01/22 00:57	1
13C5 PFNA	98		50 - 150				12/29/21 05:51	01/01/22 00:57	1
13C3 PFBS	96		50 - 150				12/29/21 05:51	01/01/22 00:57	1
18O2 PFHxS	91		50 - 150				12/29/21 05:51	01/01/22 00:57	1
13C4 PFOS	92		50 - 150				12/29/21 05:51	01/01/22 00:57	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Client Sample ID: LDW-DRUM-3

Lab Sample ID: 320-83346-3

Date Collected: 12/20/21 16:10

Matrix: Water

Date Received: 12/23/21 10:45

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	12		2.0	0.26	ng/L		12/29/21 05:51	01/01/22 01:08	1
Perfluorooctanoic acid (PFOA)	16		2.0	0.87	ng/L		12/29/21 05:51	01/01/22 01:08	1
Perfluorononanoic acid (PFNA)	0.57	J	2.0	0.28	ng/L		12/29/21 05:51	01/01/22 01:08	1
Perfluorobutanesulfonic acid (PFBS)	15		2.0	0.20	ng/L		12/29/21 05:51	01/01/22 01:08	1
Perfluorohexanesulfonic acid (PFHxS)	140		2.0	0.58	ng/L		12/29/21 05:51	01/01/22 01:08	1
Perfluorooctanesulfonic acid (PFOS)	240		2.0	0.55	ng/L		12/29/21 05:51	01/01/22 01:08	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	109		50 - 150				12/29/21 05:51	01/01/22 01:08	1
13C4 PFOA	112		50 - 150				12/29/21 05:51	01/01/22 01:08	1
13C5 PFNA	95		50 - 150				12/29/21 05:51	01/01/22 01:08	1
13C3 PFBS	105		50 - 150				12/29/21 05:51	01/01/22 01:08	1
18O2 PFHxS	104		50 - 150				12/29/21 05:51	01/01/22 01:08	1
13C4 PFOS	97		50 - 150				12/29/21 05:51	01/01/22 01:08	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Client Sample ID: LDW-DRUM-4

Lab Sample ID: 320-83346-4

Date Collected: 12/20/21 16:15

Matrix: Water

Date Received: 12/23/21 10:45

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	16		1.9	0.24	ng/L		12/29/21 05:51	01/01/22 01:18	1
Perfluorooctanoic acid (PFOA)	15		1.9	0.81	ng/L		12/29/21 05:51	01/01/22 01:18	1
Perfluorononanoic acid (PFNA)	0.76	J	1.9	0.26	ng/L		12/29/21 05:51	01/01/22 01:18	1
Perfluorobutanesulfonic acid (PFBS)	15		1.9	0.19	ng/L		12/29/21 05:51	01/01/22 01:18	1
Perfluorohexanesulfonic acid (PFHxS)	160		1.9	0.55	ng/L		12/29/21 05:51	01/01/22 01:18	1
Perfluorooctanesulfonic acid (PFOS)	330		1.9	0.52	ng/L		12/29/21 05:51	01/01/22 01:18	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	97		50 - 150				12/29/21 05:51	01/01/22 01:18	1
13C4 PFOA	114		50 - 150				12/29/21 05:51	01/01/22 01:18	1
13C5 PFNA	102		50 - 150				12/29/21 05:51	01/01/22 01:18	1
13C3 PFBS	111		50 - 150				12/29/21 05:51	01/01/22 01:18	1
18O2 PFHxS	102		50 - 150				12/29/21 05:51	01/01/22 01:18	1
13C4 PFOS	99		50 - 150				12/29/21 05:51	01/01/22 01:18	1

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Client Sample ID: LDW-DRUM-5

Lab Sample ID: 320-83346-5

Date Collected: 12/20/21 16:20

Matrix: Water

Date Received: 12/23/21 10:45

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	46		1.8	0.23	ng/L		12/29/21 05:51	01/01/22 01:29	1
Perfluorooctanoic acid (PFOA)	44		1.8	0.78	ng/L		12/29/21 05:51	01/01/22 01:29	1
Perfluorononanoic acid (PFNA)	0.54	J	1.8	0.25	ng/L		12/29/21 05:51	01/01/22 01:29	1
Perfluorobutanesulfonic acid (PFBS)	75		1.8	0.18	ng/L		12/29/21 05:51	01/01/22 01:29	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	93		50 - 150	12/29/21 05:51	01/01/22 01:29	1
13C4 PFOA	110		50 - 150	12/29/21 05:51	01/01/22 01:29	1
13C5 PFNA	89		50 - 150	12/29/21 05:51	01/01/22 01:29	1
13C3 PFBS	98		50 - 150	12/29/21 05:51	01/01/22 01:29	1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15 - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	660		9.2	2.6	ng/L		12/29/21 05:51	01/03/22 11:36	5
Perfluorooctanesulfonic acid (PFOS)	910		9.2	2.5	ng/L		12/29/21 05:51	01/03/22 11:36	5

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
18O2 PFHxS	107		50 - 150	12/29/21 05:51	01/03/22 11:36	5
13C4 PFOS	92		50 - 150	12/29/21 05:51	01/03/22 11:36	5

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Client Sample ID: LDW-DRUM-6

Lab Sample ID: 320-83346-6

Date Collected: 12/20/21 16:25

Matrix: Water

Date Received: 12/23/21 10:45

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	8.7		1.9	0.24	ng/L		12/29/21 05:51	01/01/22 02:00	1
Perfluorooctanoic acid (PFOA)	12		1.9	0.81	ng/L		12/29/21 05:51	01/01/22 02:00	1
Perfluorononanoic acid (PFNA)	1.1	J	1.9	0.26	ng/L		12/29/21 05:51	01/01/22 02:00	1
Perfluorobutanesulfonic acid (PFBS)	17		1.9	0.19	ng/L		12/29/21 05:51	01/01/22 02:00	1
Perfluorohexanesulfonic acid (PFHxS)	110		1.9	0.55	ng/L		12/29/21 05:51	01/01/22 02:00	1
Perfluorooctanesulfonic acid (PFOS)	160		1.9	0.52	ng/L		12/29/21 05:51	01/01/22 02:00	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFHpA	96		50 - 150				12/29/21 05:51	01/01/22 02:00	1
13C4 PFOA	110		50 - 150				12/29/21 05:51	01/01/22 02:00	1
13C5 PFNA	92		50 - 150				12/29/21 05:51	01/01/22 02:00	1
13C3 PFBS	99		50 - 150				12/29/21 05:51	01/01/22 02:00	1
18O2 PFHxS	96		50 - 150				12/29/21 05:51	01/01/22 02:00	1
13C4 PFOS	97		50 - 150				12/29/21 05:51	01/01/22 02:00	1

Isotope Dilution Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Matrix: Water

Prep Type: Total/NA

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	C4PFHA (50-150)	PFOA (50-150)	PFNA (50-150)	C3PFBS (50-150)	PFHxS (50-150)	PFOS (50-150)
320-83346-1	LDW-DRUM-1	91	108	104	112	94	96
320-83346-2	LDW-DRUM-2	98	113	98	96	91	92
320-83346-3	LDW-DRUM-3	109	112	95	105	104	97
320-83346-4	LDW-DRUM-4	97	114	102	111	102	99
320-83346-5	LDW-DRUM-5	93	110	89	98		
320-83346-5 - DL	LDW-DRUM-5					107	92
320-83346-6	LDW-DRUM-6	96	110	92	99	96	97
440-293285-M-1-B MS	Matrix Spike	113	111	100	113	111	105
440-293285-M-1-C MSD	Matrix Spike Duplicate	99	105	96	105	104	97
LCS 320-554613/2-A	Lab Control Sample	109	110	99	106	115	102
MB 320-554613/1-A	Method Blank	106	112	97	102	111	105

Surrogate Legend

C4PFHA = 13C4 PFHpA

PFOA = 13C4 PFOA

PFNA = 13C5 PFNA

C3PFBS = 13C3 PFBS

PFHxS = 18O2 PFHxS

PFOS = 13C4 PFOS

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15

Lab Sample ID: MB 320-554613/1-A

Matrix: Water

Analysis Batch: 555150

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 554613

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.25	ng/L		12/29/21 05:51	12/31/21 23:55	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.85	ng/L		12/29/21 05:51	12/31/21 23:55	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.27	ng/L		12/29/21 05:51	12/31/21 23:55	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.20	ng/L		12/29/21 05:51	12/31/21 23:55	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.57	ng/L		12/29/21 05:51	12/31/21 23:55	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.54	ng/L		12/29/21 05:51	12/31/21 23:55	1

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	106		50 - 150	12/29/21 05:51	12/31/21 23:55	1
13C4 PFOA	112		50 - 150	12/29/21 05:51	12/31/21 23:55	1
13C5 PFNA	97		50 - 150	12/29/21 05:51	12/31/21 23:55	1
13C3 PFBS	102		50 - 150	12/29/21 05:51	12/31/21 23:55	1
18O2 PFHxS	111		50 - 150	12/29/21 05:51	12/31/21 23:55	1
13C4 PFOS	105		50 - 150	12/29/21 05:51	12/31/21 23:55	1

Lab Sample ID: LCS 320-554613/2-A

Matrix: Water

Analysis Batch: 555150

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 554613

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Perfluoroheptanoic acid (PFHpA)	40.0	36.0		ng/L		90	72 - 130
Perfluorooctanoic acid (PFOA)	40.0	33.9		ng/L		85	71 - 133
Perfluorononanoic acid (PFNA)	40.0	39.7		ng/L		99	69 - 130
Perfluorobutanesulfonic acid (PFBS)	35.4	30.1		ng/L		85	72 - 130
Perfluorohexanesulfonic acid (PFHxS)	36.4	33.1		ng/L		91	68 - 131
Perfluorooctanesulfonic acid (PFOS)	37.1	34.1		ng/L		92	65 - 140

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C4 PFHpA	109		50 - 150
13C4 PFOA	110		50 - 150
13C5 PFNA	99		50 - 150
13C3 PFBS	106		50 - 150
18O2 PFHxS	115		50 - 150
13C4 PFOS	102		50 - 150

Lab Sample ID: 440-293285-M-1-B MS

Matrix: Water

Analysis Batch: 555150

Client Sample ID: Matrix Spike

Prep Type: Total/NA

Prep Batch: 554613

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Perfluoroheptanoic acid (PFHpA)	29	J	2000	1870		ng/L		92	72 - 130
Perfluorooctanoic acid (PFOA)	100		2000	1880		ng/L		89	71 - 133
Perfluorononanoic acid (PFNA)	ND		2000	1840		ng/L		92	69 - 130
Perfluorobutanesulfonic acid (PFBS)	32	J	1770	1510		ng/L		84	72 - 130
Perfluorohexanesulfonic acid (PFHxS)	82	J	1820	1770		ng/L		93	68 - 131

Eurofins Sacramento

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Method: EPA 537(Mod) - PFAS for QSM 5.3, Table B-15 (Continued)

Lab Sample ID: 440-293285-M-1-B MS

Matrix: Water

Analysis Batch: 555150

Client Sample ID: Matrix Spike

Prep Type: Total/NA

Prep Batch: 554613

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Perfluorooctanesulfonic acid (PFOS)	98	J	1860	1880		ng/L		96	65 - 140
<i>Isotope Dilution</i>	<i>MS %Recovery</i>	<i>MS Qualifier</i>	<i>Limits</i>						
13C4 PFHpA	113		50 - 150						
13C4 PFOA	111		50 - 150						
13C5 PFNA	100		50 - 150						
13C3 PFBS	113		50 - 150						
18O2 PFHxS	111		50 - 150						
13C4 PFOS	105		50 - 150						

Lab Sample ID: 440-293285-M-1-C MSD

Matrix: Water

Analysis Batch: 555150

Client Sample ID: Matrix Spike Duplicate

Prep Type: Total/NA

Prep Batch: 554613

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perfluoroheptanoic acid (PFHpA)	29	J	2000	1910		ng/L		94	72 - 130	2	30
Perfluorooctanoic acid (PFOA)	100		2000	1820		ng/L		86	71 - 133	3	30
Perfluorononanoic acid (PFNA)	ND		2000	1760		ng/L		88	69 - 130	4	30
Perfluorobutanesulfonic acid (PFBS)	32	J	1770	1480		ng/L		82	72 - 130	2	30
Perfluorohexanesulfonic acid (PFHxS)	82	J	1820	1760		ng/L		92	68 - 131	0	30
Perfluorooctanesulfonic acid (PFOS)	98	J	1860	1860		ng/L		95	65 - 140	1	30
<i>Isotope Dilution</i>	<i>MSD %Recovery</i>	<i>MSD Qualifier</i>	<i>Limits</i>								
13C4 PFHpA	99		50 - 150								
13C4 PFOA	105		50 - 150								
13C5 PFNA	96		50 - 150								
13C3 PFBS	105		50 - 150								
18O2 PFHxS	104		50 - 150								
13C4 PFOS	97		50 - 150								

QC Association Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

LCMS

Prep Batch: 554613

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-83346-1	LDW-DRUM-1	Total/NA	Water	3535	
320-83346-2	LDW-DRUM-2	Total/NA	Water	3535	
320-83346-3	LDW-DRUM-3	Total/NA	Water	3535	
320-83346-4	LDW-DRUM-4	Total/NA	Water	3535	
320-83346-5	LDW-DRUM-5	Total/NA	Water	3535	
320-83346-5 - DL	LDW-DRUM-5	Total/NA	Water	3535	
320-83346-6	LDW-DRUM-6	Total/NA	Water	3535	
MB 320-554613/1-A	Method Blank	Total/NA	Water	3535	
LCS 320-554613/2-A	Lab Control Sample	Total/NA	Water	3535	
440-293285-M-1-B MS	Matrix Spike	Total/NA	Water	3535	
440-293285-M-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	3535	

Analysis Batch: 555150

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-83346-1	LDW-DRUM-1	Total/NA	Water	EPA 537(Mod)	554613
320-83346-2	LDW-DRUM-2	Total/NA	Water	EPA 537(Mod)	554613
320-83346-3	LDW-DRUM-3	Total/NA	Water	EPA 537(Mod)	554613
320-83346-4	LDW-DRUM-4	Total/NA	Water	EPA 537(Mod)	554613
320-83346-5	LDW-DRUM-5	Total/NA	Water	EPA 537(Mod)	554613
320-83346-6	LDW-DRUM-6	Total/NA	Water	EPA 537(Mod)	554613
MB 320-554613/1-A	Method Blank	Total/NA	Water	EPA 537(Mod)	554613
LCS 320-554613/2-A	Lab Control Sample	Total/NA	Water	EPA 537(Mod)	554613
440-293285-M-1-B MS	Matrix Spike	Total/NA	Water	EPA 537(Mod)	554613
440-293285-M-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	EPA 537(Mod)	554613

Analysis Batch: 555563

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-83346-5 - DL	LDW-DRUM-5	Total/NA	Water	EPA 537(Mod)	554613

Lab Chronicle

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Client Sample ID: LDW-DRUM-1

Date Collected: 12/20/21 16:00

Date Received: 12/23/21 10:45

Lab Sample ID: 320-83346-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			269.3 mL	10.0 mL	554613	12/29/21 05:51	NSS	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			555150	01/01/22 00:47	RS1	TAL SAC

Client Sample ID: LDW-DRUM-2

Date Collected: 12/20/21 16:05

Date Received: 12/23/21 10:45

Lab Sample ID: 320-83346-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			264.4 mL	10.0 mL	554613	12/29/21 05:51	NSS	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			555150	01/01/22 00:57	RS1	TAL SAC

Client Sample ID: LDW-DRUM-3

Date Collected: 12/20/21 16:10

Date Received: 12/23/21 10:45

Lab Sample ID: 320-83346-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			244.1 mL	10.0 mL	554613	12/29/21 05:51	NSS	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			555150	01/01/22 01:08	RS1	TAL SAC

Client Sample ID: LDW-DRUM-4

Date Collected: 12/20/21 16:15

Date Received: 12/23/21 10:45

Lab Sample ID: 320-83346-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			260.9 mL	10.0 mL	554613	12/29/21 05:51	NSS	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			555150	01/01/22 01:18	RS1	TAL SAC

Client Sample ID: LDW-DRUM-5

Date Collected: 12/20/21 16:20

Date Received: 12/23/21 10:45

Lab Sample ID: 320-83346-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			273.1 mL	10.0 mL	554613	12/29/21 05:51	NSS	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			555150	01/01/22 01:29	RS1	TAL SAC
Total/NA	Prep	3535	DL		273.1 mL	10.0 mL	554613	12/29/21 05:51	NSS	TAL SAC
Total/NA	Analysis	EPA 537(Mod)	DL	5			555563	01/03/22 11:36	D1R	TAL SAC

Client Sample ID: LDW-DRUM-6

Date Collected: 12/20/21 16:25

Date Received: 12/23/21 10:45

Lab Sample ID: 320-83346-6

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			260.8 mL	10.0 mL	554613	12/29/21 05:51	NSS	TAL SAC
Total/NA	Analysis	EPA 537(Mod)		1			555150	01/01/22 02:00	RS1	TAL SAC

Laboratory References:

TAL SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Eurofins Sacramento

Accreditation/Certification Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Laboratory: Eurofins Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	17-020	02-20-24

1

2

3

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Method Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Method	Method Description	Protocol	Laboratory
EPA 537(Mod) 3535	PFAS for QSM 5.3, Table B-15 Solid-Phase Extraction (SPE)	EPA SW846	TAL SAC TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: Shannon & Wilson, Inc
Project/Site: LDW

Job ID: 320-83346-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-83346-1	LDW-DRUM-1	Water	12/20/21 16:00	12/23/21 10:45
320-83346-2	LDW-DRUM-2	Water	12/20/21 16:05	12/23/21 10:45
320-83346-3	LDW-DRUM-3	Water	12/20/21 16:10	12/23/21 10:45
320-83346-4	LDW-DRUM-4	Water	12/20/21 16:15	12/23/21 10:45
320-83346-5	LDW-DRUM-5	Water	12/20/21 16:20	12/23/21 10:45
320-83346-6	LDW-DRUM-6	Water	12/20/21 16:25	12/23/21 10:45

Chain of Custody Record

589805

Environment Testing
TestAmerica

Address:

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TAL-8210

Client Contact		Project Manager: Meg Strong		Site Contact: Stephanie Howard		Date: 12/20/2021		COC No: 589805	
Company Name: Shannon & Wilcox, Inc.		Tel/Email: mstrong@shannonwilcox.com		Lab Contact: David Altkucker		Carrier: FedEx		COCs	
Address: 400 N. 34th St., Suite 100		Analysis Turnaround Time		Perform MS / MSD (Y / N)		Filtered Sample (Y / N)		Sampler: CTC	
City/State/Zip: Seattle, WA 98103		☐ CALENDAR DAYS ☐ WORKING DAYS		X UCMR-6 PFAS		X UCMR-6 PFAS		For Lab Use Only:	
Phone: 206-632-8020		TAT if different from Below		Sample Date		Sample Time		Walk-in Client:	
Fax:		☒ 2 weeks ☐ 1 week ☐ 2 days ☐ 1 day		Sample Type (C=Comp, G=Grab)		Matrix		Lab Sampling:	
Project Name: LDW		Sample Date		Sample Time		Matrix		Job / SDG No.:	
Site: LDW		Sample Date		Sample Time		Matrix		Sample Specific Notes:	
P O # 21-1-12596		Sample Date		Sample Time		Matrix			
LDW-DRUM-1		12/20		1600		GW		2	
LDW-DRUM-2		12/20		1605		GW		2	
LDW-DRUM-3		12/20		1600		GW		2	
LDW-DRUM-4		12/20		1615		GW		2	
LDW-DRUM-5		12/20		1620		GW		2	
LDW-DRUM-6		12/20		1625		GW		2	


320-83346 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4= HNO3; 5= NaOH; 6= Other

Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☒ Unknown

Special Instructions/QC Requirements & Comments:

Custody Seals Intact:	Yes	No	Custody Seal No.:	1705011, 1705010	Cooler Temp. (°C):	Obs'd:	Therm ID No.:	606
Relinquished by:	☒	☐	Company:	SWI	Received by:	Company:	Date/Time:	12/20/21 1045
Relinquished by:	☒	☐	Company:	Christian Canfield	Received by:	Company:	Date/Time:	
Relinquished by:	☐	☐	Company:		Received in Laboratory by:	Company:	Date/Time:	

Login Sample Receipt Checklist

Client: Shannon & Wilson, Inc

Job Number: 320-83346-1

Login Number: 83346

List Source: Eurofins Sacramento

List Number: 1

Creator: Cahill, Nicholas P

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	1705010/170504
Sample custody seals, if present, are intact.	N/A	
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 $<6\text{mm}$ (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Appendix F

LNAPL Investigation Findings

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Tables

Table F-1: “Observational” Extended Bail-Down Test Field Measurements

Attachments

Attachment F-1: Laser-Induced Fluorescence Study Report, Columbia, December 2020

Light nonaqueous phase liquid (LNAPL) investigations completed during the 2020-2021 remedial investigation included completion of a laser-induced fluorescence (LIF) study, transmissivity testing, and collection of groundwater samples to support natural source zone depletion (NSZD) evaluation.

The LIF study was completed to delineate the Area 1 and Area 2 plumes. LIF study results are discussed within the main text of the report. The LIF subconsultant, Columbia Technologies, provided a report that includes a summary of the investigation findings, their interpretations, and copies of LIF response readings at each exploration. The report is provided as Attachment F-1 of this appendix.

To improve support evaluation of remedial options for the LNAPL plumes, two separate LNAPL transmissivity studies were completed at the Site. These included transmissivity tests completed in accordance with ASTM E2856-13 and “observational” extended bail-down tests. Test procedures are detailed in Appendix C. Test result evaluations are presented in the following Sections.

NSZD evaluations are included in the main text of the report.

F.1 TRANSMISSIVITY TEST FINDINGS

Bail-down tests were used to evaluate LNAPL transmissivity at three monitoring wells; well characteristics are summarized in Exhibit F-1.

Exhibit F-1: Monitoring Wells Used During LNAPL Transmissivity Test

Well Name	Construction Materials	Screened Interval (feet bgs)	LNAPL Plume
MW-17	6-inch PVC	8 to 23	Area 1
MW-29	6-inch PVC	7 to 22	Area 1
MW-35	2-inch PVC	5 to 20	Area 2

bgs = below ground surface; PVC = polyvinyl chloride

F.1.1 Drawdown and Light Nonaqueous Phase Liquid Thickness

The transmissivity was calculated using the initial volume of drawdown and the estimated volumetric response. The volumetric response was estimated using the LNAPL layer thickness, which was calculated using the water-interval pressure transducer data, the measured elevation of the air/LNAPL interface, and the barometric pressure transducer data. The water-interval pressure transducer was referenced as zero elevation for the

purposes of this calculation. The following equations were used to estimate the LNAPL volumetric response (see Exhibits B-2 through B-4).

Exhibit F-2: Equation 1

Equation	Variable and Definition
$Z_{CGW} = Z_{P1} + \frac{P_{P1} - P_{atm}}{\rho_w * g/g_c}$	Z_{P1} Elevation of the water-interval pressure transducer P1 (feet)
	Z_{CGW} Elevation of the calculated water table (feet)
	P_{P1} Measured absolute pressure from pressure transducer in water interval: P1 (psf)
	P_{atm} Measured atmospheric pressure inside the well casing (psf)
	ρ_w Groundwater density (assumed 62.4 lb/ft ³)
	g/g_c 1 lbf/lbm

lb/ft³ = pounds per cubic foot; lbf = pound-force; lbm = pound-mass; psf = pounds per square foot

Exhibit F-3: Equation 2

Equation	Variable and Definition
$Z_{OW} = \frac{Z_{CGW} - \rho_r * Z_{AN}}{1 - \rho_r}$	Z_{OW} Elevation of LNAPL/water interface (feet)
	Z_{CGW} Elevation of the calculated water table (feet)
	ρ_r The relative LNAPL to water density, that is $\rho_r = \rho_n/\rho_w$ (unitless)
	Z_{AN} The air/LNAPL interface elevation (feet)

The density of the LNAPL (ρ_n) in Areas 1 and 2 were analyzed during August 2017 by Spectra Laboratories of Tacoma, Washington. For the purposes of the volumetric response calculation, the density of LNAPL in Area 1 is estimated to be the average value of the density calculated from samples collected from MW-21 and MW-27 (0.9373 kilogram per liter [kg/L] and 0.9201 kg/L) with the average of 0.9287 kg/L (equal to 57.977 pound-mass per cubic foot [lbm/ft³]). The density of LNAPL in Area 2 is estimated to be the density analyzed from a sample of LNAPL collected from MW-35 and is 0.9239 kg/L (equal to 57.677 lbm/ft³).

Exhibit F-4: Equation 3

Equation	Variable and Definition
$b_{nt} = Z_{AN(t)} - Z_{OW}$	b_{nt} LNAPL thickness at time t (feet)
	$Z_{AN(t)}$ The air/LNAPL interface elevation at time t (feet)
	Z_{OW} Elevation of LNAPL/water interface (feet)

Air/LNAPL and LNAPL/water interface elevations and LNAPL thicknesses measured during the bail-down tests are shown in Exhibits E-5 through E-7.

APPENDIX F: LNAPL INVESTIGATION FINDINGS

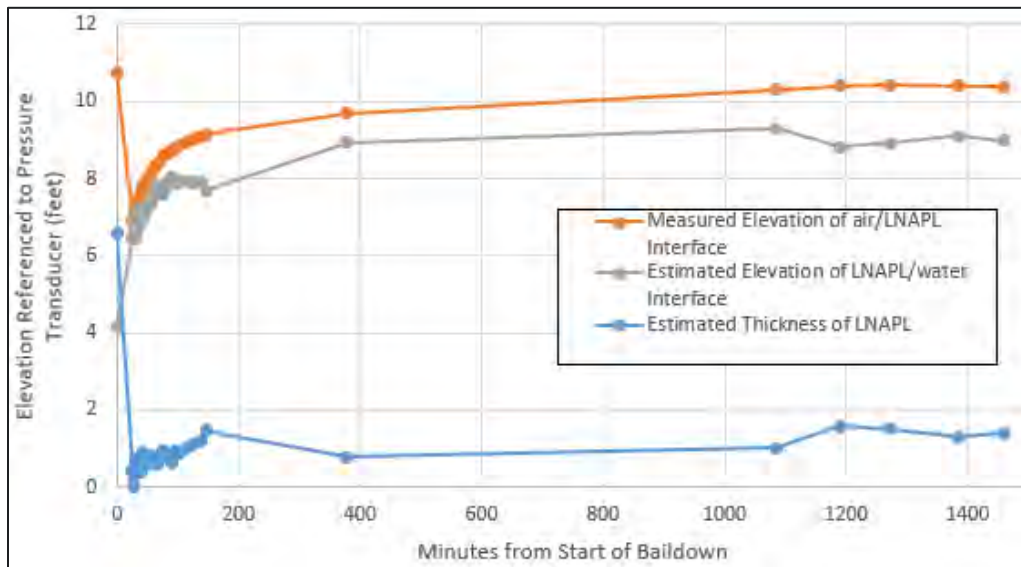


Exhibit F-5: LNAPL Bail-Down and Response at MW-17 (Plume Area 1)

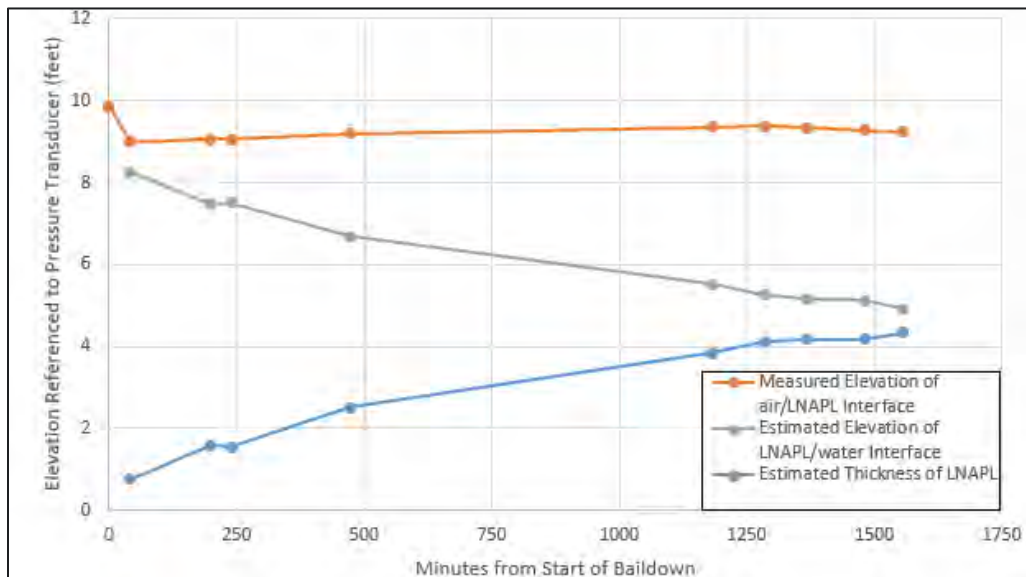


Exhibit F-6: LNAPL Bail-Down and Response at MW-29 (Plume Area 1)

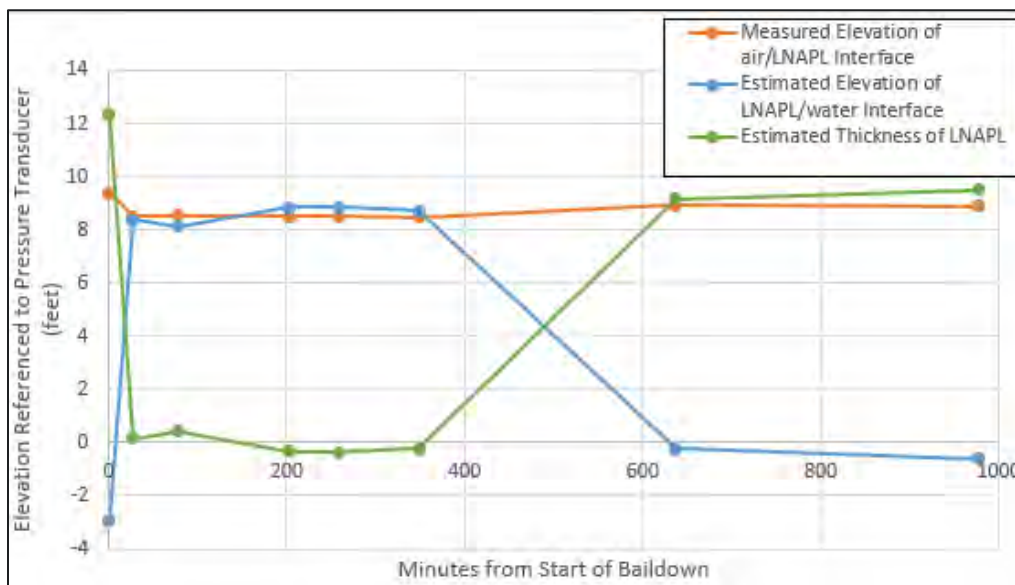


Exhibit F-7: LNAPL Bail-Down and Response at MW-35 (Plume Area 2)

F.1.2 Light Nonaqueous Phase Liquid Transmissivity

LNAPL transmissivity was estimated using the Bouwer-Rice method, which assumes a quasi-steady state model for recharge to the well (i.e., the model assumes steady radial flow to the well with rate dependent on the well drawdown; no storage effects are included), and that the ratio of change in LNAPL head to LNAPL thickness is constant.

F.1.2.1 Suitability Screening

Available data was screened for suitability to apply the Bouwer-Rice method. According to the Bouwer-Rice method, the logarithm of the drawdown varies as a linear function of time. Data that exhibits a linear relationship may be extracted for further use in the transmissivity calculation. Drawdown was calculated using the equation shown below in Exhibit F-8.

Exhibit F-8: Equation 4

Equation	Variable and Definition	
$S_{nt} = Z_{AN*} - Z_{AN(t)}$	Z_{AN*}	The air/LNAPL interface elevation for equilibrium condition (feet)
	$Z_{AN(t)}$	The air/LNAPL interface elevation at time t (feet)
	S_{nt}	LNAPL drawdown at time t (feet)

Exhibits F-9 through F-11, below, were used to screen the data for suitability to apply the Bouwer-Rice method. Though generally linear, the data varied somewhat from a linear relationship (R-squared values ranging from 0.74 to 0.90), indicating that the assumptions of the Bouwer-Rice Method (i.e., quasi-steady state model) may not be a good fit.

APPENDIX F: LNAPL INVESTIGATION FINDINGS

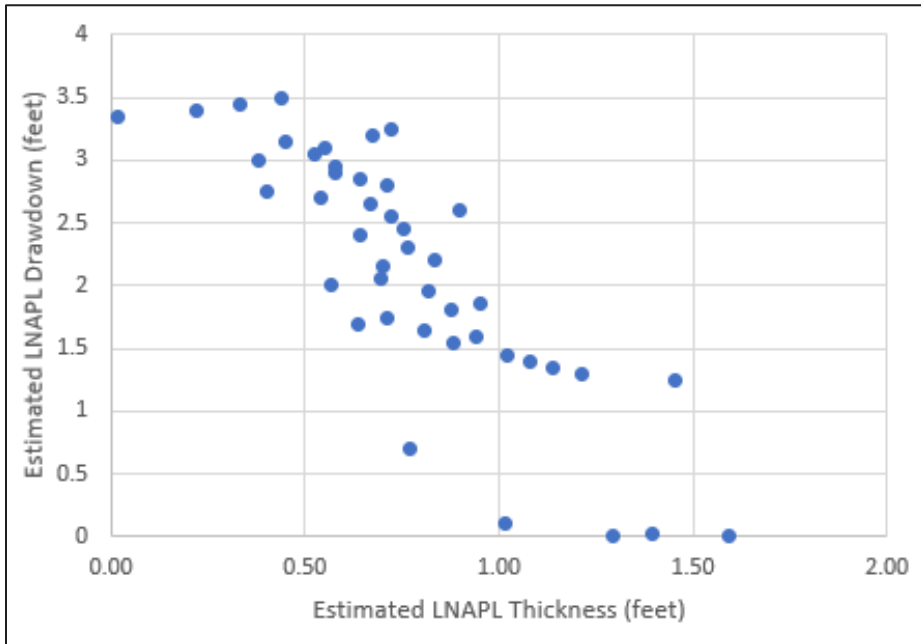


Exhibit F-9: Evaluation for Linear Relationship at MW-17 (Plume Area 1)

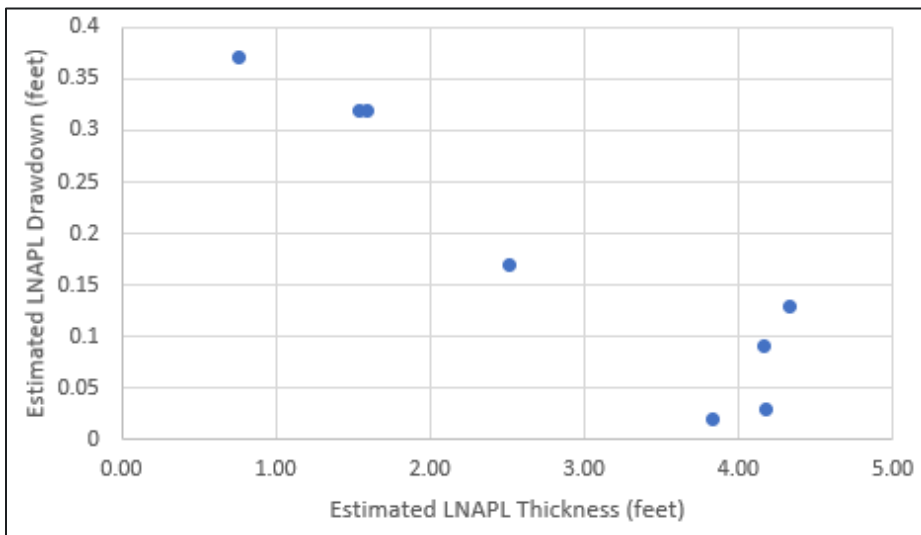


Exhibit F-10: Evaluation for Linear Relationship at MW-29 (Plume Area 1)

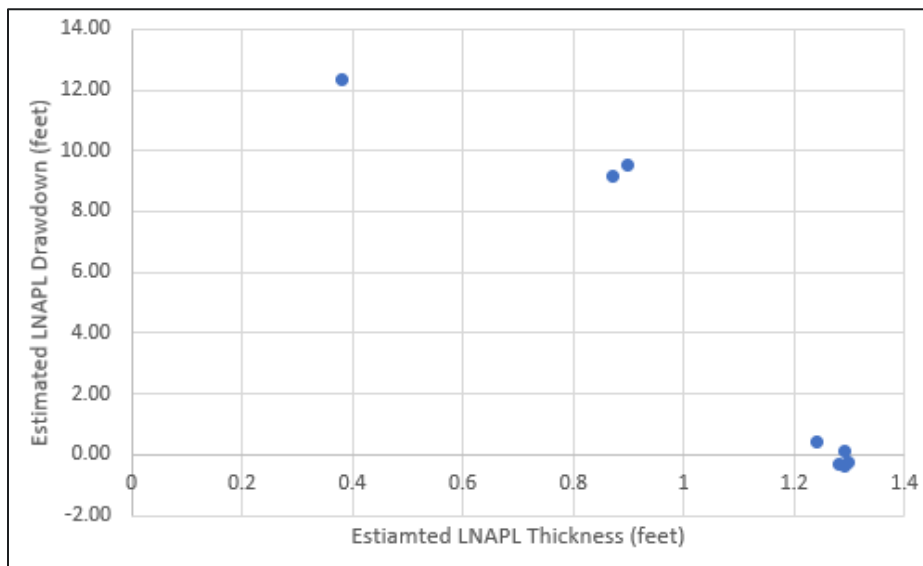


Exhibit F-11: Evaluation for Linear Relationship at MW-35 (Plume Area 2)

F.1.2.2 Transmissivity Estimation

According to the Bouwer-Rice Method, LNAPL transmissivity may be estimated using Equation 5 (see Exhibit F-12).

Exhibit F-12: Equation 5

Equation	Variable and Definition
$T_n = r_w^2 \frac{\ln\left(\frac{R_{oi}}{r_w}\right) \ln\left(\frac{S_o}{S_n}\right)}{2j t}$	T_n LNAPL transmissivity (ft ² /minute)
	S_o Maximum drawdown induced (feet)
	S_n LNAPL drawdown at time t (feet)
	j Ratio of change in drawdown to change in thickness over the recovery period being analyzed
	t Elapsed time (minute)
	R_{oi} Radius of influence (feet)
	r_w Effective well radius (feet) (this value is approximated as the radius of the filter pack)

The following sections describe methods used to estimate the variables that are used in Equation 5. A summary of estimated variables and the estimated LNAPL Transmissivity is provided in Exhibit F-13.

Exhibit F-13: Estimated Value for LNAPL Transmissivity (T_n)

Well Name	Effective Well Radius: r_w (feet)	$\ln(R_{oi}/r_w)$ (unitless)	Ratio for Change in Drawdown to Change in Thickness: j (unitless)	Slope of Log-Drawdown versus Time Data: $\ln(s_o/s_n)/t$ (minute ⁻¹)	LNAPL Transmissivity (ft ² /minute)	LNAPL Transmissivity (ft ² /day)	Standard Error of LNAPL Transmissivity (ft ² /minute)
MW-17	0.4	2.4	3.65	0.0034	0.00018	0.26	0.01
MW-29	0.4	2.4	0.07	0.0013	0.0036	5.2	2.2
MW-35	0.3	2.6	0.04	0.0005	0.0015	2.1	0.06

F.1.2.3 Effective Well Radius (r_w)

According to the ASTM Standard, the effective well radius (r_w), as used in Equation 5, is the outer radius of the filter pack. A description of construction methods and construction logs were not available for MW-17, MW-29, and MW-35. Based on the measured diameter of the casings, the filter pack is assumed to extend 2 inches from the well casing. The estimated effective well radius is provided in Exhibit F-14.

Exhibit F-14: Effective Well Radius (r_w)

Well Name	Construction Materials	Effective Well Radius: r_w (inches)	Effective Well Radius: r_w (feet)
MW-17	6-inch PVC	5	0.4
MW-29	6-inch PVC	5	0.4
MW-35	2-inch PVC	4	0.3

PVC = polyvinyl chloride

F.1.2.4 Ratio of Radius of Influence to Effective Well Radius (R_{oi}/r_w)

The ratio R_{oi}/r_w is approximated using a n equation and two polynomials provided by Butler (1998¹) (Equations 6 through 8).

¹ Butler, J.J. Jr., 1998, The Design, Performance, and Analysis of Slug Tests, Lewis Publishers, Boca Raton, Florida, p. 108-109.

Exhibit F-15: Equation 6

Equation	Variable and Definition
$\ln\left(\frac{R_{oi}}{r_w}\right) = \left[\frac{1.1}{\ln\left(\frac{d+b}{r_w\sqrt{k_z/k_r}}\right)} + \frac{\left(A + B * \ln\left[\frac{B_{form} - (d+b)}{r_w\sqrt{k_z/k_r}}\right]\right)^{-1}}{b(r_w\sqrt{k_z/k_r})^{-1} + \ln(\sqrt{k_z/k_r})} \right]$	R_{oi} Radius of influence (feet)
	r_w Effective well radius (feet) (this value is approximated as the radius of the filter pack)
	b Well screen length
	d z position of top of screen relative to water table (positive direction upward) (L)
	k_z/k_r anisotropic ratio (vertical to radial components) of the formation's hydraulic conductivity (L/T)
	B_{form} formation thickness (distance from water table to impermeable boundary) (L)

NOTE:

A and B are empirical coefficients (equations are provided in Equations 7 and 8, below).

Exhibit F-16: Equations 7 and 8

Equation	Variable and Definition
$A = 1.4720 + 0.03537\left(\frac{b}{r_w\sqrt{k_z/k_r}}\right) - 8.148 \times 10^{-5}\left(\frac{b}{r_w\sqrt{k_z/k_r}}\right)^2$ $+ 1.028 \times 10^{-7}\left(\frac{b}{r_w\sqrt{k_z/k_r}}\right)^3 - 6.484 \times 10^{-11}\left(\frac{b}{r_w\sqrt{k_z/k_r}}\right)^4$ $+ 1.573 \times 10^{-14}\left(\frac{b}{r_w\sqrt{k_z/k_r}}\right)^5$	b well screen length
	r_w Effective well radius (feet) (this value is approximated as the radius of the filter pack)
	k_z/k_r anisotropic ratio (vertical to radial components) of the formation's hydraulic conductivity (L/T)
$B = 0.2372 + 5.151 \times 10^{-3}\left(\frac{b}{r_w\sqrt{k_z/k_r}}\right) - 2.682 \times 10^{-6}\left(\frac{b}{r_w\sqrt{k_z/k_r}}\right)^2$ $- 3.491 \times 10^{-10}\left(\frac{b}{r_w\sqrt{k_z/k_r}}\right)^3 + 4.738 \times 10^{-13}\left(\frac{b}{r_w\sqrt{k_z/k_r}}\right)^4$	B_{form} formation thickness (distance from water table to impermeable boundary) (L)

NOTES:

The well screen length (b) is estimated from well construction logs for similar wells as reported in historical investigation reports.

The distance from the end of screen to the water table (d) is estimated based on the estimated screen interval and values of the air/NAPL interface at the end of the test (equilibrium condition).

Since the anisotropic ratio (k_z/k_r) has not been evaluated, a value of one is used as recommended by Butler (1989).The formation thickness (B_{form}) is unknown since the impermeable boundary has not been encountered in the deepest available boring of approximately 60 feet depth, therefore, the formation thickness is estimated to be 70 feet.

Estimated values for Equation 6 are summarized in Exhibit F-17, below:

Exhibit F-17: Estimated Values for Equation 6

Well Name	b (feet)	d (feet)	k_z/k_r	B_{form} (feet)	A	B	$\ln(R_{oi}/r_w)$
MW-17	15	-2.4	1	70	1.4	0.4	2.4
MW-29	15	-2.4	1	70	1.4	0.4	2.4
MW-35	15	-4.8	1	70	1.3	0.5	2.6

F.1.2.5 Ratio of Change in Drawdown to Change in Thickness (j)

The ratio of change in drawdown to change in thickness of LNAPL (j) is calculated using the following equation (see Exhibit F-18):

Exhibit F-18: Equation 9

Equation

$$j = \frac{\text{drawdown final} - \text{drawdown initial}}{\text{thickness final} - \text{thickness initial}}$$

The drawdown and thickness values were estimated using data collected during field activities. The final, equilibrium elevation of the air/LNAPL interface was referenced. The following values for j were estimated (see Exhibit F-19).

Exhibit F-19: Ratio of Change in Drawdown to Change in Thickness (j)

Well Name	Elevation of air/LNAPL Interface		Thickness of LNAPL		Ratio for Change in Drawdown to Change in Thickness: j (unitless)
	At Start of Test (after bail-down)	At End of Test	At Start of Test (after bail-down)	At End of Test	
MW-17	6.9	10.4	0.44	1.4	3.65
MW-29	9.0	9.24	0.76	4.33	0.07
MW-35	8.5	8.89	0.14	9.5	0.04

F.1.2.6 Maximum Drawdown Induced (s_o)

The maximum drawdown induced (s_o) is estimated from the y-intercept of the drawdown versus log-time plot. Exhibits F-20 through F-22, below, show the log-time plots with fitted linear regression equations.

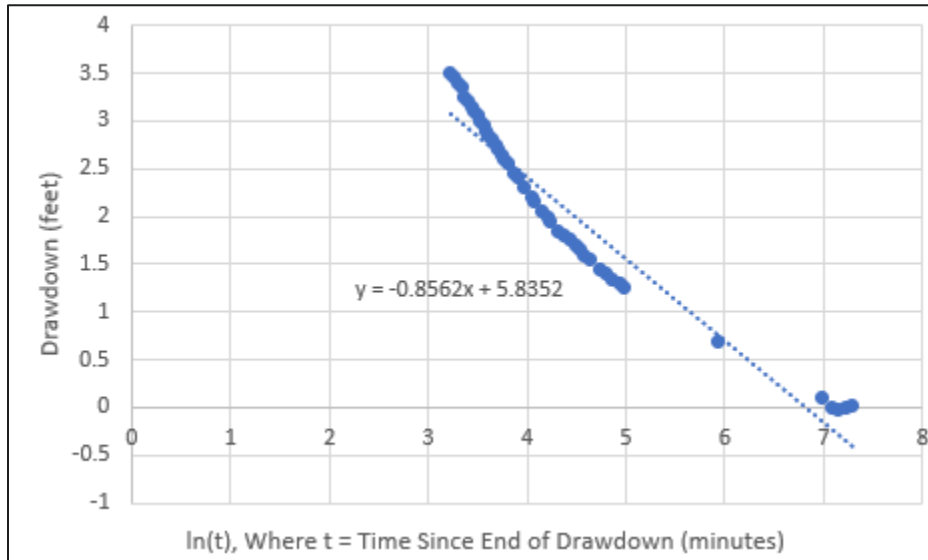


Exhibit F-20: Drawdown Versus Log-Time Plot for MW-17

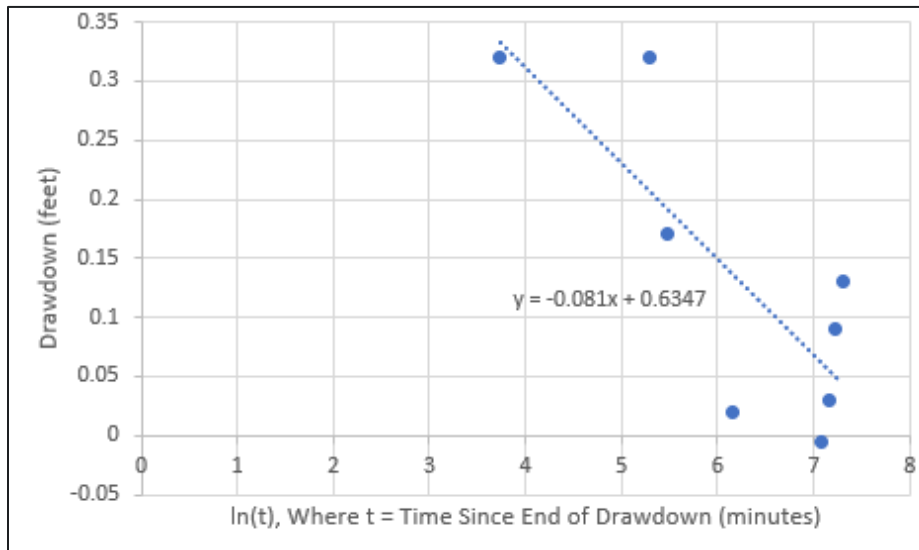


Exhibit F-21: Drawdown Versus Log-Time Plot for MW-29

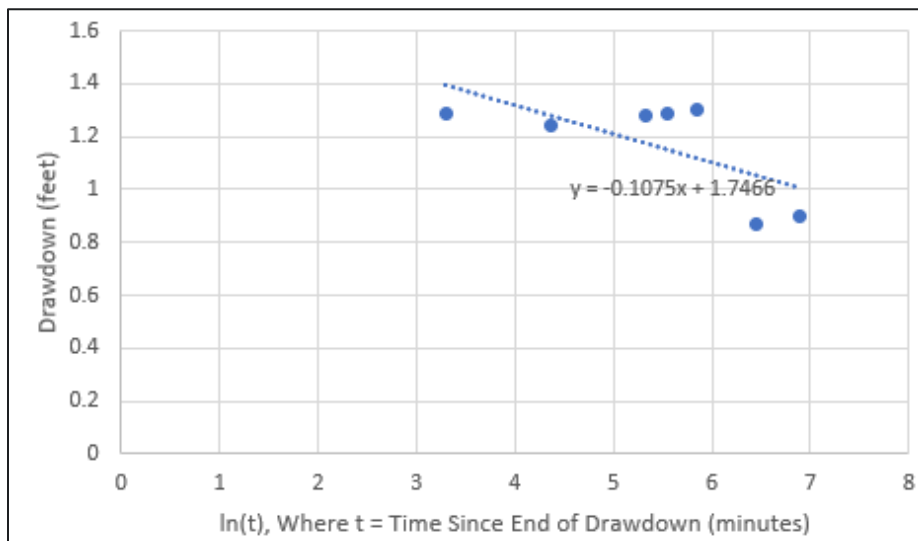


Exhibit F-22: Drawdown Versus Log-Time Plot for MW-35

The y-intercept is calculated by setting $x=0$. The calculated maximum induced drawdown values are listed in Exhibit F-23, below.

Exhibit F-23: Calculated Values for Maximum Induced Drawdown (s_0)

Well Name	Maximum Induced Drawdown: s_0 (feet)
MW-17	5.8
MW-29	0.63
MW-35	1.7

F.1.2.7 Slope of Drawdown-Time Data ($\ln[s_0/s_n]/t$)

According to the Bouwer-Rice Method, the logarithm of the drawdown varies as a linear function of time. A straight line may be fit to drawdown-time data and the slope of this line is used to estimate the LNAPL transmissivity. If the line is fit using linear regression, the variance of the slope ($\ln[s_0/s_n]/t$) can be used to estimate the LNAPL transmissivity standard error. Exhibits F-24 through F-26 provide plots of the drawdown-time data with fitted linear regression equations.

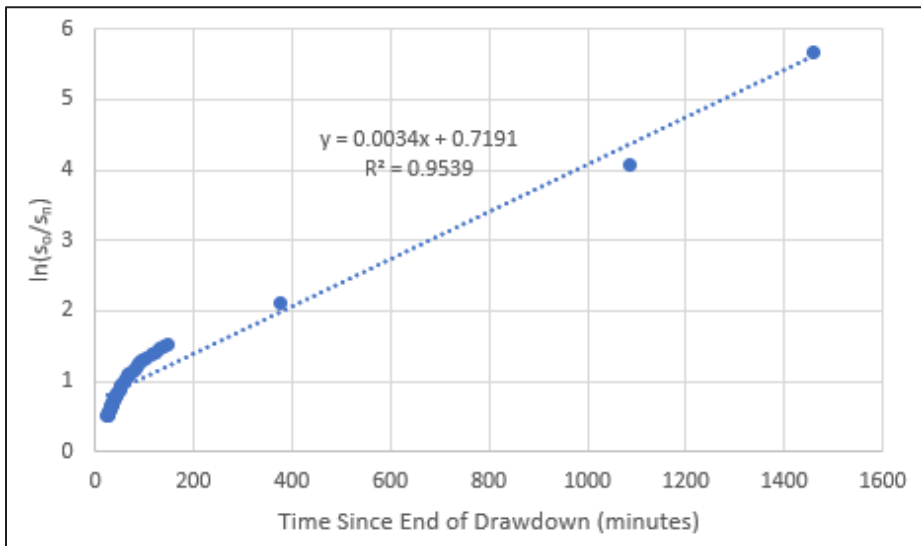


Exhibit F-24: Log-Drawdown Versus Time Plot for MW-17

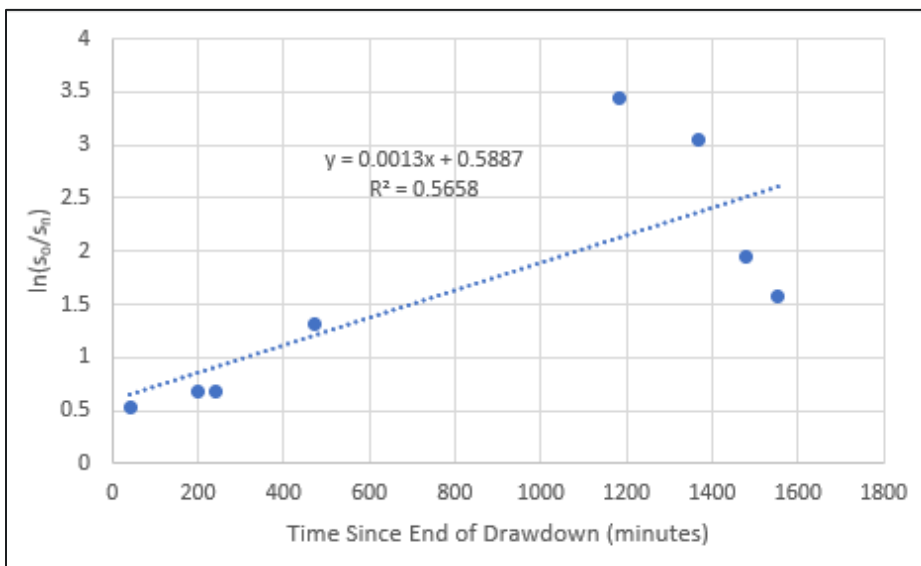


Exhibit F-25: Log-Drawdown Versus Time Plot for MW-29

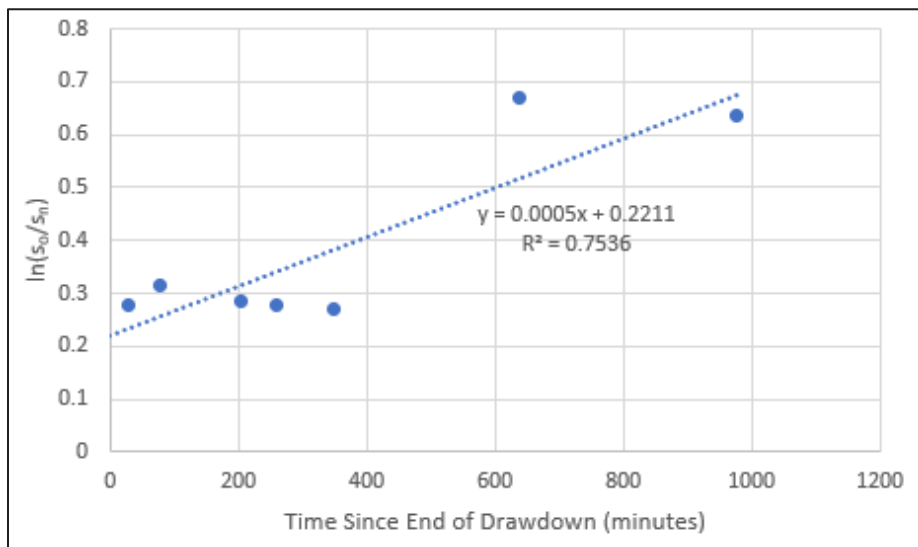


Exhibit F-26: Log-Drawdown Versus Time Plot for MW-35

The slope of the linear regression equation is equal to $\ln(s_0/s_n)/t$. The slope values are provided in Exhibit F-27.

Exhibit F-27: Calculated Values for $\ln(s_0/s_n)/t$

Well Name	Slope of Log-Drawdown Versus Time Data: $\ln(s_0/s_n)/t$ (unitless)
MW-17	0.0034
MW-29	0.0013
MW-35	0.0005

F.1.2.8 Standard Error

The standard error of the LNAPL Transmissivity was estimated using the standard error of the regression of the log-drawdown versus time data: $\ln(s_0/s_n)/t$. The standard error of the regression provides the absolute measure of the typical distance that the data points fall from the regression line. The standard error of LNAPL Transmissivity is directly proportional to the standard error for the regression of the log-drawdown versus time data since the two variables are directly proportional (Equation 5). The standard error was estimated using Excel's® Data Analysis Toolpak. The data analysis tools were used on the $\ln(s_0/s_n)/t$ regression to calculate the standard error of the regression. The standard error of the regression was multiplied by the variables in Equation 5 to calculate the standard error of the LNAPL Transmissivity (Equation 11) (see Exhibits F-28 and F-29).

Exhibit F-28: Equation 11

Equation	Variable and Definition
$SE_{Tn} = r_w^2 \frac{\ln\left(\frac{R_{oi}}{r_w}\right)}{2j} SE_{DT}$	SE_{Tn} standard error of the LNAPL Transmissivity
	SE_{DT} standard error of the drawdown-time data
	R_{oi} Radius of influence (feet)
	r_w Effective well radius (feet) (this value is approximated as the radius of the filter pack)
	j The ratio of change in drawdown to change in thickness of LNAPL

The estimate of the standard error for the LNAPL Transmissivity is provided in Exhibit F-29.

Exhibit F-29: Standard Error of LNAPL Transmissivity

Well Name	Standard Error of the Regression of Log-Drawdown Versus Time Data SE_{DT} (unitless)	Standard Error of LNAPL Transmissivity SE_{Tn} (ft ² /minute)
MW-17	0.2	0.01
MW-29	0.8	2.2
MW-35	0.1	0.2

F.2 “OBSERVATIONAL” EXTENDED BAIL-DOWN TEST FINDINGS

Due to the relatively high standard error values during analysis of the transmissivity test findings, a second “observational” transmissivity study was completed at the Site. The second study was comprised of extended LNAPL bail-down tests performed at MW-29 and MW-35. The response at MW-19 was also measured due to its proximity (24 feet) to MW-29. No bail-down was performed at MW-19.

Measurements collected during fieldwork are summarized in Table F-1. Graphical interpretations of the measurements are provided in Exhibits F-30 and F-31.

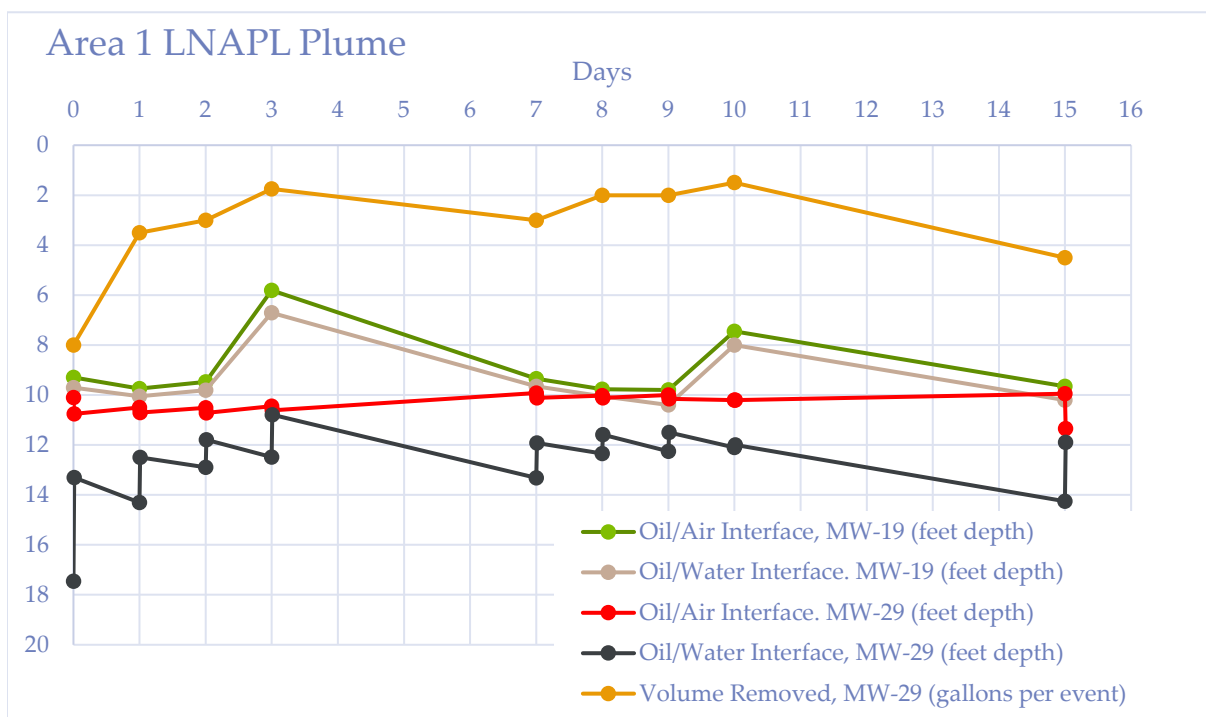


Exhibit F-30: Results for Area 1 LNAPL Plume

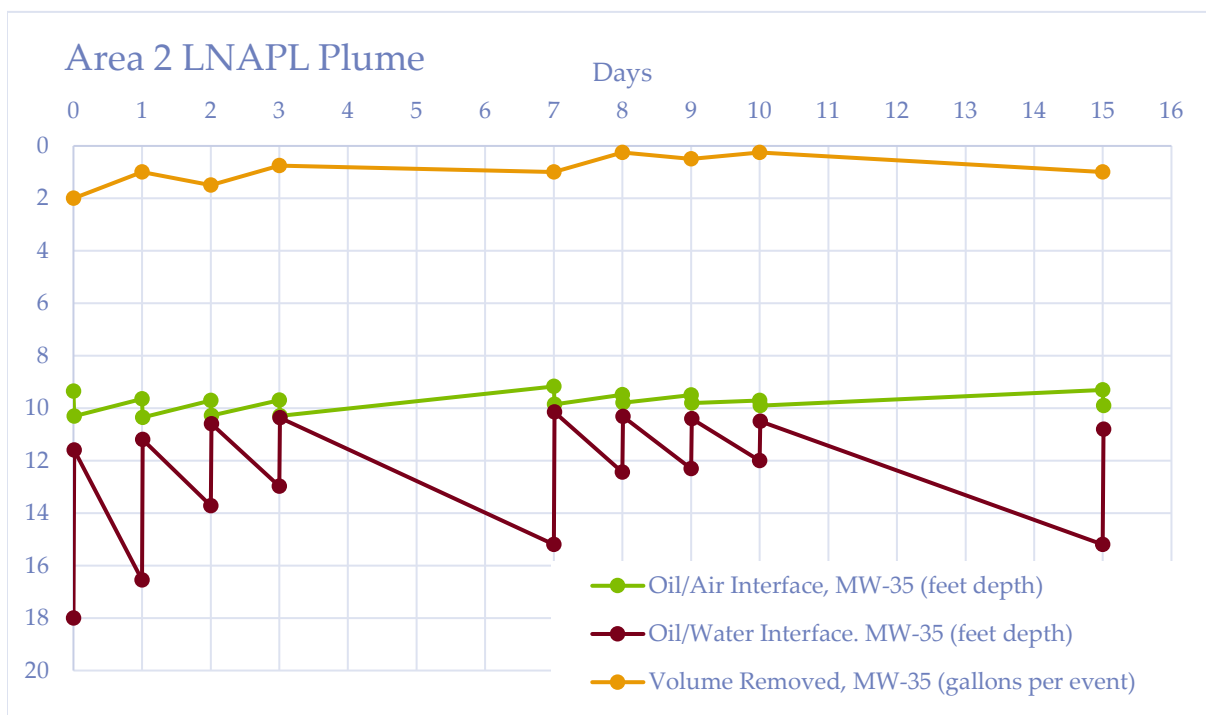


Exhibit F-31: Results for Area 2 LNAPL Plume

APPENDIX F: LNAPL INVESTIGATION FINDINGS

The near-vertical changes in the interface depths represent the pre- and post-bail-down measurements. After bail-down, both MW-29 and MW-35 displayed a drop in the air/LNAPL elevations and a rise in the LNAPL/water elevations.

During the period after bail-down, the interfaces were observed to move towards equilibrium conditions (increase of air/LNAPL interface and drop of the LNAPL/water interface). The testing period included two weekends during which the wells were not bailed down. The total recharge during the weekends was greater than the recharge after one day.

An average of 2.3 and 0.7 gallons of LNAPL were removed per event from MW-29 and MW-35, respectively. The average excludes the initial bail-down and the bail-downs immediately after the weekends. The volume of LNAPL removed from MW-29 may be larger when compared to MW-35 since MW-29 has a larger casing diameter than MW-35 (6 inches versus 2 inches).

Based on the results of the bail-down tests, it is estimated that equilibrium conditions (i.e., static elevation of the air/LNAPL and LNAPL/water interfaces) may be reestablished after approximately 1 to 2 weeks following removal of LNAPL from wells MW-29 or MW-35. Additionally, the bail-down of MW-29 appeared to influence (lower the elevation of) the interfaces observed at MW-19. The influence at MW-19 appeared to be delayed by approximately 3 days.

Based on the results of the bail-down test, it appears that there is some potential for recovery of LNAPL from the Area 1 and Area 2 plumes.

Table F-1: "Observational" Bail-Down Test Field Measurements

Date Time		MW-19		MW-29					MW-35				
				---Prior to Bail-Down--		-----After Bail-Down-----			---Prior to Bail-Down--		-----After Bail-Down-----		
		Air/LNAPL Interface	LNAPL/Water Interface	Air/LNAPL Interface	LNAPL/Water Interface	Air/LNAPL Interface	Oil/Water Interface	Volume Removed	Air/LNAPL Interface	LNAPL/Water Interface	Air/LNAPL Interface	LNAPL/Water Interface	Volume Removed
		Feet Depth	Feet Depth	Feet Depth	Feet Depth	Feet Depth	Feet Depth	Gallons per Event	Feet Depth	Feet Depth	Feet Depth	Feet Depth	Gallons per Event
11/9/2021	1400	9.3	9.7	10.1	17.45	10.75	13.3	8	9.35	18	10.3	11.6	2
11/10/2021	1640	9.75	10.05	10.5	14.3	10.7	12.5	3.5	9.65	16.55	10.35	11.2	1
11/11/2021	1615	9.47	9.81	10.51	12.89	10.72	11.8	3	9.71	13.72	10.28	10.6	1.5
11/12/2021	1545	5.81	6.71	10.45	12.48	10.62	10.79	1.75	9.69	12.97	10.29	10.37	0.75
11/16/2021	1317	9.35	9.65	9.92	13.32	10.11	11.92	3	9.17	15.2	9.85	10.15	1
11/17/2021	1014	9.77	10.05	10.02	12.34	10.11	11.59	2	9.48	12.44	9.79	10.32	0.25
11/18/2021	1119	9.8	10.4	10	12.25	10.15	11.5	2	9.5	12.3	9.8	10.4	0.5
11/19/2021	1030	7.45	8	10.2	12.1	10.2	12	1.5	9.7	12	9.9	10.5	0.25
11/24/2021	1327	9.65	10.2	9.95	14.25	11.35	11.9	4.5	9.3	15.2	9.9	10.8	1

LNAPL = light non-aqueous phase liquid



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**High-Resolution Light Non-Aqueous Phase
Liquid (LNAPL)
Conceptual Site Model Assessment,
Former Jorgensen Forge
Tukwila, WA
December 28, 2020**

CT Project Number 3738-2018-03



Submitted by:

COLUMBIA Technologies

Rockville, Maryland

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Appendices

Appendix A: Direct Sensing Equipment Description

Appendix B: Quality Control Procedures

Appendix C: UVOST® Logs (Individual Scale) – Area 1

Appendix D: UVOST® Logs (Individual Scale) – Area 2

Appendix E: UVOST® Logs (Collective Scale) – Area 1

Appendix F: UVOST® Logs (Collective Scale) – Area 2

Appendix G: UVOST® Response to Various Saturated Products on Wet Sand

Conversion Factors

Inch/Ounce/Pound/PSI to International System of Units

Multiply	By	To obtain
Length		
Inch (in.)	2.54	Centimeter (cm)
Inch (in.)	25.4	Millimeter (mm)
Foot (ft.)	0.3048	Meter (m)
Volume		
Ounce (oz.)	29.6	Milliliters (ml)
Gallon (gal)	3.8	Liters (L)
Pressure		
Pounds per Square Inch (psi)	6.89	Kilopascals (kPa)
Hydraulic Conductivity		
Feet per day (ft/day)	0.0003527	Centimeters per second (cm/sec)

Temperature in degrees Celsius (°C) is converted to degrees Fahrenheit (°F) as
 $(^{\circ}\text{F}) = (1.8 \times (^{\circ}\text{C})) + 32$

Datum

Horizontal and vertical coordinates are referenced from the World Geodetic System 1984 [EPSG:4326].

Supplemental Information

Electrical conductivity (EC) is provided in millisiemens per meter (mS/meter).

Concentrations of chemical constituents in water are provided in either milligrams per liter (mg/L) or micrograms per liter (µg/L).

Concentrations of chemical constituents in soil are provided in either milligrams per kilogram (mg/kg) or micrograms per kilogram (µg/kg).

Concentrations of chemical constituents in vapor are provided in either milligrams per cubic meter (mg/m³) or micrograms per cubic meter (µg/m³).

High-Resolution Light Non-Aqueous Phase Liquid (LNAPL) Conceptual Site Model Assessment, Former Jorgensen Forge Tukwila, WA

December 28, 2020

Summary

COLUMBIA Technologies, LLC, (**COLUMBIA**) in collaboration with **Shannon & Wilson (S & W)**, conducted a high-resolution assessment at the Former Jorgensen Forge at 8531 East Marginal Way South, Tukwila, Washington, CT Project Number 3738-2018-03 (the Site) during the period of 26 to 30 October 2020.

The primary objectives of this assessment were to characterize the vertical and horizontal extent of contaminant plumes in Areas 1 and 2 of the Site. Data from this investigation will be instrumental in determining a cost-effective remediation design strategy for containing the contaminant plumes.

To accomplish these objectives, a High-Resolution Site Characterization (HRSC) was conducted and an updated LNAPL Conceptual Site Model (LCSM) was developed in accordance with the guidelines of the Interstate Technology and Regulatory Council (ITRC), LNAPL-

3: LNAPL Site Management: LCSM Evolution, Decision Process, and Remedial Technologies (2018).

The updated LCSM presented herein is based on high-resolution direct sensing measurements made by **COLUMBIA**, and confirmation soil sampling and pertinent historic Site data provided by **S & W**.

The direct sensing data utilized for this assessment are the measurements from a Laser Induced Fluorescence (LIF) tool (specifically the Ultraviolet Optical Scanning Tool, also known as UVOST®). Direct sensing logs are presented in **Appendix C** through **F**.

HRSC survey stations are shown in **Figure 3**. HRSC survey locations consist of 40 UVOST® borings

The direct-sensing stations were initially located at the Site near wells with measurable phase separated petroleum hydrocarbons (PHCs) indicative of

nearby LNAPL. Subsequent locations were added in step outs to more completely define the LNAPL footprint.

Following the direct sensing survey, **S & W** obtained 12 soil samples from three borings and analyzed them for total petroleum hydrocarbons (TPH-Gasoline Range Organics (TPH-GRO), TPH-Diesel Range Organics (TPH-DRO) and TPH-Residual Range (TPH-RRO)) to identify the type and concentration of PHCs.

This high-resolution assessment of the Site confirmed significant zones of LNAPL in both Area 1 and Area 2 based on multiple lines of evidence that include UVOST® response, phase separated PHCs in monitoring wells, and TPH analysis of discrete soil samples.

In Area 1, the HRSC identified likely LNAPL from 2.5 to 20.5 ft bgs in several discontinuous zones. In Area 2, the HRSC identified likely LNAPL from 3 to 18 ft bgs in several discontinuous zones.

With the exception of station A1-22, located on the southern edge of Area 1, which had only a shallow response, the HRSC bounded the LNAPL area by UVOST® stations that had no, or low responses, or in one case in Area 2, a monitoring well that had no detections of phase separated PHCs.

Some of the LNAPL in Area 1 may be recoverable as the TPH-DRO and TPH-RRO concentrations in soil samples exceeded the API screening criteria for mobility or recoverability.

The LIF signatures indicate that the chemical composition of the LNAPL below 5 ft bgs is similar throughout Area 1. Where there is LNAPL in the zone above 5 ft bgs it has a different LIF signature. The laboratory analysis of soil samples indicate that the residual range organics are predominant over the diesel range organics in Area 1.

The LIF signatures indicate that multiple products were released in Area 2. The laboratory analysis of soil samples indicate that the diesel range organics are predominant over the gasoline range organics in Area 2.

There are monitoring wells in both Area 1 and Area 2 where LNAPL was identified and most but not all well screens extend to below the LNAPL zones.

This HRSC is consistent with the prior investigations and provided additional delineation of the LNAPL areas.

Approximately 20,000 cubic yards of soil in Areas 1 and 2, combined had fluorescence levels that indicated likely LNAPL (greater than 3% RE).

Approximately 390,000 Kg of PHCs are estimated to be in Area 1 and 28,000 Kg of PHCs are estimated to be in Area 2, however, the correlations between TPH and the UVOST® responses are not strong, so these mass estimates are approximate.

There is a potential for vapor intrusion into buildings in the survey area per ITRC guidelines¹

The updated LCSM presented herein is based on high-resolution direct sensing measurements made by **COLUMBIA**, confirmation soil sampling and pertinent historic Site data provided by **S & W**.

¹ Interstate Training and Regulatory Council (ITRC).
October 2014. *Petroleum Vapor Intrusion; Fundamentals of*

Screening, Investigation, and Management.

Background

(Information provided by S & W)

Site and Release History

The Former Jorgensen Forge is located at 8531 East Marginal Way South in Tukwila, Washington.

Overall, the Site occupies approximately 20 upland acres. There are two areas of concern. Area 1 is on the northeastern portion of the site and includes the portions of the forge building that contain the Hollowbore Area, the Machine Shop Area, and the Shipping area, and surrounding grounds.

Area 2 is located in the southeastern portion of the site and includes portions of the Forge Building containing the Forge Shop area as well as the separate Aluminum Heat Treat Building (AHTB) and the surrounding grounds. **Figure 1** indicates the two AOCs.

Cutting oil is present within Area 1 soils and groundwater, and as an LNAPL plume on groundwater. No single feature has been identified as the source of this contamination; however, several features which may have contributed to the contamination are or historically were located within the area. These features include vaults and tanks associated with operation of the Hollowbore Area lathes, both inside the main building and outside to the north and northwest of the main building. Subsurface piping was used within the area to convey cutting oil to and from the Hollowbore Area lathes from the vaults and tanks. This

subsurface piping is believed to be a likely significant source to the cutting oil plume.

In addition to the cutting oil-related features, a heating oil UST was located adjacent to the office building and flammable lockers were located in the Shipping Area.

Within the main building, shallow soil samples (1.5 to 2 ft bgs) contained TPH-Oil Range Organics (TPH-O) at concentrations above screening levels, suggesting near-surface release points (potentially piping running to and from the lathes from the vaults).

Two distinct LNAPL plumes have been identified in Area 2 - hydraulic fluid near the oil water separator and diesel contamination under the main building and between the building and the Diesel Storage Area. The two plumes in Area 2 have co-mingled. The hydraulic oil is believed to have been released to the subsurface when the oil-water separator was overfilled on several occasions. The source of diesel contamination is believed to be product lines that ran from the Decommissioned Diesel Storage Area to the main building.

Area 2 includes several Site features that may have contributed to contamination within the area. These features primarily include vaults and hydraulic oil tanks used to operate equipment within the Forge Shop Area. Quench tanks, pipes

that used to be in a steam tunnel, an oil-water separator, the Decommissioned Diesel Storage Area, and product lines are also located within Area 2.

Lithology

The geology of the Site generally consists of a mixture of silty sand, sand, and gravel, classified as fill (Hf), to depths of 2 to 24 feet below ground surface (ft bgs) with the thickest fill occurring in the northwest portion of the Site adjacent to the Lower Duwamish Waterway (LDW) and within the former embayment area. Previous borings in areas along the eastern portion of the Site do not designate fill soils, although the near-surface soils in these areas are similar to the fill soils encountered across other areas of the Site. A review of historical photographs for the Site vicinity (Appendix A) indicates that prior to the 1940s, much of the western portion of the Site was an embayment of the Duwamish River. Aerial photographs compiled by EPA (2003) and historical USACE records indicate that the embayment was filled in 1944. Alluvial sediment consisting of sand, silt, and clay underlie the fill to depths of at least 81.5 ft bgs as indicated in the deepest onsite boring (PL2-JF01C). The silt and clay deposits occur from 8 to 14 ft bgs and may have also been deposited through estuarine or tidal flat processes. Below about 14 ft bgs, the alluvial sediment consists of interbedded sandy silt, silty sand, and sand with an occasional silt interbed. Some of the geologic units can be

correlated between borings and across portions of the Site.

In general, the soil observed throughout most of the Site (excluding the area nearest the Duwamish River) consists of the following stratum layers (or horizons), listed as encountered from shallowest to deepest:

- Well graded sand (SW) very loose to very dense, brown to gray, dry to damp, fine- to coarse-grained, trace to few fines, no to some fine gravel, occasionally poorly graded (SP), occasionally with gravel (SPG). Variable thickness but typically encountered from approximately 0 to 10 ft bgs (approximately 10 feet thick). Can be thinner (0 to 5 ft bgs, 5 feet thick) or thicker (0 to 15 ft bgs, 15 feet thick) in places.
- Silt (ML) (if present) soft, brown to gray, black in places, moist to wet, slightly plastic, sandy in places, occasional organics, occasional marine/organic odor. Variable thickness but typically encountered from approximately 10 to 13 ft bgs. Can be thinner (8 to 9 ft bgs, 1 foot thick) or thicker (8 to 14 ft bgs, 6 feet thick) in places.
- Poorly graded sand (SP) loose to medium dense, most commonly black, brown to gray in places, wet, fine- to coarse-grained, trace silt, occasional marine/organic odor. Typically, the underlying soil

type of the general Site stratigraphy, encountered to a depth of 60 feet. Typically encountered at 14 ft bgs.

Soil types observed nearer the Duwamish River are highly variable and do not typically follow a general stratigraphic sequence. In general, the soils nearer the Duwamish River are siltier compared to more upland soil. Fill material is common within the vicinity of the former wharf and embayment area. Soil types observed nearer the Duwamish River include silts, sands, and gravels (as well as any combination of the three) as well as the fill material mentioned above.

Groundwater

The 2006 Fallon and Anchor Final Investigation and Data Summary Report states that recharge to the water table aquifer is primarily by direct infiltration of precipitation and periodic contributions from streams during high-stage periods. Regional groundwater flow in the unconfined aquifer is typically to the south or southwest, toward the Duwamish Waterway.

The Site is underlain by lenses and layers of silt and clay. There are no identified discrete zones, and only a few units can be correlated within the Site monitoring wells. The Site hydrostratigraphy is further complicated by placement of fill atop the pre-development topography, including placement of fill between 1942 and 1946

into the previously existing embayment.

Clay lenses occur throughout the Site and perched and locally confined groundwater has been observed at several locations. The entire unconfined shallow water-bearing zone beneath the Site is considered a single aquifer system and occurs between 9 and 13 ft bgs. Tidal influences have been identified in monitoring wells MW-5 and MW-6, located on the western portion of the Site. The depth to groundwater on the eastern portion of the Site showed seasonal response, with water levels 1 foot to 2 feet higher during the rainy season.

Prior Remediation Activities

Manufacturing operations at the site have ceased. Numerous soil borings and monitoring wells have been placed at the site. Remediation has not begun.

Hydrology

Section 3.2.1 of the April 15, 2020 **S & W Remedial Investigation Work Plan** states that “The Site is underlain by sand and silty sand, with isolated lenses and layers of silt and clay...Silt and clay layers occur throughout the Site, and groundwater is observed perched above these layers and locally confined beneath these layers at some of the borings and monitoring well locations. Although locally perched or confined conditions exist, the silt and clay layers appear discontinuous and groundwater interacts above and below these layers.”

Shannon & Wilson's evaluation of the

groundwater flow direction indicates that in the eastern portion of the Site, the groundwater flow direction is to the southwest. In the western portion of the Site, the groundwater flow direction becomes variable and is affected by the tidal cycle, and also likely affected by the variability of the subsurface in the area of the backfilled embayment. In general, in the western portion of the Site, the groundwater flows toward the LDW.

Historical Laboratory Analysis

In Area 1, TPH-O has been detected at concentrations above the screening level within soil samples taken from borings completed within the main building and outside to the north of the main building. Outside of the main building, elevated TPH-O was only measured within samples taken from depths of greater than approximately 5 ft bgs. Within the main building, shallow soil samples (1.5 to 2 ft bgs) also contained TPH-O at concentrations above screening levels, suggesting near-surface release points (potentially piping running to and from the lathes from the vaults). TPH-O was detected at concentrations exceeding the screening level within the deepest soil sample collected from several borings.

TPH-O was measured at a maximum concentration of 150,000 mg/kg, which was detected within a sample taken from 3 to 5 ft bgs from boring FB-2, located within the main building in the Hollowbore Area. Samples taken from depths of 5 to 5.5 ft bgs and 8 to 8.5 ft bgs from boring

OB2, located outside to the north of the main building, contained TPH-O at concentrations of 120,000 and 110,000 mg/kg, respectively.

Groundwater samples are not collected from several Area 1 wells due to the accumulation of LNAPL within the wells. Area 1 wells MW-9, MW-23, MW-24, MW-25, MW-30, MW-48, and MW-49 have not contained LNAPL and have been sampled on several occasions. With the exception of well MW-48, the wells were sampled for TPH-Diesel Range Organics (TPH-D) and TPH-O analysis in August 2017. Wells MW-9 and MW-30 were also sampled in February 2018. Groundwater samples taken from wells MW-23, MW-24, and MW-49, located north of the LNAPL plume in the upgradient direction, and the sample taken from MW-9, to the east of the LNAPL plume, did not contain detectable concentrations of TPH-D or TPH-O. The samples taken from MW-30, located within the Hollowbore Area and directly south of the LNAPL plume, contained TPH-D at concentrations of 665 and 702 µg/L, above the screening level of 500 µg/L. Well MW-31, located outside of Area 1 in the downgradient direction, contained elevated TPH-O at a concentration of 1,080 µg/L in August 2017. A sample taken from the well in February 2018 did not contain detectable TPH-O.

BTEX constituents have not been detected within Area 1 soil or groundwater.

In Area 2, TPH-O and TPH-D were detected in soils, primarily within the area located between the main building and the AHTB. TPH-O was detected above screening levels within three Area 2 soil samples collected from between 7 and 8.5 ft bgs. TPH-D was detected above screening levels within several borings within samples taken from between 7 and 10 ft bgs. A silt layer was noted within boring logs within the vicinity at a depth of approximately 10 ft bgs. It is believed that the layer has acted to impede downward migration of contamination.

TPH-D and TPH-O have been detected in groundwater samples from Area 2 monitoring wells. BTEX constituents are not typically detected. TPH-O groundwater impacts have occasionally been detected in cross-gradient well MW-32 but have not been observed in downgradient wells. Groundwater samples taken from wells MW-36, MW-40 and MW-41 in February 2018 contained TPH-D at concentrations exceeding screening levels, suggesting that the dissolved phase TPH-D contamination may be expanding in the downgradient direction. Well MW-37 has not been sampled for TPH-D analysis since 2009. Groundwater samples taken from well MW-14, located in the upgradient direction, have historically contained TPH-D and TPH-O at concentrations above screening levels.

Samples collected from an unknown depth during installation of former well MW-33, located within the LNAPL plume adjacent to the truck scale reportedly

contained TPH-Gasoline Range Organics (TPH-G) at 9,400 mg/kg. No other soil samples within the area have contained TPH-G above screening levels. Groundwater samples collected in 2000 from well MW-34, downgradient of well MW-33, contained TPH-G at concentrations above the screening level (as high as 1,700 µg/L). The TPH-G concentrations within samples taken from MW-34 decreased during subsequent events. TPH-G was not detected within samples taken from the well in 2018. The source of the TPH-G detections is unknown. From the groundwater trends observed, it appears that the TPH-G impacts have attenuated.

Residual LNAPL

The presence of phase separated PHCs has been documented in numerous monitoring wells across the site. The LNAPL in Area 1 has remained stable other than the appearance of LNAPL within monitoring well MW-22, beginning in 2005. In August 2017, LNAPL was observed within wells MW-16 through MW-21 and in MW-26 through MW-29 at thicknesses ranging from 0.1 to 9.5 feet. **Figures 1 and 2** show the thickness of LNAPL measured in Area 1 by **S & W** in 2018 and 2020, respectively. The overall pattern of LNAPL in Area 1 as measured by monitoring wells is fairly consistent from 2018 to 2020.

An LNAPL sample collected from MW-27 in Area 1 in August 2017 contained petroleum hydrocarbons within the oil

range.

In Area 2 a commingled LNAPL plume of hydraulic oil and diesel is present. Other than the brief appearance of LNAPL within monitoring well MW-34 in 2009, the LNAPL plume has remained stable. In August 2017 and February 2018, 6.9 and 8.6 feet of LNAPL, respectively was measured in monitoring well MW-35. **Figures 1 and 2** show the thickness of LNAPL measured in Area 2 by **S & W** in 2018 and 2020, respectively. The overall pattern of LNAPL in Area 2 as measured by monitoring wells is fairly consistent from 2018 to 2020.

An LNAPL sample taken from MW-35 in August 2017 contained petroleum hydrocarbons within both diesel and oil ranges.

Methods, Assumptions, and Procedures

This HRSC was conducted in accordance with the guidelines of the Interstate Technology and Regulatory Council (ITRC), LNAPL-3: LNAPL Site Management: LCSM Evolution, Decision Process, and Remedial Technologies (2018).

Planning for this HRSC involved a review of available site documentation to develop an understanding of the existing Conceptual Site model (CSM) and indications of residual LNAPL impacts, and to assess the performance of remedial efforts implemented to date. LNAPL thickness measured in monitoring wells in 2018 and 2020 are presented in **Figures 1** and **2** at the end of the report.

Direct sensing survey stations are shown in **Figure 3** at the end of the report. Direct sensing survey locations consist of forty (40) UVOST® borings.

These direct-sensing stations were initially located at the Site systematically adjacent to likely release points for PHCs. Subsequent locations were added where needed to more completely define the LNAPL footprint.

UVOST® (Ultraviolet Optical Scanning Tool)

Utilizing UVOST®, the vertical distribution and relative concentrations of LNAPL in the subsurface can be discerned at the centimeter scale. Initial UVOST®

stations were advanced in proximity to selected monitoring wells and soil boring locations with known petroleum hydrocarbon concentrations indicative of LNAPL. These first lines of evidence enabled the team to characterize the presence and depth interval of LNAPL at the impacted locations. The observed response of the UVOST® system at these locations then served as a reference for complete delineation of LNAPL present at the site.

The remaining UVOST® stations were planned to be advanced at selected locations stepping out from the responses discovered during the initial borings to establish lateral boundaries to the LNAPL mass and confirm LNAPL stability.

Verification of LNAPL Plume Stability Using Discrete Soil Sampling

Guided by the results of the UVOST® survey, **COLUMBIA** recommended soil samples be taken at locations exhibiting the most continuous and greatest direct sensing responses.

Following the direct sensing survey, 12 soil samples from three borings were obtained by **S & W** and analyzed for TPH-GRO, TPH-DRO and TPH-RRO to identify the concentration of PHCs.

Results and Discussion

LNAPL Distribution

In order to map the extent of the residual LNAPL, the HRSC locations were initially placed in areas where the monitoring wells historically had measurable LNAPL. The UVOST® technology was used to delineate residual LNAPL phase PHCs. Forty UVOST® stations were placed to identify the lateral and vertical extent of the LNAPL. Thirty of the 40 stations had responses above 3% RE indicating zones of residual-phase LNAPL at depth intervals ranging from 2 to 20 ft bgs. Fifteen stations had responses above 100% RE. The 10 stations with responses below 3% RE bounded the lateral extent of the LNAPL areas.

The UVOST® data logs for this investigation are shown in **Appendices C through F**. **Figures 4 through 7** provide visualizations of the UVOST® data from this investigation. **Figures 4 and 5** provide visualizations of the overall area of investigation and **Figure 6** is a visualization of Area 1 and **Figure 7** is a visualization of Area 2. The following paragraphs discuss the results of the investigation for Area 1 and Area 2, separately.

Area 1. Station A1-02 had the thickest zone of elevated responses - from approximately 2.5 to 20.5 ft bgs, indicating that it is near the largest of the release source areas in Area 1. The stations surrounding A1-02 also had

deep, thick zones of elevated response, indicating there was likely a relatively large release in this area.

As shown in **Figures 4 through 6**, the elevated LIF responses were bounded by several stations, indicating the LNAPL likely extended from A1-04, A1-08, and A1-15 on the north, to A1-17 on the east, to A1-19 and A1-20 on the south, to A1-05 on the west to generally bound the LNAPL area.

There was a shallow response at station A1-22, located on the southern edge of the LNAPL area, but the peak response (130% RE) was in a very thin zone at approximately 3 ft bgs, the bulk of the UVOST® response was much lower and extended from approximately 2.5 bgs to 4.5 bgs, and station A1-19, less than 75 feet to the east had very low UVOST® responses, indicating that there may have been a separate, smaller release near station A1-22, unrelated to the release that led to the detections near A1-02.

There were significant distances between some of the UVOST® stations, which reduces confidence in the model estimates of LNAPL between the UVOST® stations. For example, A1-02 is 100 feet or more from A1-21, A1-11, A1-13, A1-01, and A1-07, however, significant amounts of phase separated PHCs have been detected over time in monitoring wells MW-16, MW-17, MW-18, MW-26, MW-27, and MW-29, located

in areas between the UVOST® stations. When considered along with the monitoring well LNAPL thickness data, the configuration of LNAPL as shown in **Figures 8 and 9** can be shown with confidence.

The LIF signatures indicate that the chemical composition of the LNAPL below 5 ft bgs is similar throughout the LNAPL area in Area 1. Where there is LNAPL in the zone above 5 ft bgs it has a different LIF signature. The LIF signature at station A1-22, which only has responses above 5 ft bgs is similar to the signature of the LNAPL in the first 2 ft bgs of A1-02 and very different from the signature from the LNAPL below 8 ft bgs in A1-02. The laboratory analysis of soil samples indicate that the residual range organics are predominant over the diesel range organics in Area 1.

Area 2. Station A2-16, near the oil water separator had the greatest UVOST® response (389% RE) at approximately 12.5 ft bgs, and elevated responses from approximately 8 to 14.5 ft bgs. Station A2-07 under the eastern portion of the main building had a 381 %RE response at approximately 13 ft bgs, and elevated responses from approximately 8 to 16 ft bgs. The deepest response (approximately 18 ft bgs) was found at station A2-08, approximately 30 feet south of station A2-07.

As shown in **Figures 4, 5 and 7**, the elevated UVOST® responses were generally bounded by several stations, indicating the LNAPL likely extended

from A2-18, on the north, to A2-12 and A2-15 on the east, to A2-13 on the south, to A2-03 and A2-05 on the west to bound the LNAPL area.

Although no UVOST® station was placed directly east of A2-16, monitoring well MW-15, less than 100 feet to the east, has not shown phase separated PHCs, increasing confidence in the extent of the LNAPL shown in **Figures 8 and 10**.

Three aspects of the HRSC data indicate that there are two or more areas of release within Area 2. First, the stations between A2-16 and A2-07 had lower UVOST® responses, indicating at least partial horizontal separation of release areas. Second, the LIF signatures in A2-16 and A2-07 are different, indicating likely different release products. Third, the elevated responses in station A2-01, near the northern edge of the LNAPL area, near A2-07 were from approximately 3 to 6 ft bgs, which is shallower than the LNAPL zone in nearby A2-06 and A2-07.

The laboratory analysis of soil samples indicates that the DRO concentrations are greater than RRO and GRO concentrations in the area of A2-07 and RRO concentrations are greater than DRO or GRO concentrations near A2-16 in Area 2.

LNAPL Characteristics and Stability

Following the direct sensing survey, **S & W** took 12 soil samples from three borings near LIF stations (A1-02, A2-07, and A2-16) and analyzed them for TPH-

GRO, TPH-DRO and TPH-RRO to identify concentrations of PHCs (as shown in **Figures 11** through **18**). Sample results are compared to screening concentrations in API Bulletin No. 9 in **Table 1**, below for potential product mobility and recoverability and to establish plume stability.

The API screening values provide conservative estimates of LNAPL mobility. Concentrations above the LNAPL saturation value of C_{sat} are indicative of the presence of LNAPL. Residual LNAPL saturation concentrations C_{res} are used as a screening limit below which LNAPL is presumed to be immobile.

TPH-DRO and TPH-RRO concentrations in 10 of the 12 soil samples exceeded the API screening values for LNAPL. There were exceedances of API's LNAPL screening criteria in all three borings. All five of the samples taken near A1-02 exceeded the API LNAPL screening criteria for TPH-DRO, TPH-RRO, or both. Two of the four samples taken near A2-07 exceeded the API LNAPL screening criteria for TPH-DRO, TPH-RRO, or both. All three of the samples taken near A2-16 exceeded the API LNAPL screening criteria for TPH-DRO and TPH-RRO. Four of the five samples taken near station A1-02 exceeded the mobility screening criteria in the API guidelines.² None of the samples taken near A2-07 or A2-16 exceeded API's mobility screening

criteria. The results are presented in **Table 1**, below.

Note, however, the limited number of soil samples as compared to the extended thickness of LNAPL described by the UVOST® leaves open the possibility of further and possibly higher LNAPL concentrations in the survey area.

The highest concentration of PHCs measured in the soil samples was 199,800 mg/kg TPH-DRO and RRO, combined, taken at station A1-02 at 12.8 ft bgs. All five samples taken from A1-02 had both TPH-DRO and TPH-RRO concentrations with the RRO concentration 3.4 to 4.5 times the DRO concentration, which indicates that the product is similar at all of the sampled intervals.

On the other hand, the samples from A2-07 that failed the API LNAPL screening criteria had much greater TPH-DRO concentrations than TPH-RRO concentrations, and the samples taken near A2-16 were dominated by RRO over DRO, further indicating that they are the result of two different releases.

Figures 11 through **18** at the end of the report provide visualizations of the UVOST® and TPH-DRO and RRO results.

These initial results imply that the overall LNAPL footprint in Area 1 is not stable on a macroscale and it is likely that some of

² API Soil & Groundwater Research Bulletin No. 9., Brost et al., June 2000. *Non-Aqueous Phase Liquid (NAPL) Mobility*

Limits in Soil.

the LNAPL is recoverable.

In Area 2, it is less likely that the LNAPL is recoverable, however, on a localized scale within the LNAPL footprint of Area 2, LNAPL may move into and out of pore spaces or monitoring wells, largely due to fluctuations in hydraulic conditions. That is, LNAPL may continue to exhibit micro-scale mobility within an LNAPL zone that is stable on a macro-scale within the LNAPL footprint based on residual NAPL concentrations and residual NAPL saturation in unsaturated soils.

The use of these values to screen for NAPL mobility presumes homogeneous soils and soil properties, which is never the case. Inherent geologic variability, macro-pores, and fractures will greatly affect the mobility and movement of NAPL. These factors must be recognized when these screening values are applied.

Residual Saturation Screening Values (API Bulletin No. 9, 2000)					
LNAPL Type	Soil Type	CSat mg/kg	CRes mg/kg	Sr cm3/cm3	
Gasoline	M-C Sand	143	3,387	0.02	
Gasoline	M-F Sand	215	5,833	0.03	
Gasoline	Silt – F Sand	387	10,000	0.05	
Middle Distillates	M-C Sand	5	7,742	0.04	
Middle Distillates	M-F Sand	9	13,333	0.06	
Middle Distillates	Silt – F Sand	18	22,857	0.1	
Heavy Distillates	M-C Sand	6	17,419	0.08	
Heavy Distillates	M-F Sand	9	30,000	0.1	
Heavy Distillates	Silt – F Sand	18	51,429	0.2	
November 3-6, 2020 Discrete Soil Sample Results (mg/kg)					
Field ID	Depth	TPH-GRO	TPH-DRO	TPH-RRO	Notes
A1-02	5	-	2,260	7,650	DRO & RRO Exceeds Csat
A1-02	10	-	3,310	12,900	DRO & RRO Exceeds Csat
A1-02	12.8	-	44,800	155,000	DRO & RRO Exceed Cres
A1-02	18	-	20,400	77,600	DRO & RRO Exceed Cres
A1-02	25	-	99.2	436	DRO & RRO Exceed Csat
A2-07	12	876	10,700	4,030	GRO, DRO & RRO Exceed Csat
A2-07	13.5	68.3	796	335	DRO & RRO Exceeds Csat
A2-07	18	61.7	ND	ND	
A2-07	25	ND	ND	ND	
A2-16	9.5	71	3,400	7,430	DRO & RRO Exceeds Csat
A2-16	12.5	39.9	3,230	10,800	DRO & RRO Exceeds Csat
A2-16	18	ND	11.5	29.6	DRO & RRO Exceeds Csat

Table 1
Comparison of TPH Concentrations to API Residual Saturation Screening Values
for LNAPL Mobility

LNAPL Stability

Reference (A) provides a comprehensive update of the current science and understanding of LNAPL distribution in the subsurface and how it changes over time.

The residual LNAPL was identified above and below the air-water interface and exhibited the characteristics of Zones 1, 2, and 3 present in both finer-grained soils acting as storage zones and coarser-grained soils. (See **Figure 19**, below).

LNAPL Volume and Mass

Based on the three-dimensional model of the UVOST® sensor levels shown in

Figures 5 through **7**, approximately 20,000 cubic yards of soil had fluorescence levels that indicate likely LNAPL (greater than 3% RE). Based on the laboratory analysis of the soil samples for total TPH (GRO + DRO + RRO) (shown in **Figures 11** and **18**) and the correlation with UVOST® responses in each of the 0.2 feet sample intervals, (TPH in mg/Kg = $322.84 \times (\text{LIF \%RE})$; $R^2 = 0.515$ for Area 1, and = $13.24 \times (\text{LIF \%RE})$; $R^2 = 0.2145$ for Area 2) and a dry soil density of 115 pound per cubic foot, approximately 390,000 Kg of PHCs are estimated to be in Area 1 and 28,000 Kg of PHCs are estimated to be in Area 2. The correlations between TPH and the UVOST® responses are not strong, so these mass estimates are approximate.

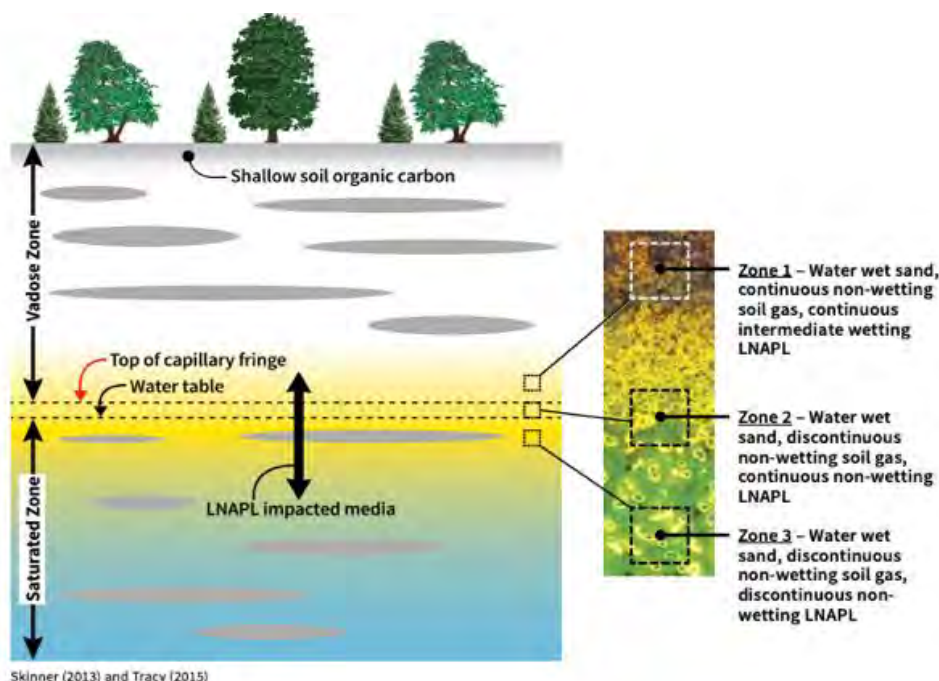


Figure 19 – LNAPL Distribution in the Subsurface

Monitoring Wells and LNAPL

There are monitoring wells in the areas where LNAPL was identified and the well screens extend to below the LNAPL zones.

Petroleum Vapor in Buildings

There was LNAPL within 15 ft bgs under buildings in the area of this investigation so there is a potential for vapor intrusion within the survey area per ITRC guidelines³ (30-ft of the potentially occupied buildings at a depth of 15-ft or less).

Quality Control and Data Anomalies

The distances between some of the UVOST[®] stations was greater than 30 feet which is generally the target distance between stations for modeling UVOST[®] data. However, the phase separated LNAPL data from monitoring wells that were between UVOST[®] stations increases the confidence in the model of the UVOST[®] data.

The correlation between UVOST[®] responses and the TPH concentrations in

soil samples was weak, especially for Area 2, which reduces confidence in the PHC mass estimates. The laboratory analysis of the soil samples and the LIF signatures indicated significant variability in the chemical composition of the LNAPL, which further supports the conclusion that the mass estimates should be viewed as approximate.

Each direct sensing instrument was operated in accordance with the manufacturer's standard operating procedures and the *Standard Practice for Direct Push Technology for Volatile Contaminant Logging with the Membrane Interface Probe (MIP)* ASTM STANDARD D7352 – 07.

Performance testing was conducted on the UVOST[®] system prior to each survey sounding. These procedures are outlined in **Appendix B**.

A QC review of the UVOST[®] logs for this project did not reveal any anomalies in the operation of the system that would have resulted in a lack of detection of petroleum LNAPL.

The direct-sensing logs generated for this assessment are presented in **Appendices C through F**.

³ Interstate Training and Regulatory Council (ITRC).
October 2014. *Petroleum Vapor Intrusion; Fundamentals of*

Screening, Investigation, and Management.

Conclusions

1. This high-resolution assessment of the Site confirmed significant zones of LNAPL in both Area 1 and Area 2 based on multiple lines of evidence that include UVOST® response, phase separated PHCs in monitoring wells, and TPH analysis of discrete soil samples.
2. In Area 1, the HRSC identified likely LNAPL from 2.5 to 20.5 ft bgs in several discontinuous zones.
3. In Area 2, the HRSC identified likely LNAPL from 3 to 18 ft bgs in several discontinuous zones.
4. With the exception of station A1-22, located on the southern edge of Area 1, which had only a shallow response, the HRSC bounded the LNAPL area by UVOST® stations that had no, or low responses, or in one case in Area 2, a monitoring well that had no detections of phase separated PHCs.
5. Some of the LNAPL in Area 1 may be recoverable as the TPH concentrations in soil samples exceeded the API screening criteria for mobility or recoverability.
6. The LIF signatures indicate that the chemical composition of the LNAPL below 5 ft bgs is similar throughout the LNAPL area in Area 1. The laboratory analysis of soil samples indicate that the residual range organics are predominant over the diesel range organics in Area 1.
7. The LIF signatures indicate that at least two products were released in Area 2. The laboratory analysis of soil samples indicate that Area 2 has both residual range organics and diesel range organics in varying concentrations.
8. There are monitoring wells in the area where LNAPL was identified and most, but not all, the well screens extend to below the LNAPL zones.
9. This HRSC is consistent with the prior investigations and provided additional delineation of the LNAPL areas.
10. Approximately 20,000 cubic yards of soil in Areas 1 and 2, combined had fluorescence levels that indicated likely LNAPL (greater than 3% RE).
11. Approximately 390,000 Kg of PHCs are estimated to be in Area 1 and 28,000 Kg of PHCs are estimated to be in Area 2, however, the correlations between TPH and the LIF responses are not strong, so these mass estimates are approximate.
12. There is a potential for vapor intrusion into buildings in the survey area per ITRC guidelines⁴

⁴ Interstate Training and Regulatory Council (ITRC).
October 2014. *Petroleum Vapor Intrusion; Fundamentals of*

Screening, Investigation, and Management.

References

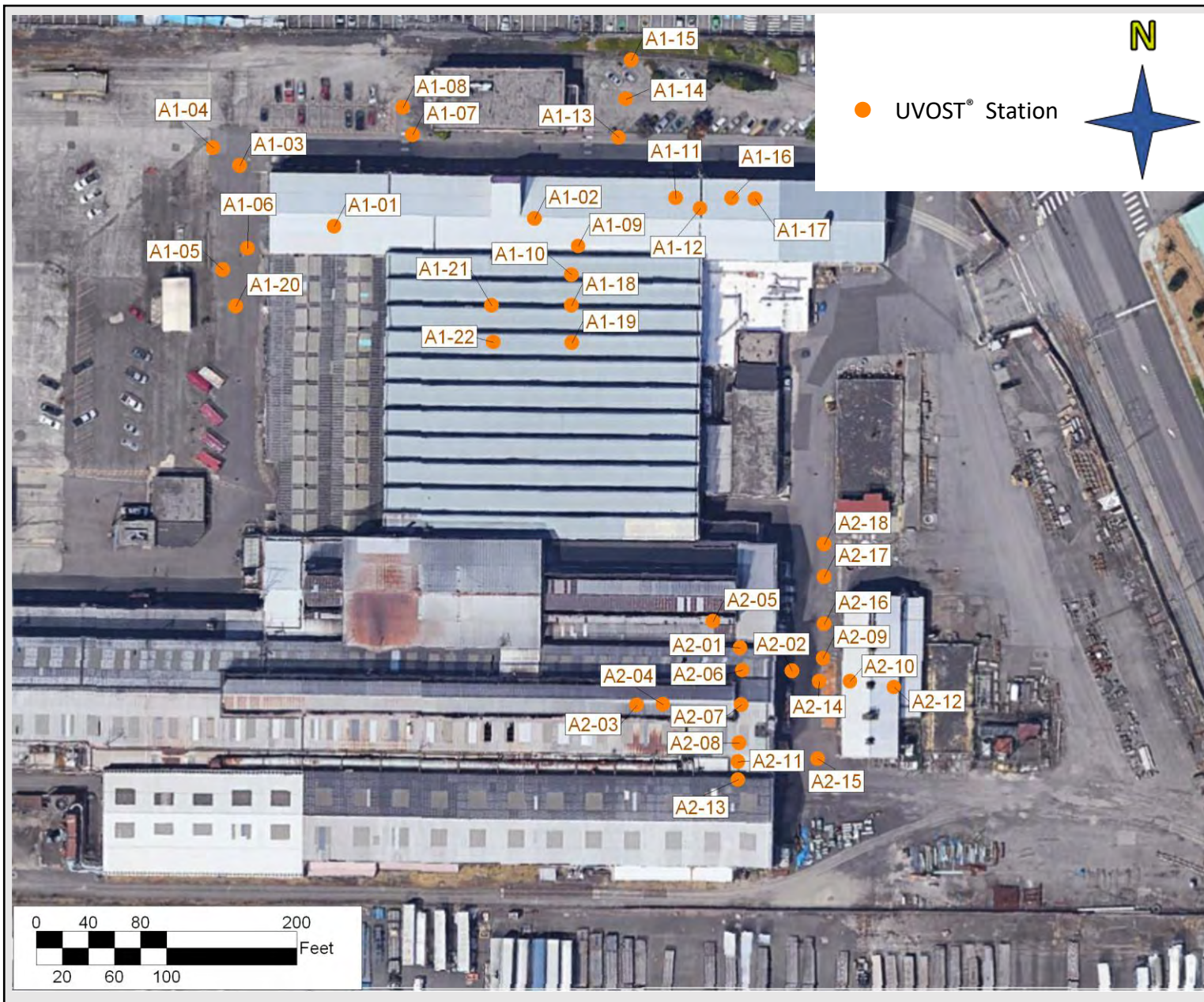
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List of Symbols, Abbreviations, and Acronyms

Symbol or Abbreviation	Definition
CSM	Conceptual Site Model. A CSM is a method to describe what is known or can be inferred about a site for the purpose of making a decision. A CSM generally will address physical, chemical and biological systems; contaminant release and transport; societal issues; policy, land use, and exposures.
DPT	Direct-Push Technology (DPT) refers to a group of techniques used for subsurface investigation by driving, pushing and/or vibrating small-diameter rods into the ground.
LCSM	LNAPL Conceptual Site Model. A LCSM is a conceptual site model focused on the release and transport of LNAPL contaminants.
LIF	Laser-induced fluorescence is a spectroscopic method in which an atom or molecule is excited to a higher energy level by the absorption of laser or LED light followed by spontaneous emission of light.
LNAPL	Light Non-Aqueous Phase Liquids are groundwater contaminants that are not soluble in water and have lower density than water, in contrast to a DNAPL which has higher density than water.
Migrating LNAPL	Migrating LNAPL. Migrating LNAPL refers to plume-scale behavior; the overall body or a portion of the LNAPL body is expanding. The mechanisms that drive LNAPL migration are sufficient to overcome resistive forces.
Mobile LNAPL	Mobile LNAPL. Mobile LNAPL represents a pore-scale concept. LNAPL occupies a sufficient fraction of the total porosity to form an interconnected network, but does not contain the driving forces on the LNAPL body to exceed the resistive forces.
PHC	Petroleum Hydrocarbons. The presence of petroleum hydrocarbon fuels in any phase. (PHC).
Residual LNAPL	Residual LNAPL. Residual LNAPL represents a pore-scale concept whereby LNAPL occupies a fraction of pore space that is discontinuous and too small for LNAPL flow to occur.
UST	Underground Storage Tank. Under Federal law UST means any one or combination of tanks including connected underground pipes that is used to contain regulated substances, and the volume of which including the volume of underground pipes is 10 percent or more beneath the surface of the ground. This does not include, among other things, any farm or residential tank of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes, tanks for storing heating oil for consumption on the premises, or septic tanks.
UVOST®	Ultraviolet Optical Scanning Tool®. A UVOST® is a tool that uses laser light in the ultraviolet spectrum to excite fluorescent molecules that exist in the vast majority of hazardous non-aqueous phase liquids (NAPLs) such as petroleum fuels/oils, coal tars, and creosotes.
VOC	Volatile organic compounds (VOCs) are organic chemicals that have a high vapor pressure at ordinary room temperature. Their high vapor pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublime from the liquid or solid form of the compound and enter the surrounding air, a trait known as volatility.

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FIGURES



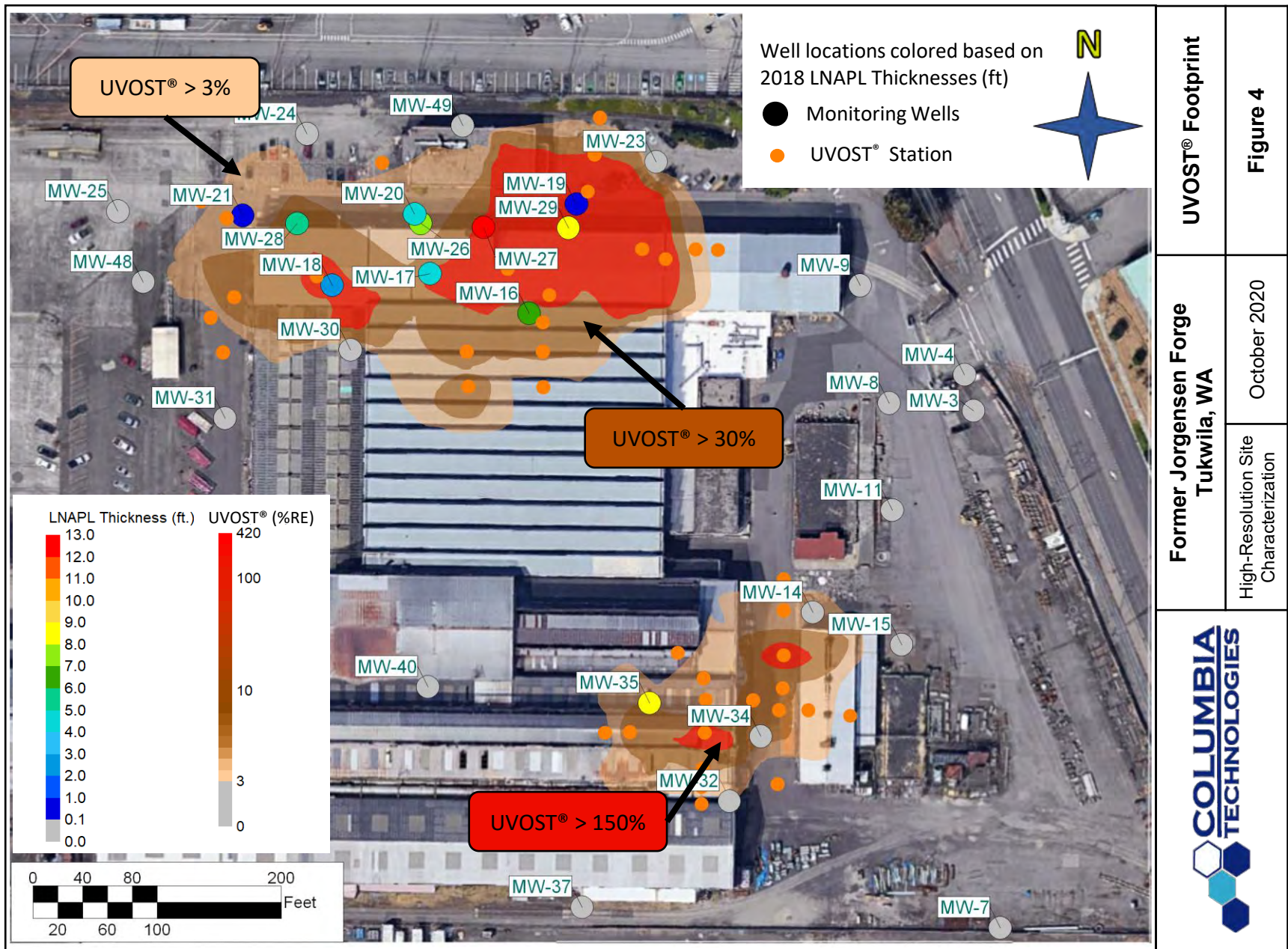
UVOST® Stations

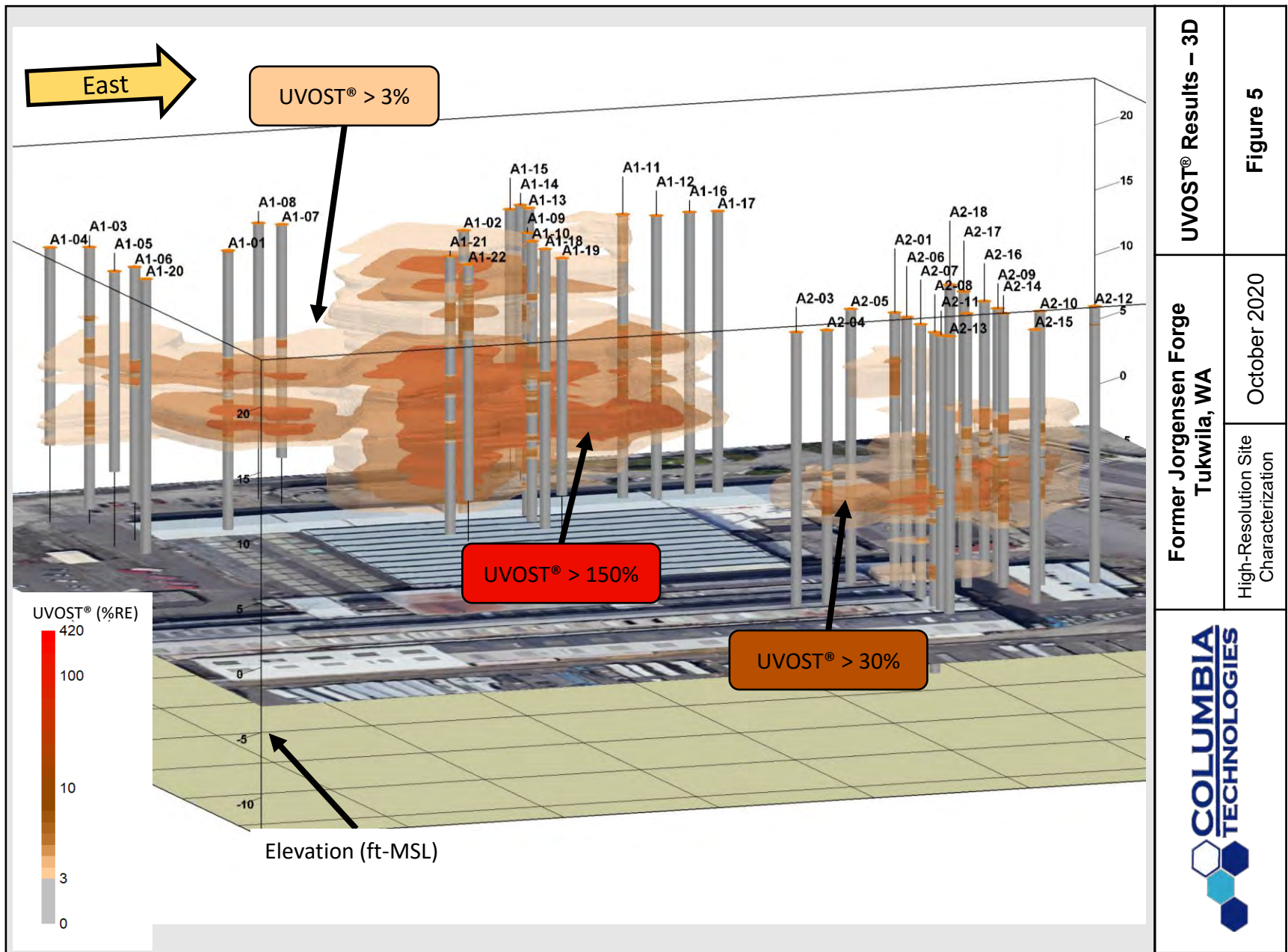
Former Jorgensen Forge
Tukwila, WA

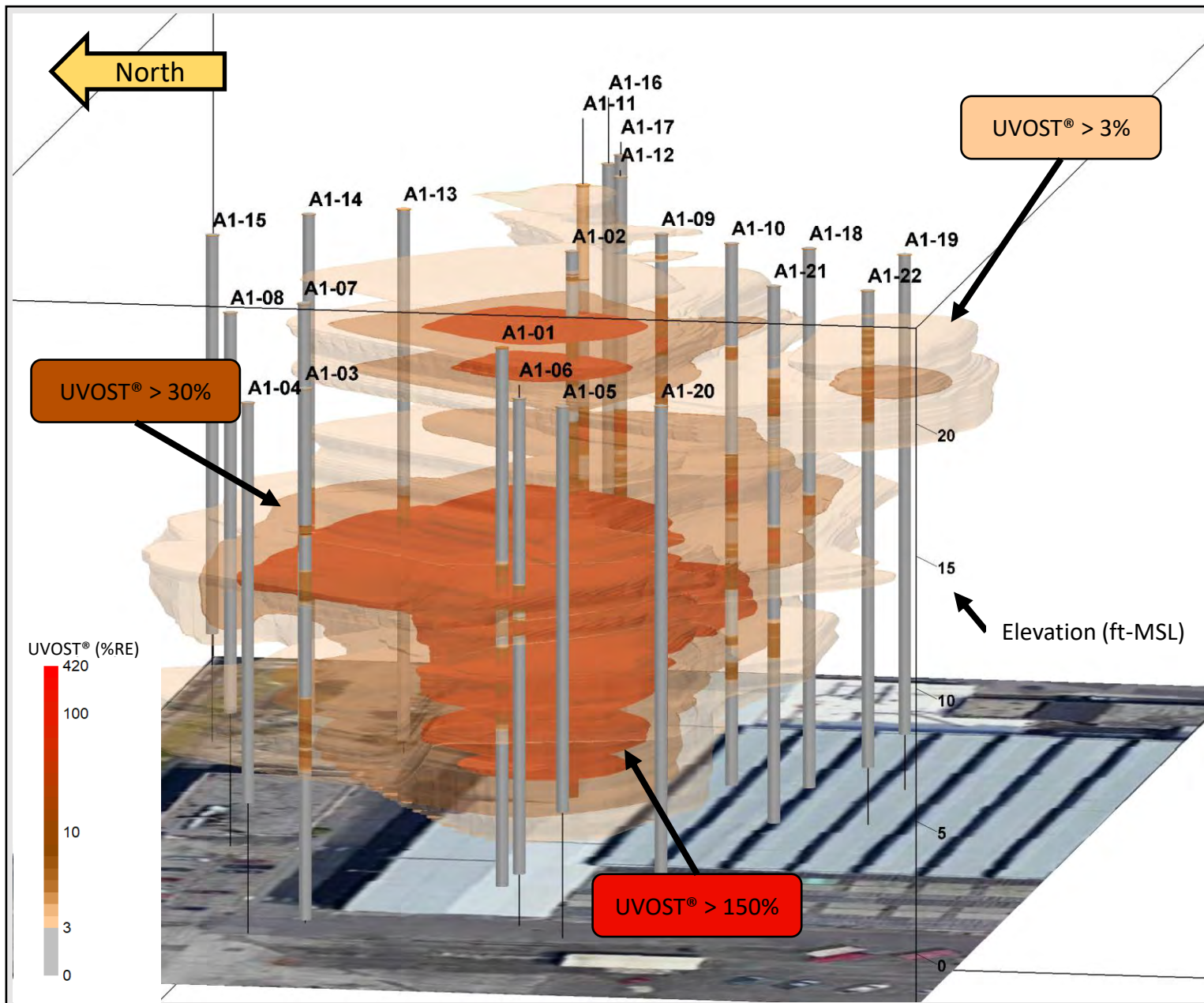
High-Resolution Site
Characterization

Figure 3









**UVOST® Results –
Area 1**

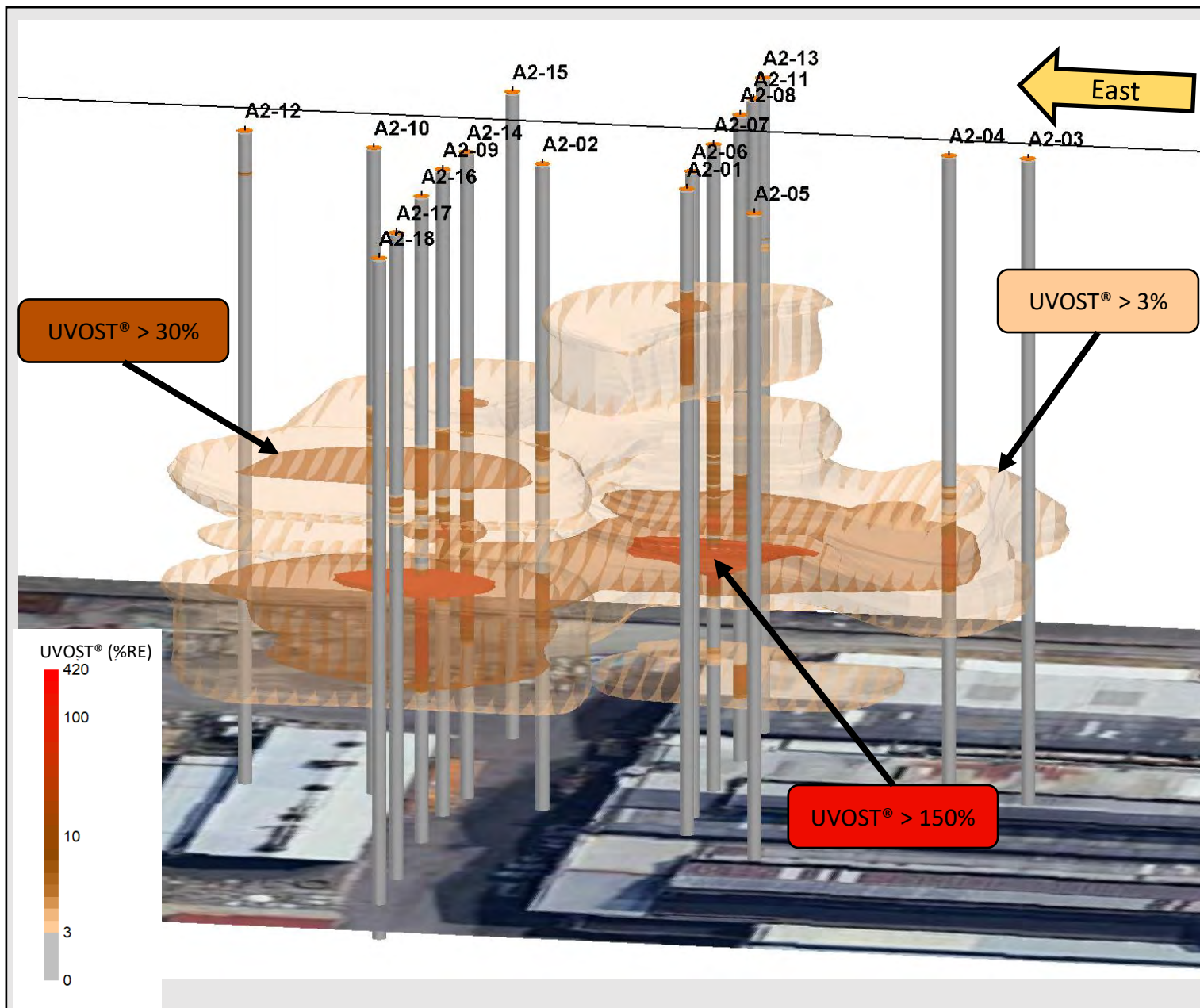
**Former Jorgensen Forge
Tukwila, WA**

High-Resolution Site
Characterization

October 2020

Figure 6





UVOST® Results –
Area 2

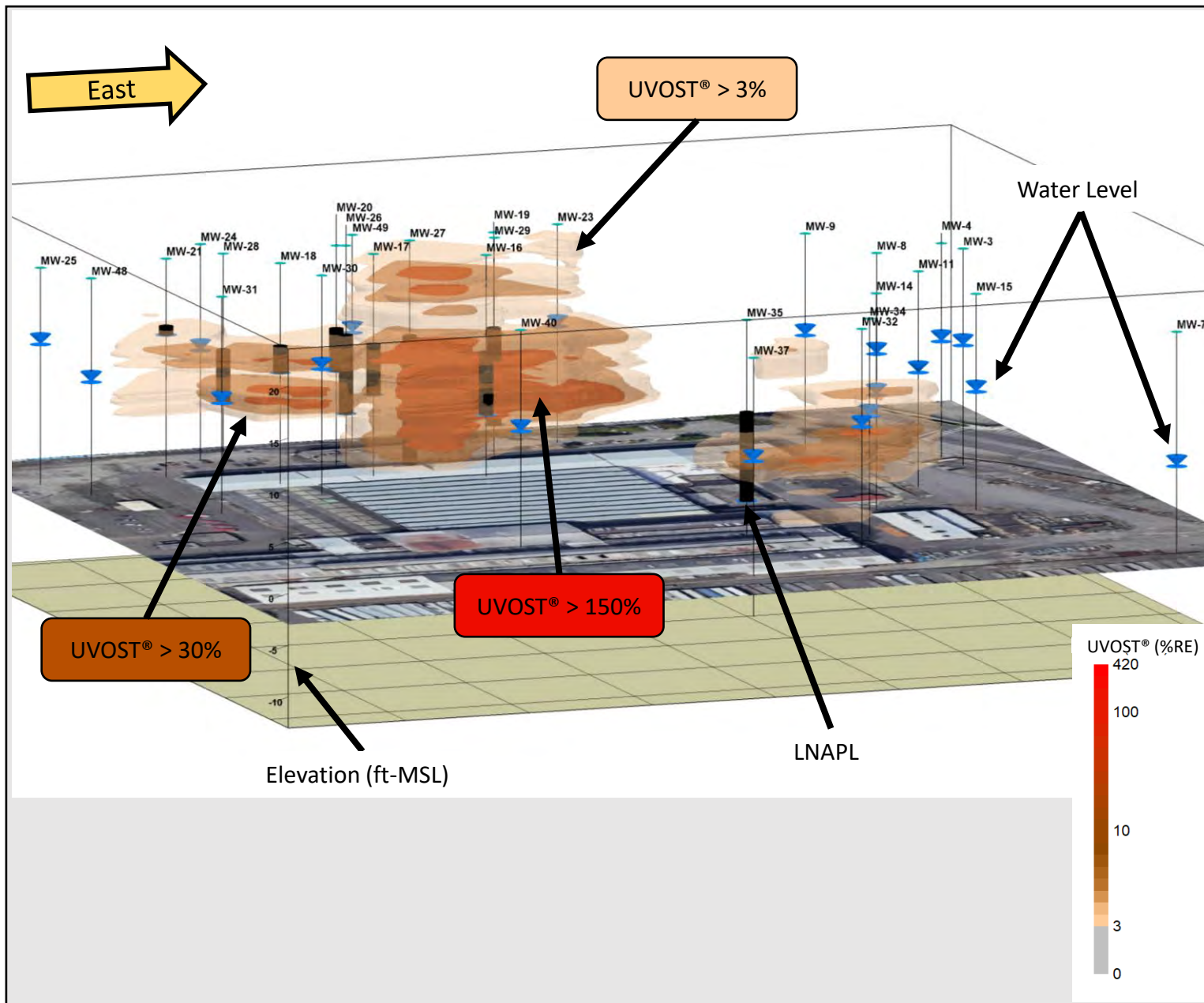
Former Jorgensen Forge
Tukwila, WA

High-Resolution Site
Characterization

October 2020



Figure 7



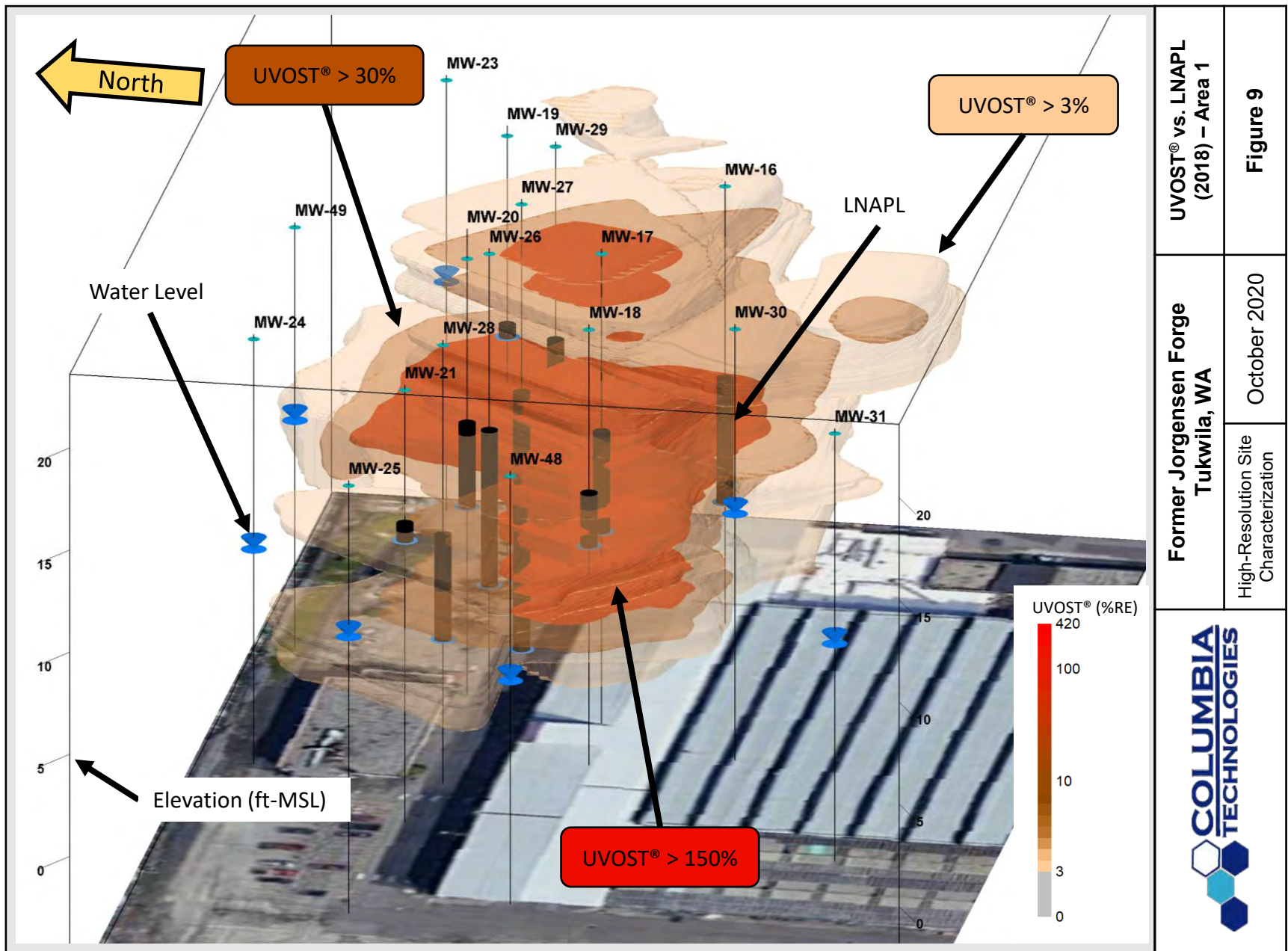
UVOST® vs. LNAPL
(2018)

Former Jorgensen Forge
Tukwila, WA

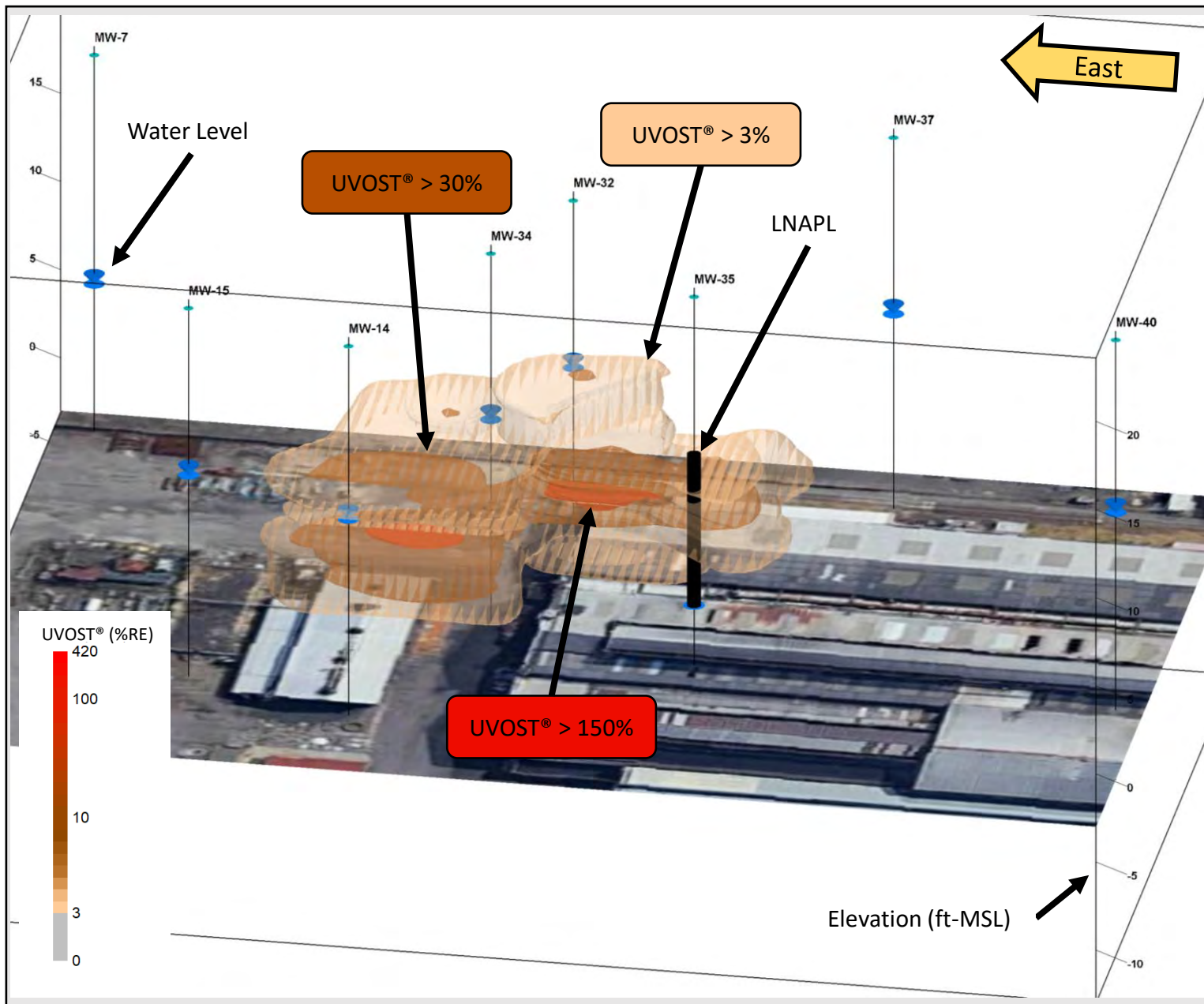
High-Resolution Site
Characterization

Figure 8

October 2020



	Former Jorgensen Forge Tukwila, WA		UVOST® vs. LNAPL (2018) – Area 1
	High-Resolution Site Characterization	October 2020	Figure 9



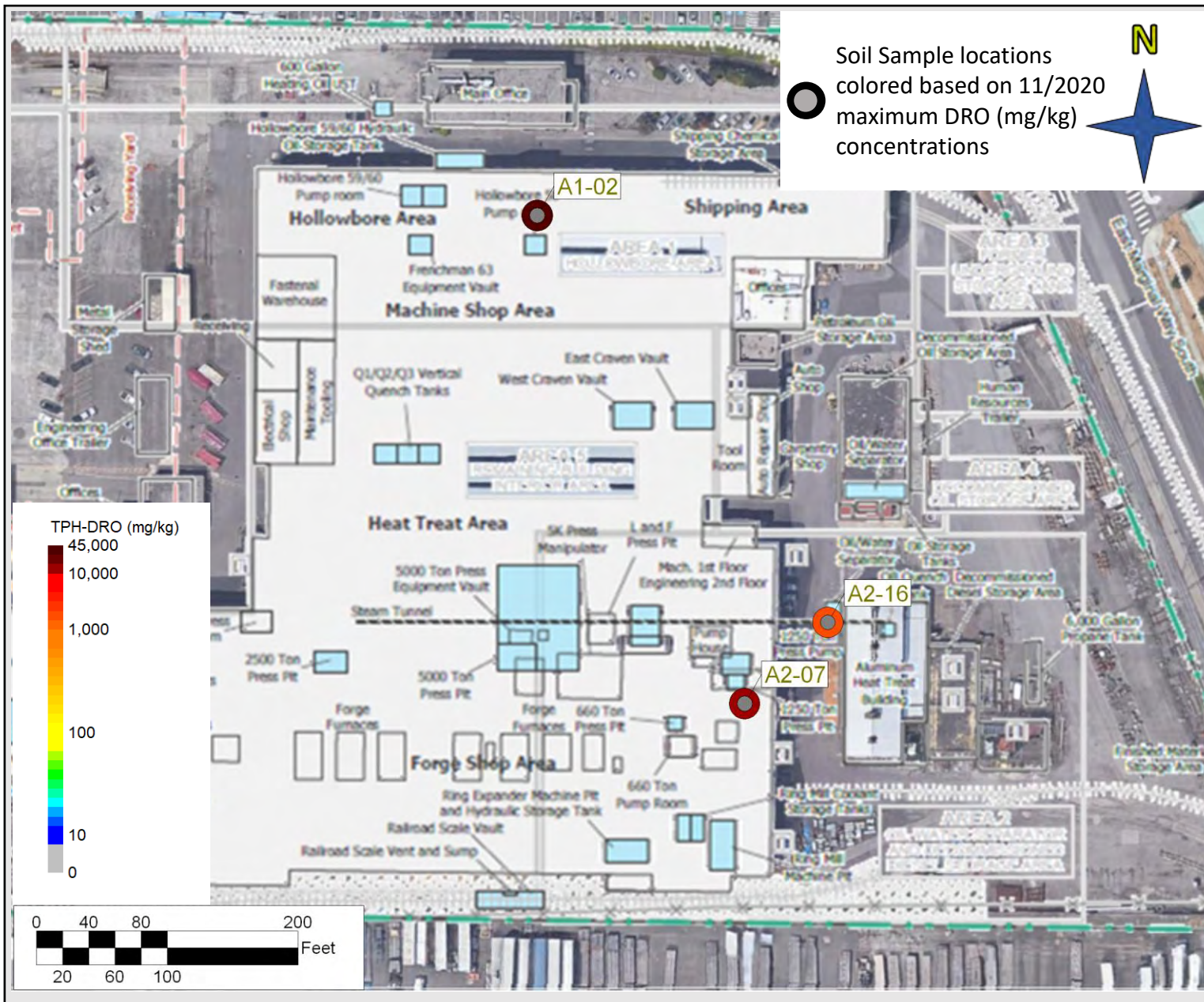
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(2018) – Area 2

Former Jorgensen Forge
Tukwila, WA

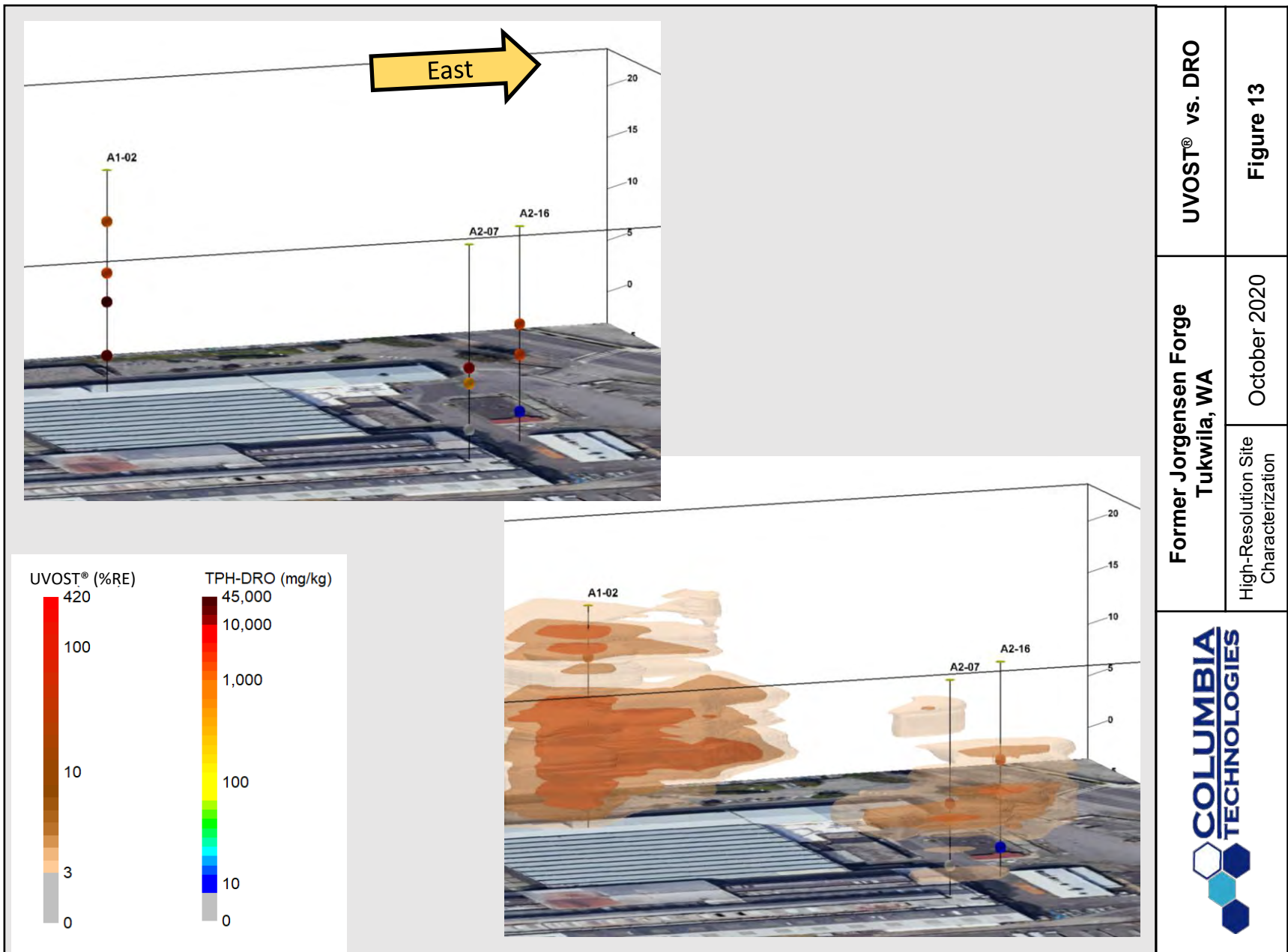
High-Resolution Site
Characterization

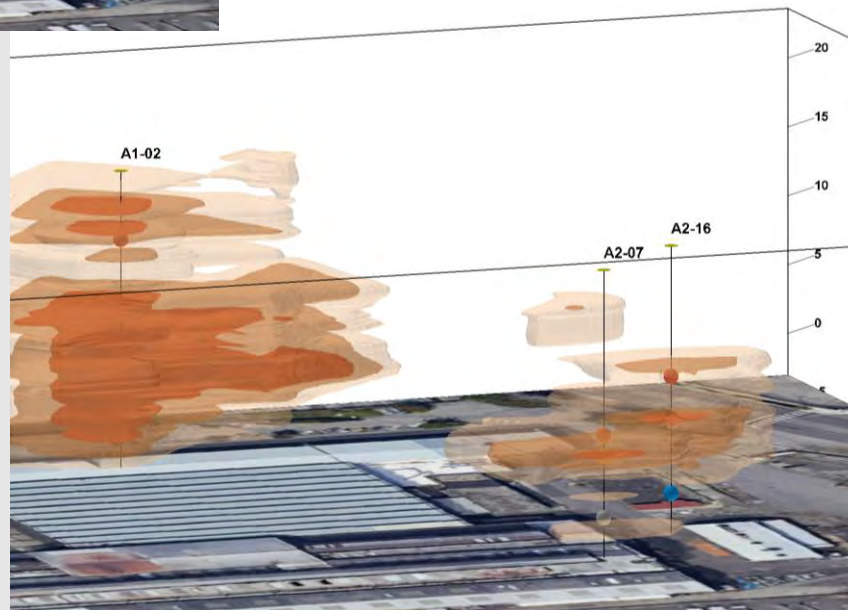
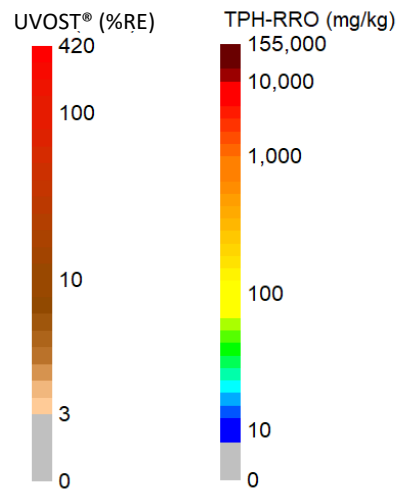
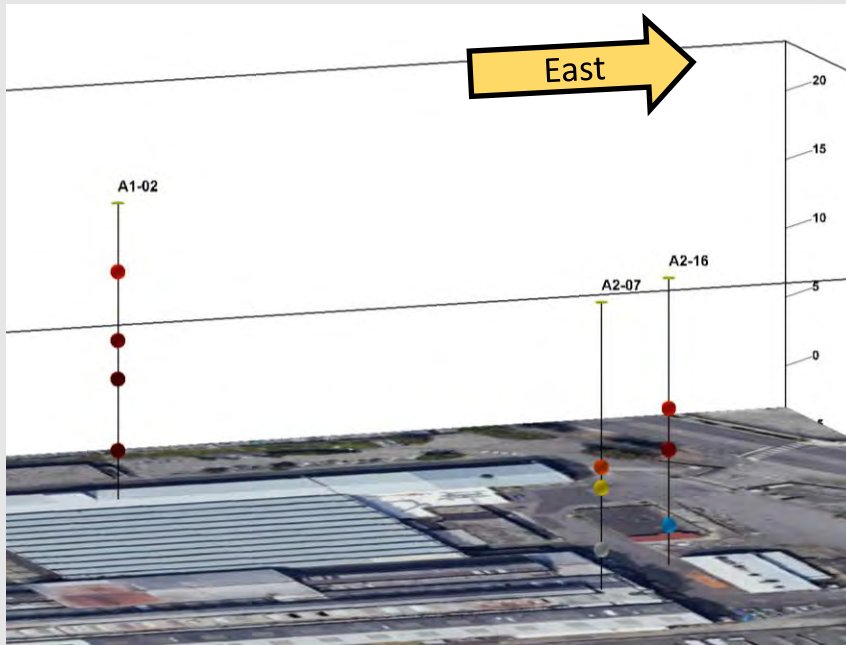
Figure 10





TPH-DRO Soil Results	Figure 11	
Former Jorgensen Forge Tukwila, WA	October 2020	High-Resolution Site Characterization
		





UVOST® vs. RRO

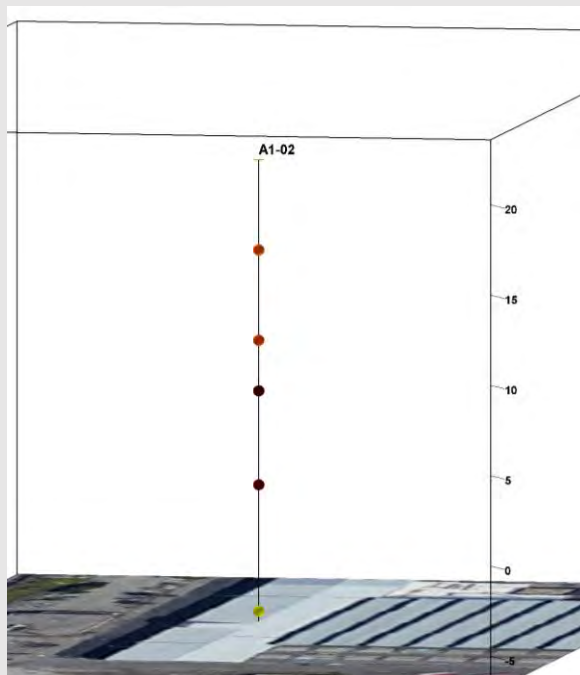
Former Jorgensen Forge
Tukwila, WA

October 2020

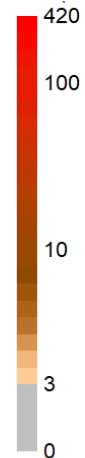
High-Resolution Site
Characterization



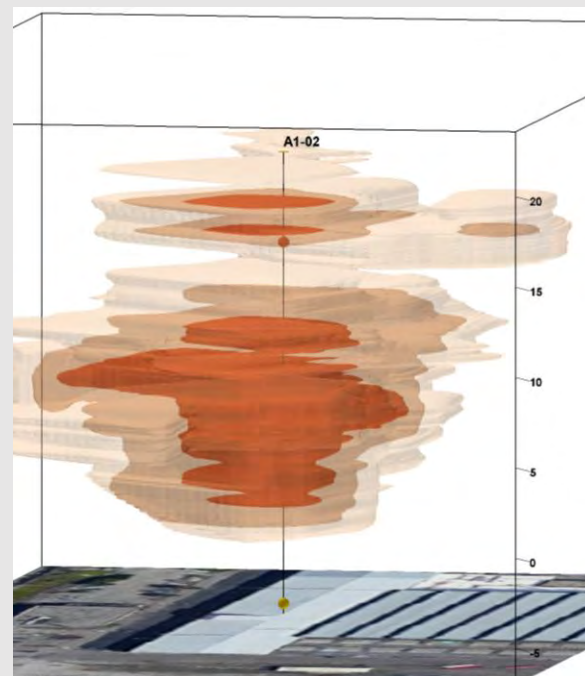
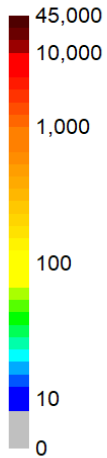
Figure 14



UVOST® (%RE)



TPH-DRO (mg/kg)



UVOST® vs. DRO –
Area 1

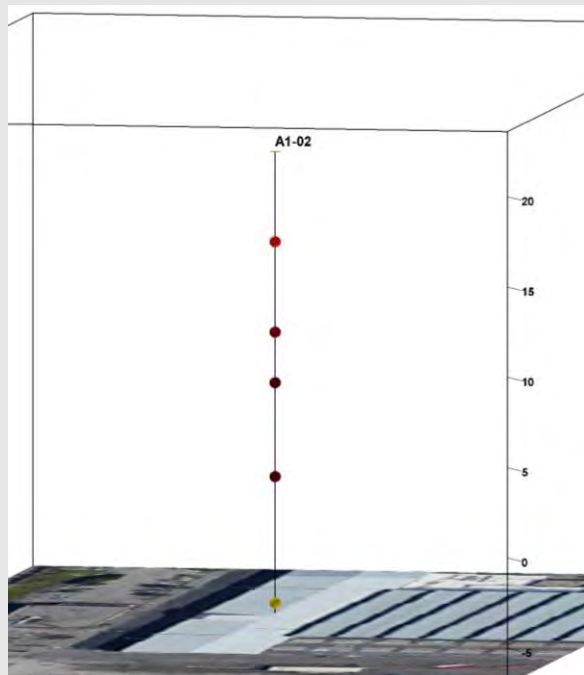
Former Jorgensen Forge
Tukwila, WA

October 2020

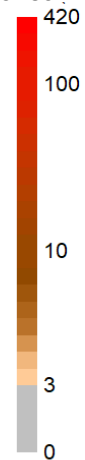
High-Resolution Site
Characterization

Figure 15

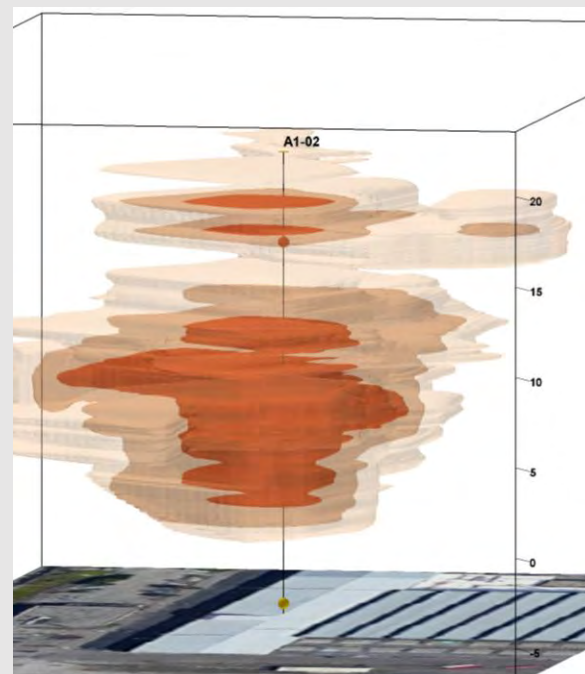
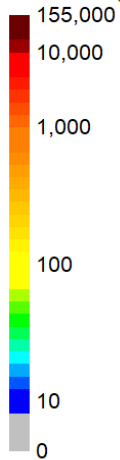




UVOST® (%RE)



TPH-RRO (mg/kg)



UVOST® vs. RRO –
Area 1

Former Jorgensen Forge
Tukwila, WA

October 2020

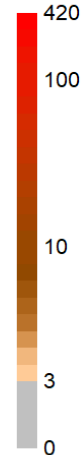
High-Resolution Site
Characterization

Figure 16

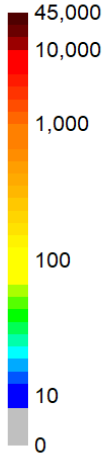




UVOST® (%RE)



TPH-DRO (mg/kg)



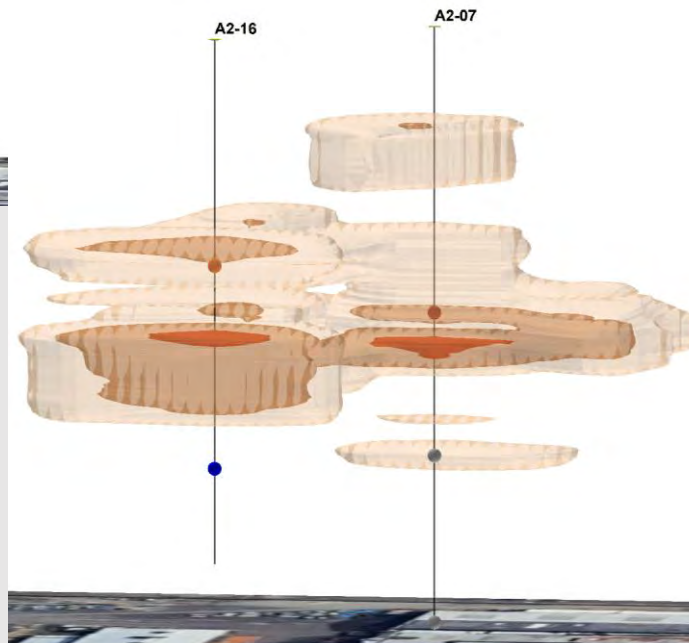
A2-16

A2-07



A2-16

A2-07



UVOST® vs. DRO -
Area 2

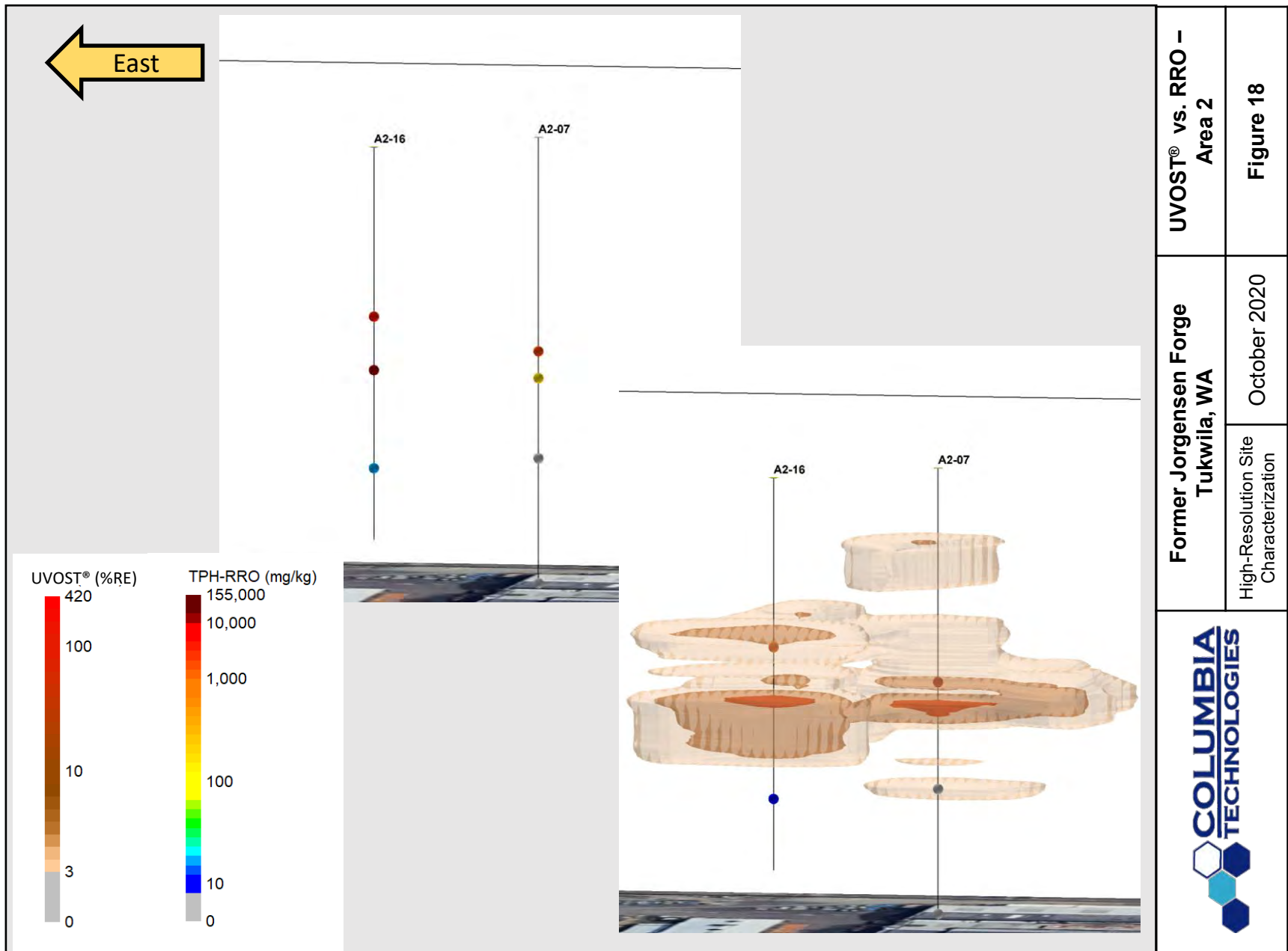
Former Jorgensen Forge
Tukwila, WA

October 2020

High-Resolution Site
Characterization

Figure 17





APPENDICES

APPENDIX A - Direct Sensing Equipment Description

UVOST® Equipment Description

The LIF system utilized for this investigation is the latest generation UVOST® system developed by Dakota Technologies, Inc. (DTI). The UVOST® system uses a high-energy laser to produce an ultraviolet (UV) light source for the detection of polycyclic aromatic hydrocarbons (PAHs).

The UVOST® system employs an excitation beam of light from a xenon chloride laser at 308 nanometers (nm), pulsed at 50 megahertz and delivered to the sapphire window via a silica fiber optic line. Any residual phase PAHs present in the soil matrix will absorb and then release this photon energy in the form of fluorescence.

This fluorescence is returned to the optical detection system via a second silica fiber optic line, detected, and recorded in real time across four 50nm wavelength bins centered at 350, 400, 450, and 500 nm.

The aforementioned wavelengths represent a common range of fluorescence associated with PAHs. Typically, the lighter fuels (jet fuel and gasoline) emit fluorescence at the shorter wavelengths – 350 and 400 nm, while heavier, less distilled compounds such as bunker fuel or diesel fuel emit fluorescence at the longer wavelengths – 450 nm and 500 nm.

UVOST® screening is performed by pushing/hammering a shock protected optical cavity (SPOC) into the soil at the target rate of two centimeters per second (0.8 inches per second). As the SPOC is advanced, the total monitored fluorescence, as well as the intensity and temporal duration of the fluorescence at each of the four monitored wavelengths, are recorded and displayed in real-time at one-second intervals as a function of depth.

UVOST® system data are presented as a percentage of the normalized % Reference Emitter (RE) performance standard. This standard consists of a blend of Non-Aqueous Phase Liquid (NAPL) and produces a consistent fluorescence response over the four wavelengths monitored by the UVOST® system. Collected data are then presented as the %RE. Using the same RE at each location and site allows normalization of data collected over several locations, sites, or screening events. The RE standard is provided by the equipment manufacturer and is the same for all UVOST® systems currently in operation.

Any fluorescence response is normally indicative of residual phase petroleum hydrocarbons, though some naturally occurring materials such as limestone will also fluoresce to a lesser and more monochromatic degree.

Depth Measurement

Depth in feet is measured and recorded using a precision potentiometer with a

100-inch linear range. The potentiometer is mounted on the mast of the DPT rig and a counterweight anchored to the foot of the rig. Measurements are recorded on the down stroke of the mast, as the tooling string is pushed into the ground, and is accurate within 1/10th of an inch. The reference elevation (depth) reported for each individual boring is established by setting the data logger to zero feet with the sensing window of the downhole probe aligned with the ground surface.

Plotting the boring locations on a contour map provides elevations of the ground at the station. The ground surface elevations at the stations can be surveyed if more precise elevations are needed.

APPENDIX B – Quality Control Procedures

System Quality Control Checks

Direct sensing technologies such as UVOST® provides qualitative or semi-quantitative direct contact measurements of conditions in the soil of the subsurface. Correct performance response of the instrument is determined using standards or mixtures of known values or concentrations. Before and after each measurement run, the instrument is tested with these known standards to ensure their response is within an acceptable range.

The nature of direct-sensing technology is different than a typical laboratory analysis. In the lab, a known volume of a known concentration is introduced to the system, the compounds are separated chromatographically, and the response for each individual compound is recorded. This process is highly reproducible, and precise standards exist for laboratory control limits.

These performance tests of direct sensing instruments are not calibrations, per se. While the instrument response can be expected to be linear for a single chemical compound or in the known matrix conditions of the performance test standards, matrix conditions and chemical mixtures will be highly variable throughout the measurement run in subsurface.

Several other factors affect direct-sensing responses.

For UVOST®, these factors include:

- Soil grain size
- Interferences from fluorescent minerals such as limestones
- Contaminant types
- Degree of saturation
- System performance

For these reasons, a "calibration" is not possible. The variables within compounds of interest, mixtures of compounds, and subsurface conditions cannot be standardized. However, system performance can. Therefore, COLUMBIA Technologies implements protocols to test and evaluate system performance to produce the highest quality data in the industry. The results of these performance tests are maintained with each project file and available upon request.

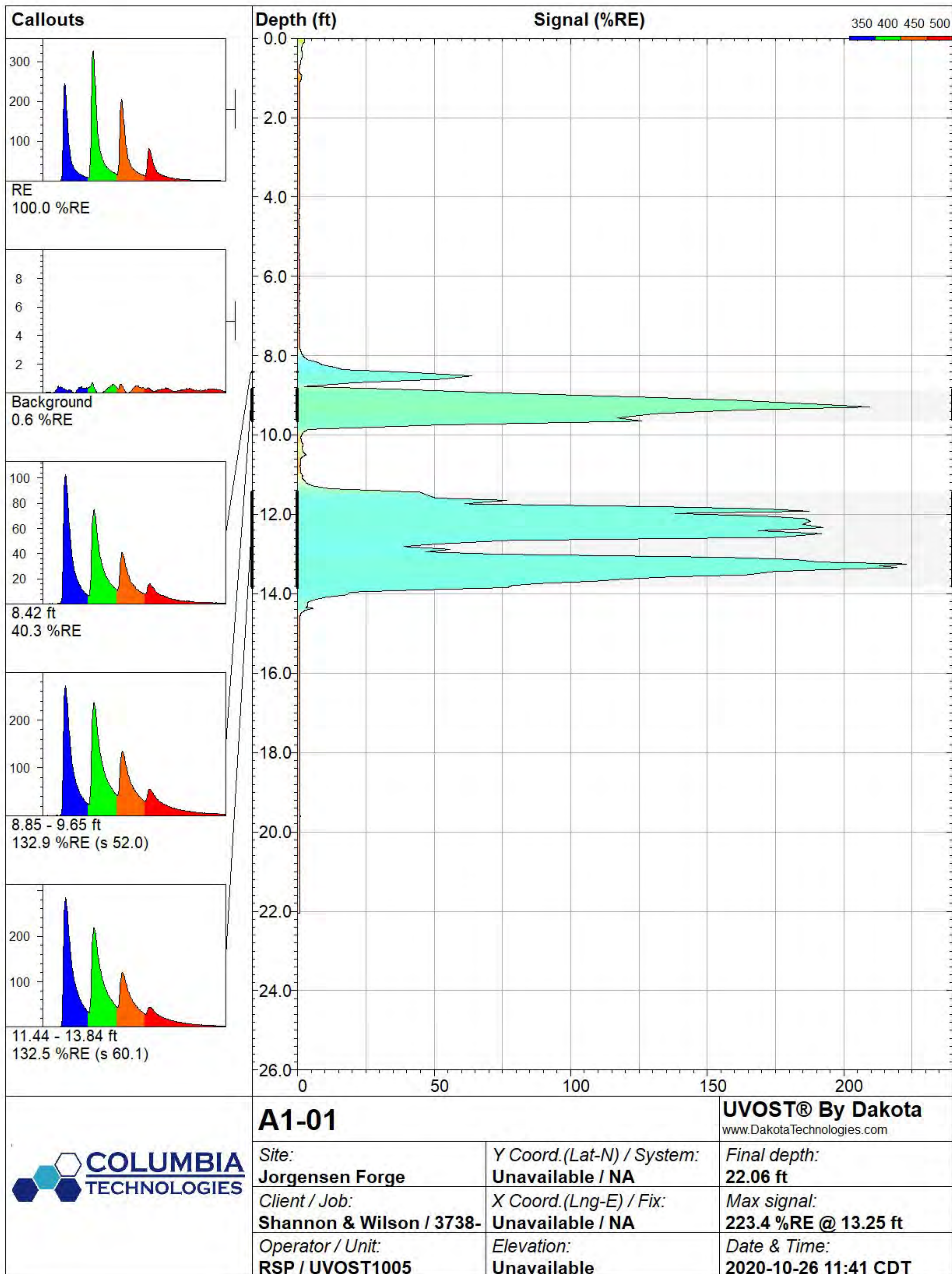
UVOST® System Performance Tests

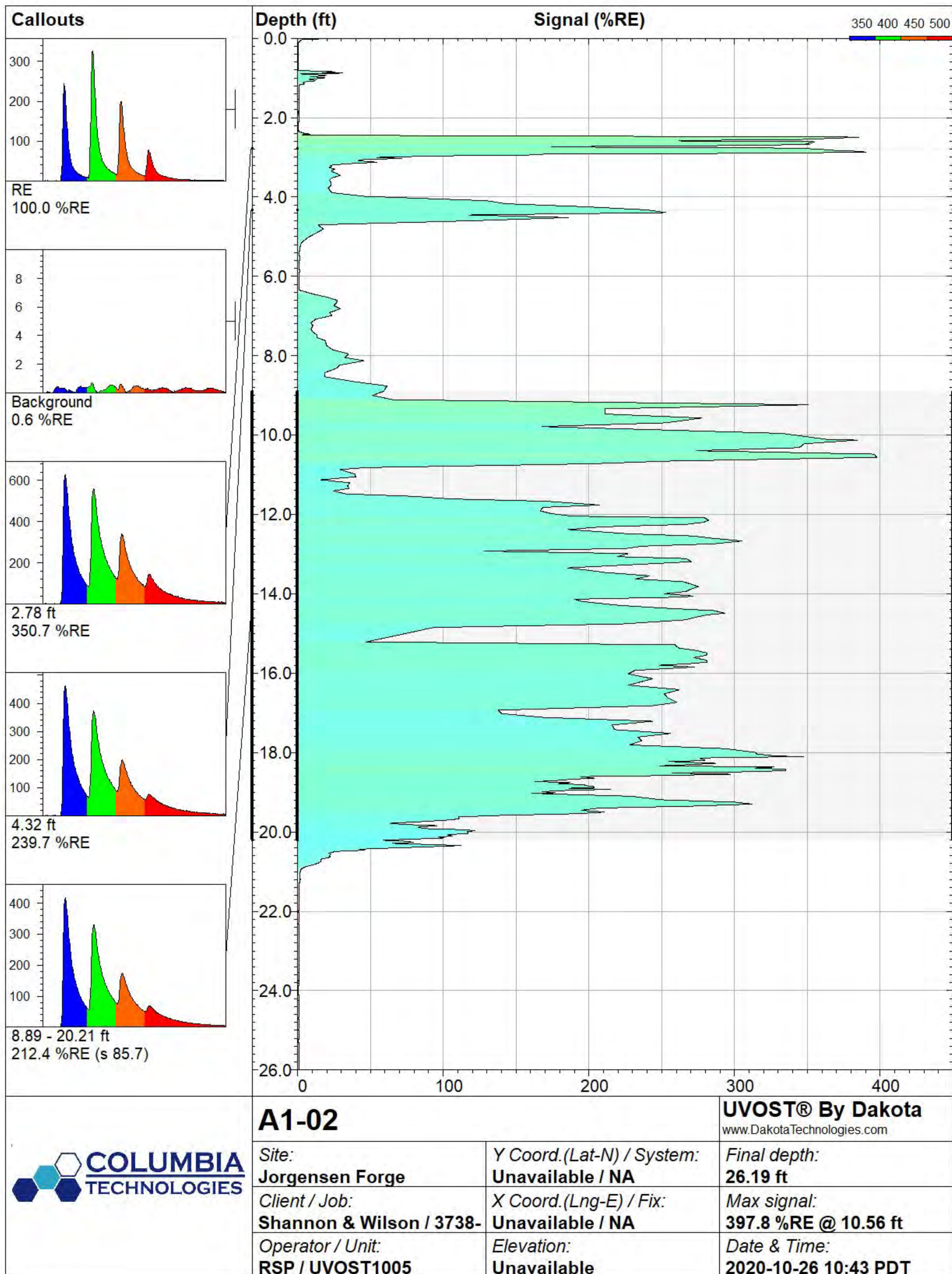
As a quality control check, the UVOST® system response is evaluated prior to and upon completion of each UVOST® screening location. This evaluation is completed using a Reference Emitter (RE) that consists of a blend of NAPL and produces a consistent fluorescence response over the four wavelengths monitored by the UVOST® system. Collected data is then presented as a percentage of the RE. Using the same RE at each location and site allows normalization of data collected over several locations, sites, or screening

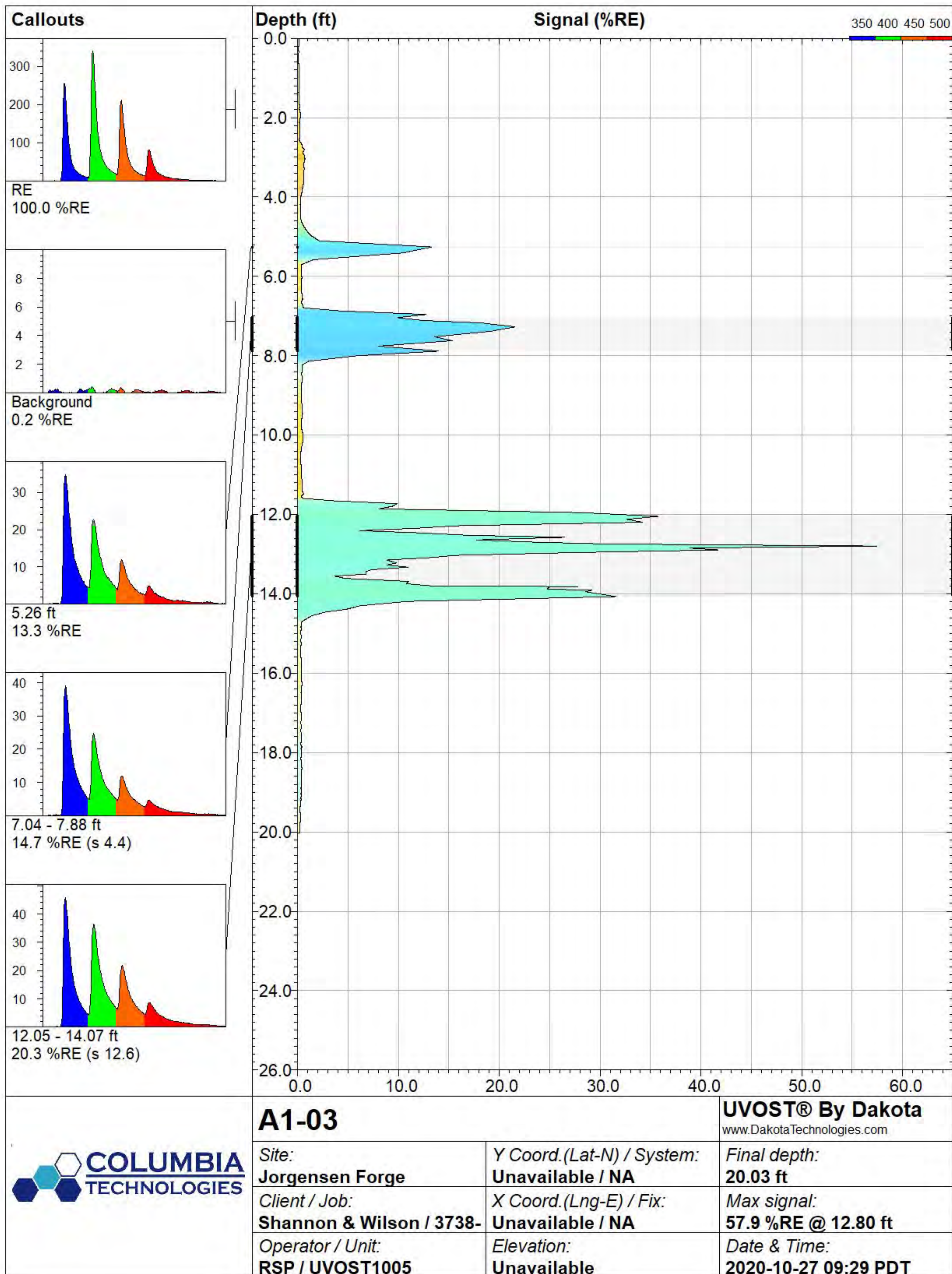
events. The RE standard is provided by the manufacturer, Dakota Technologies, and is the same for all UVOST® systems currently in operation.

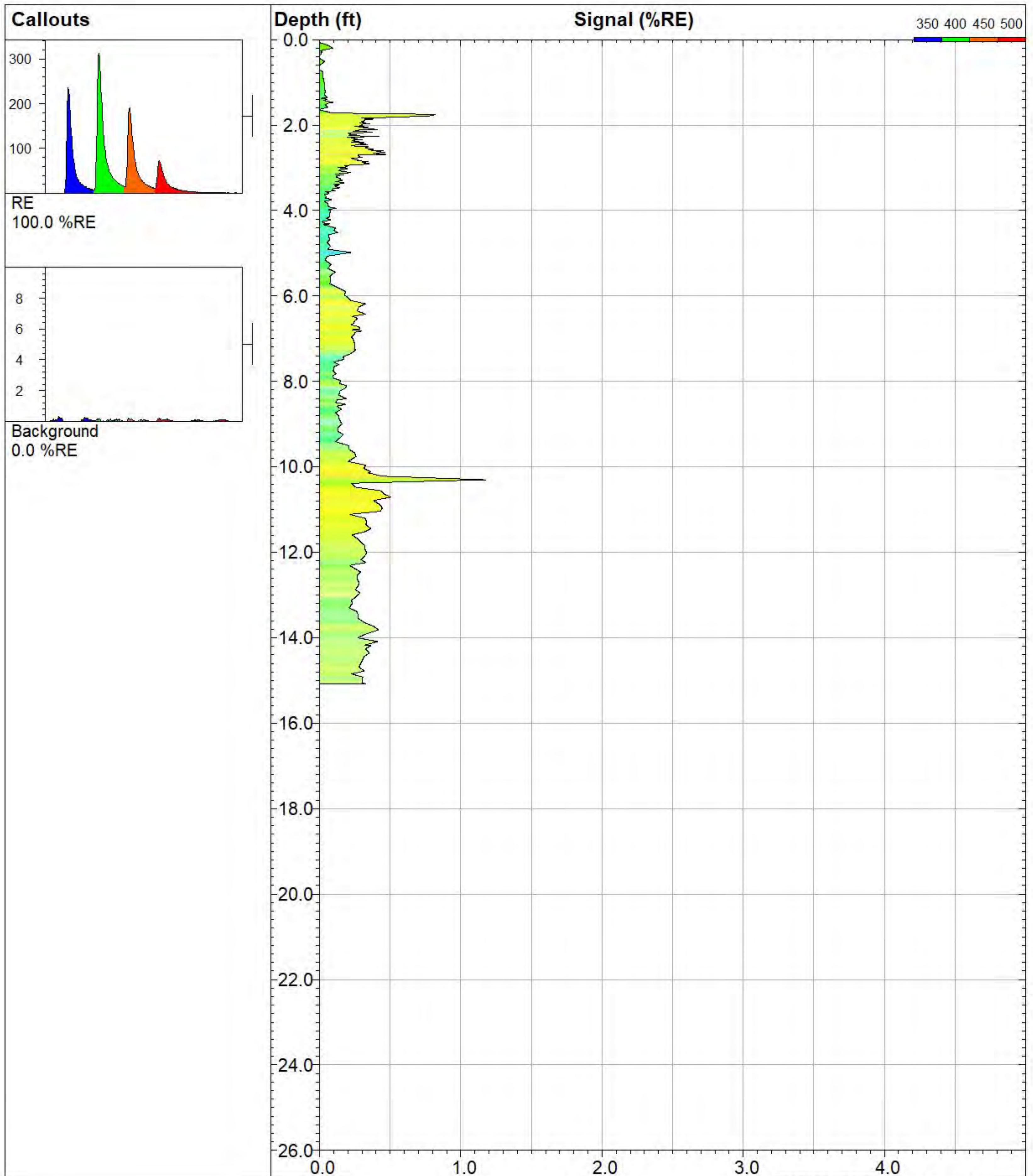
In addition to obtaining a baseline RE for each location, the background reading of the UVOST® system is electronically recorded prior to insertion into the soil. This background reading is required to be less than 0.5% of RE prior to the start of any testing. The background during tool advancement typically stays at or below the surface background reading – giving confidence that any increases in fluorescence are "true" readings and not fluctuations or variations in background.

APPENDIX C - UVOST® Logs for Area 1– Individual Scale









A1-04

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
15.07 ft

Client / Job:
Shannon & Wilson / 3738-

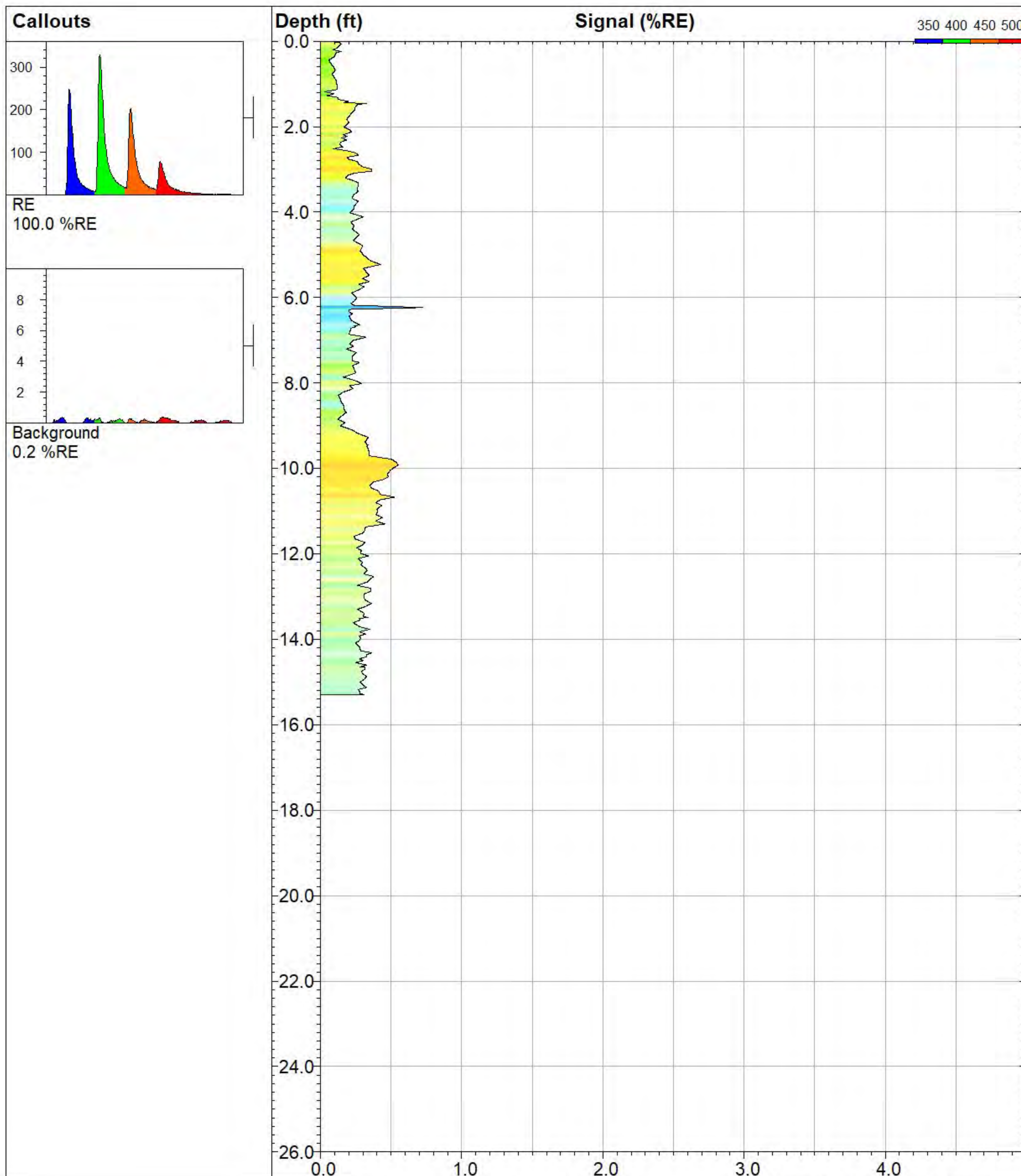
X Coord.(Lng-E) / Fix:
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Max signal:
1.2 %RE @ 10.30 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-27 11:56 PDT



A1-05

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
15.30 ft

Client / Job:
Shannon & Wilson / 3738-

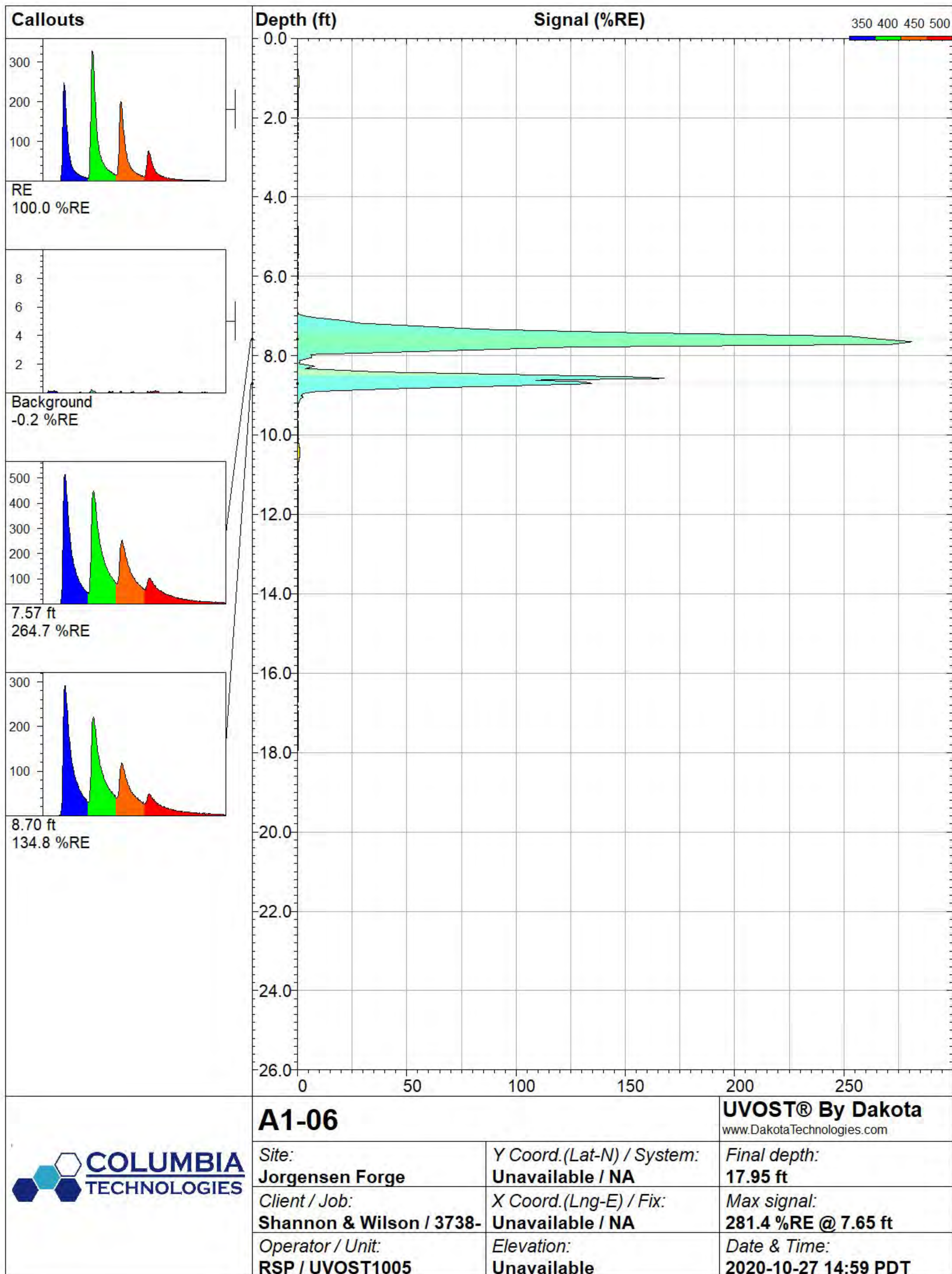
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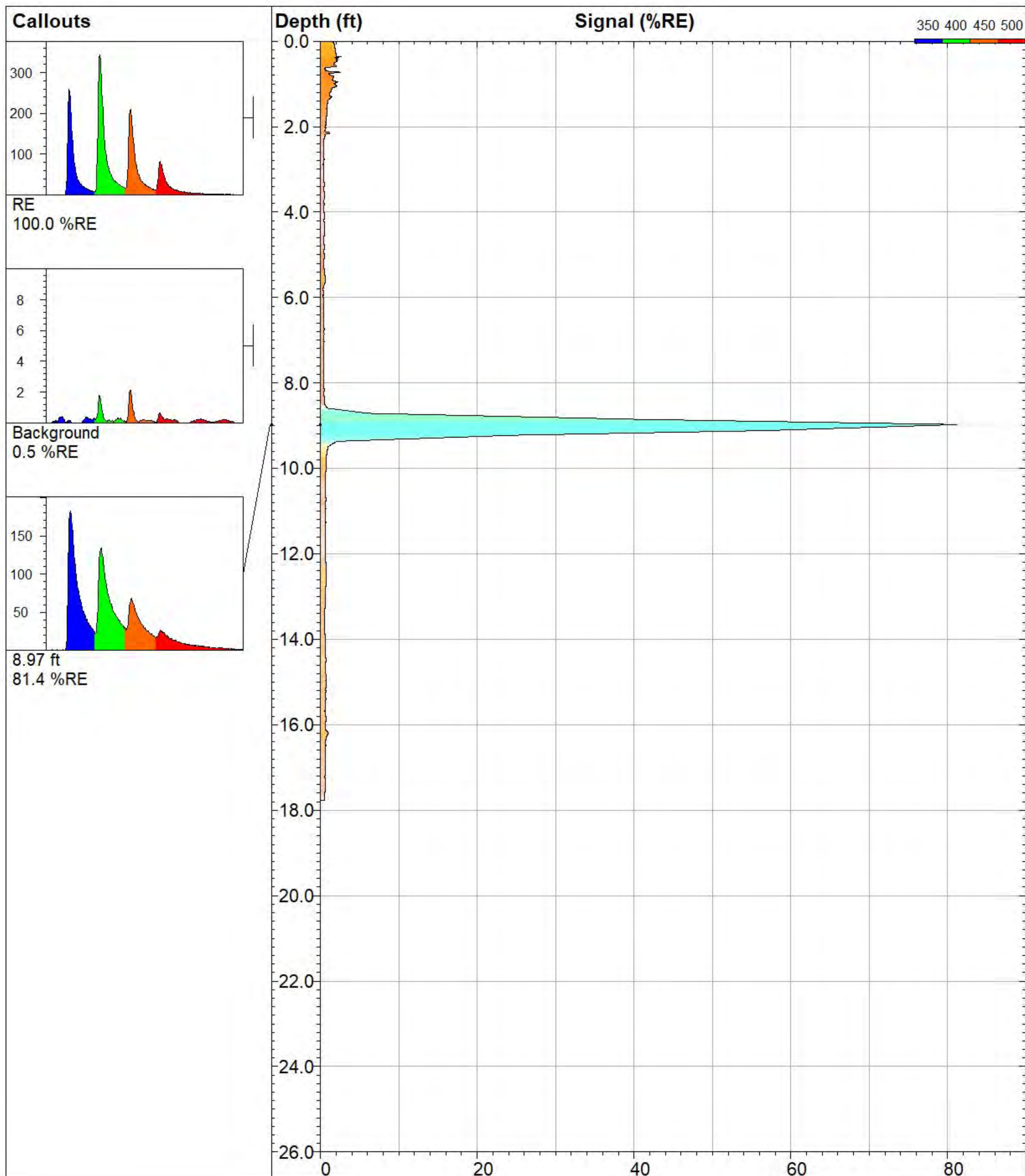
Max signal:
0.7 %RE @ 6.23 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-27 10:40 PDT





A1-07

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
17.77 ft

Client / Job:
Shannon & Wilson / 3738-

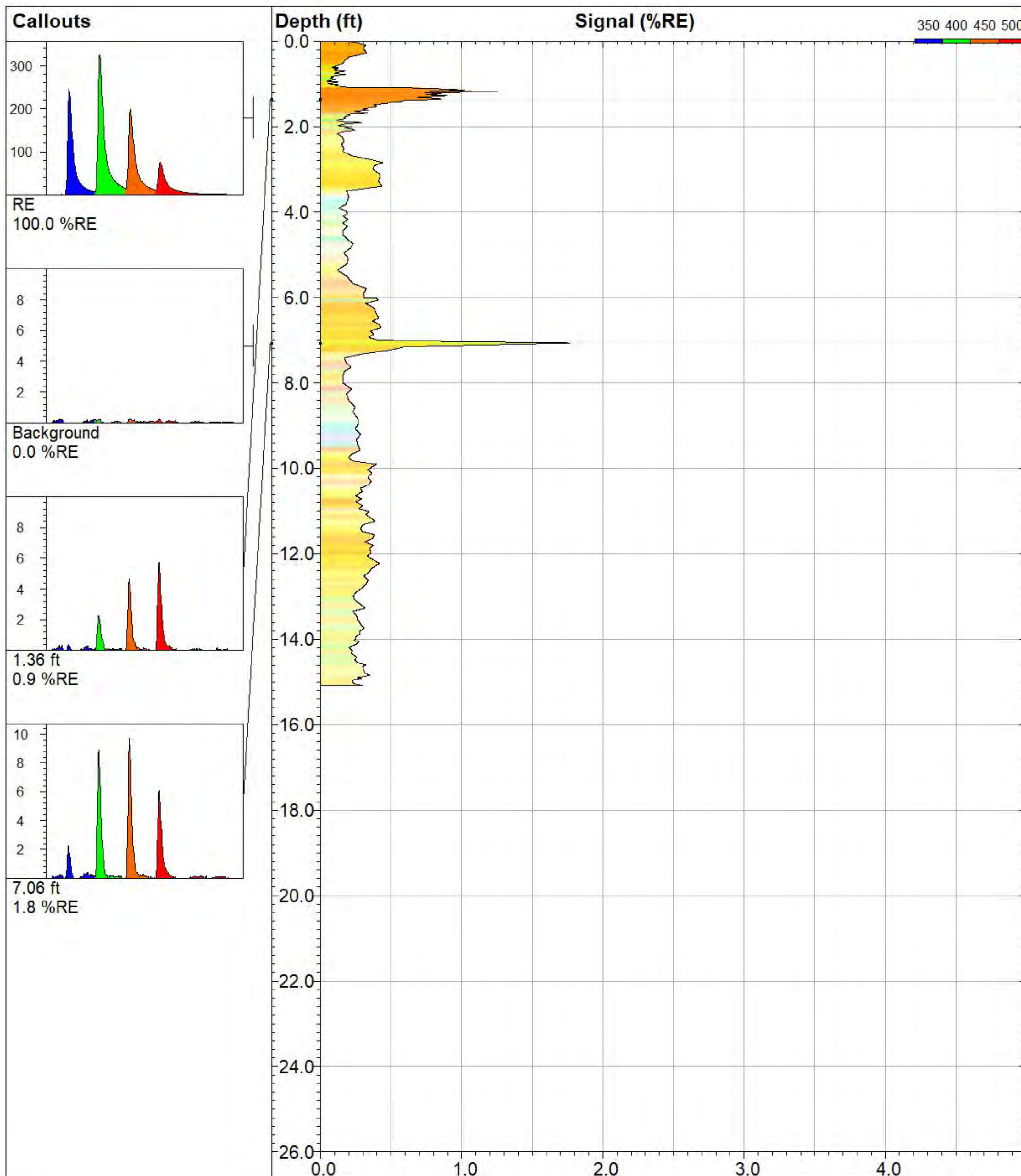
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Max signal:
81.4 %RE @ 8.97 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

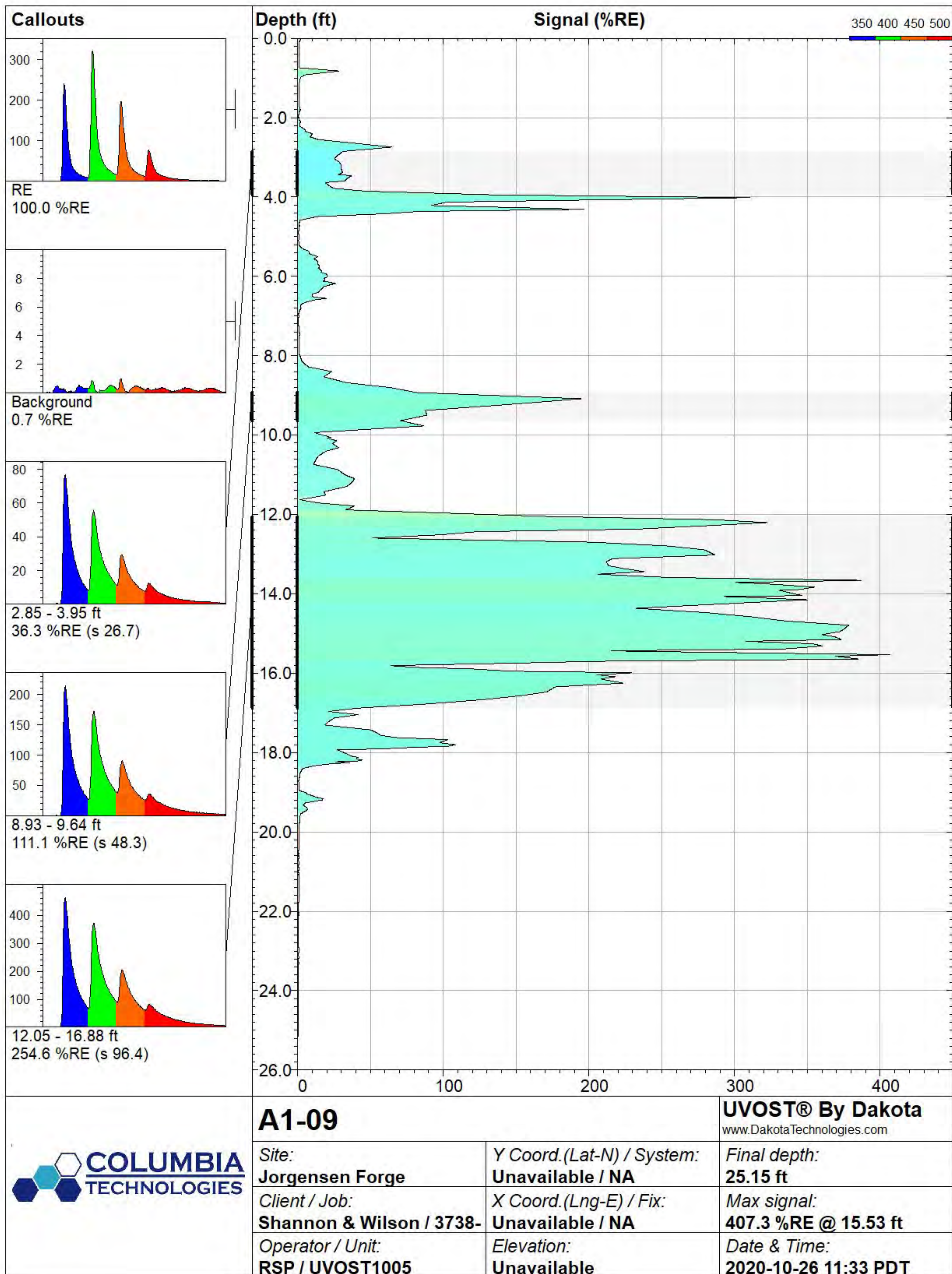
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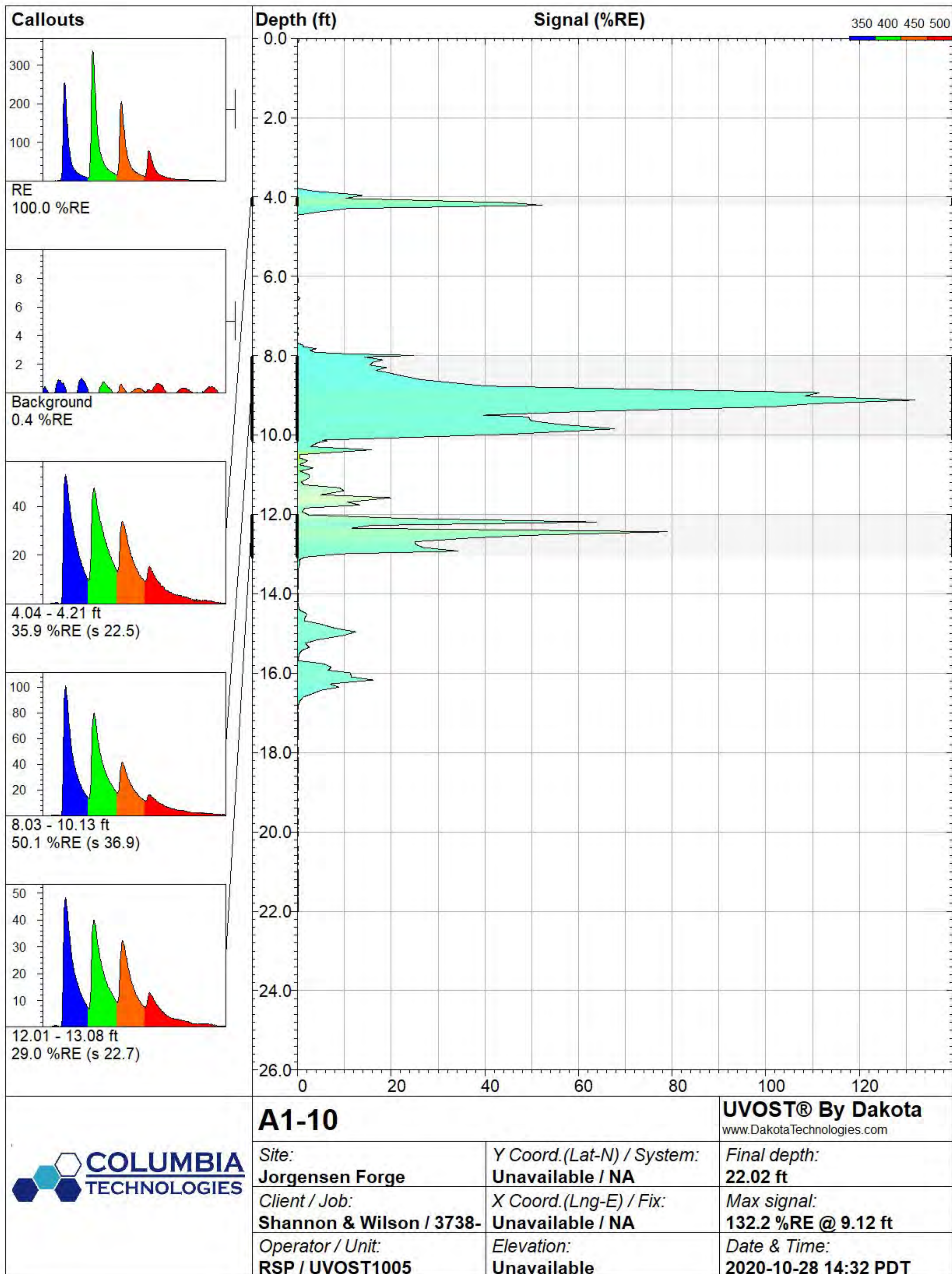


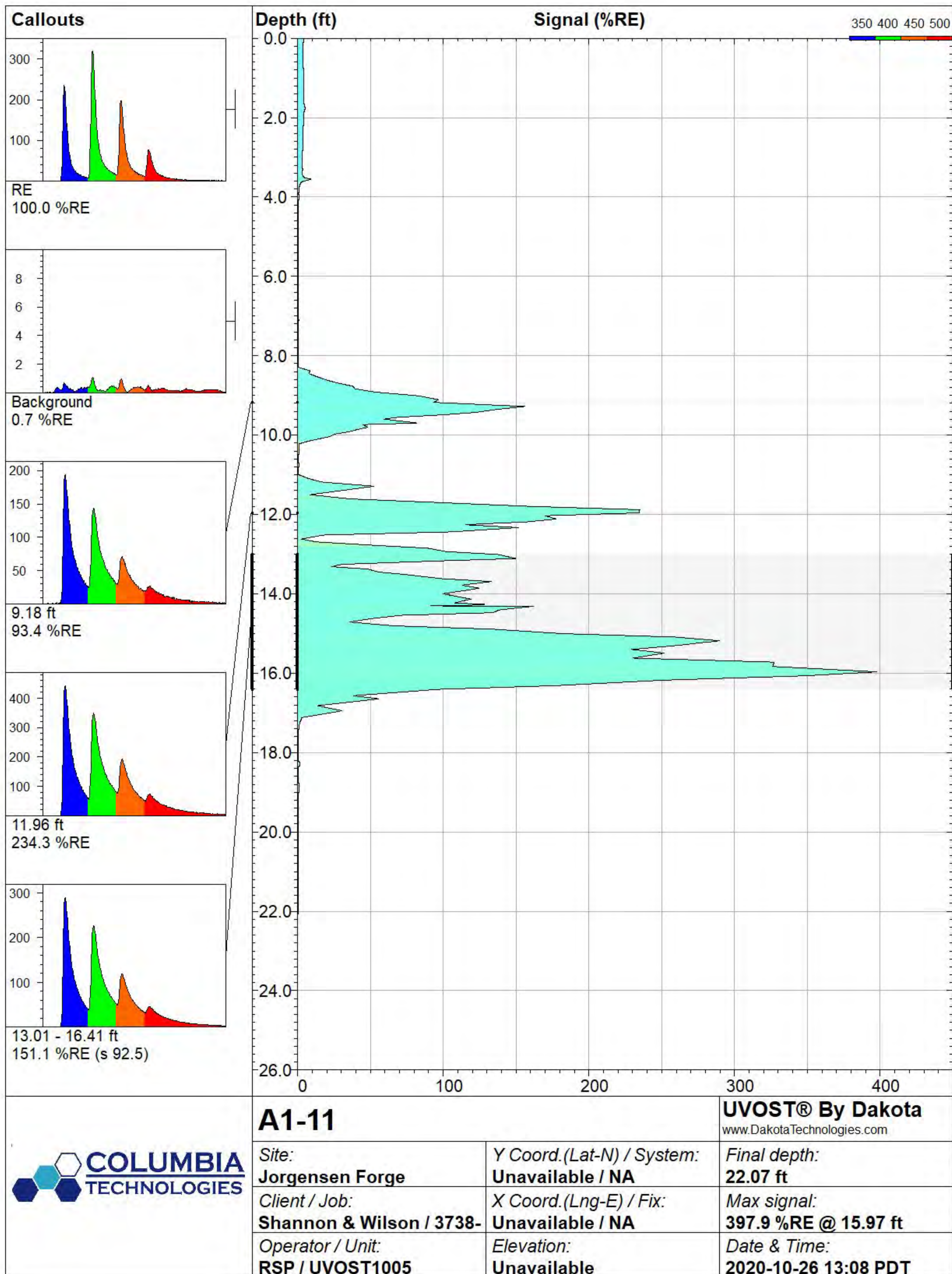
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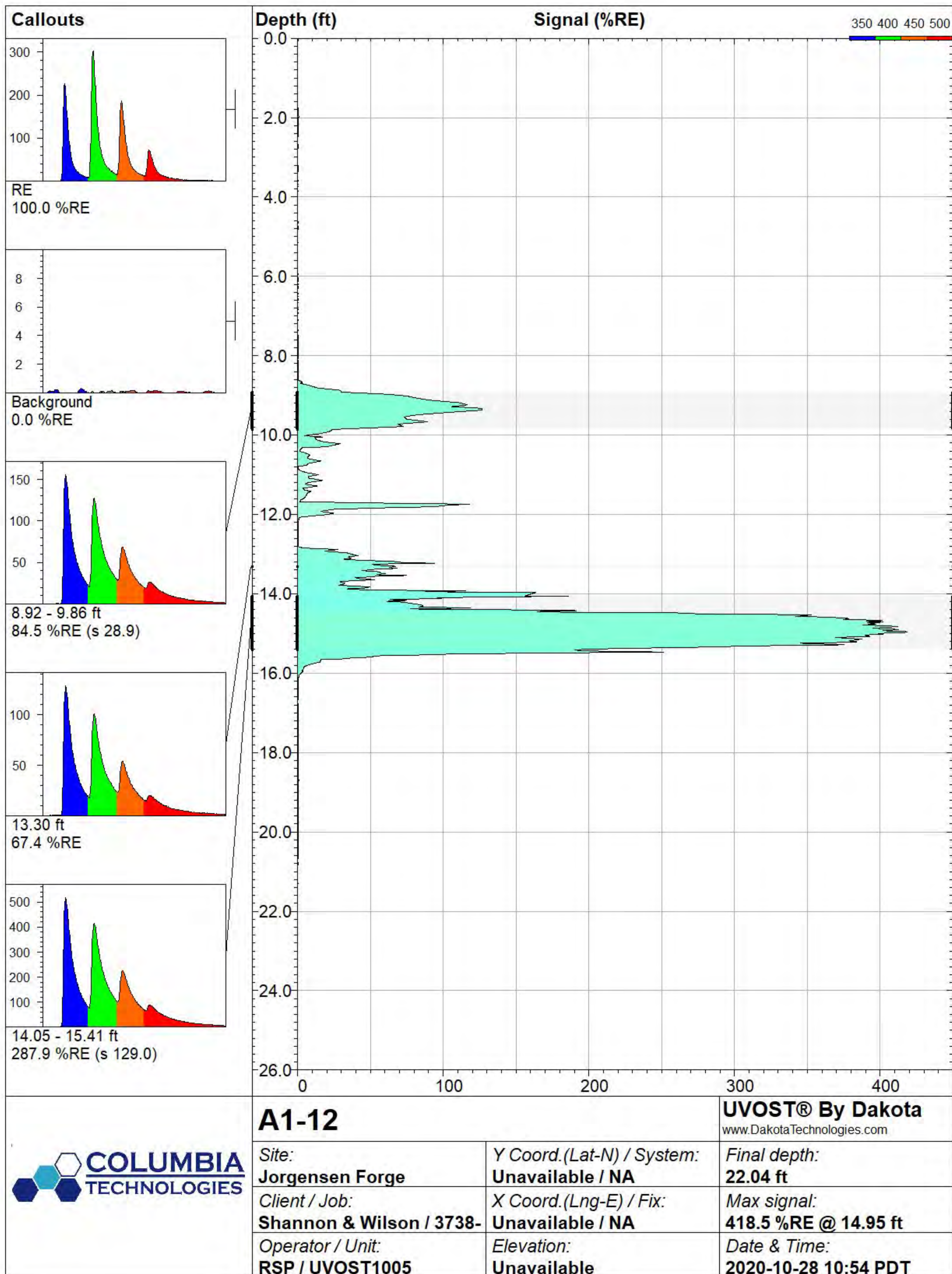
UVOST® By Dakota
www.DakotaTechnologies.com

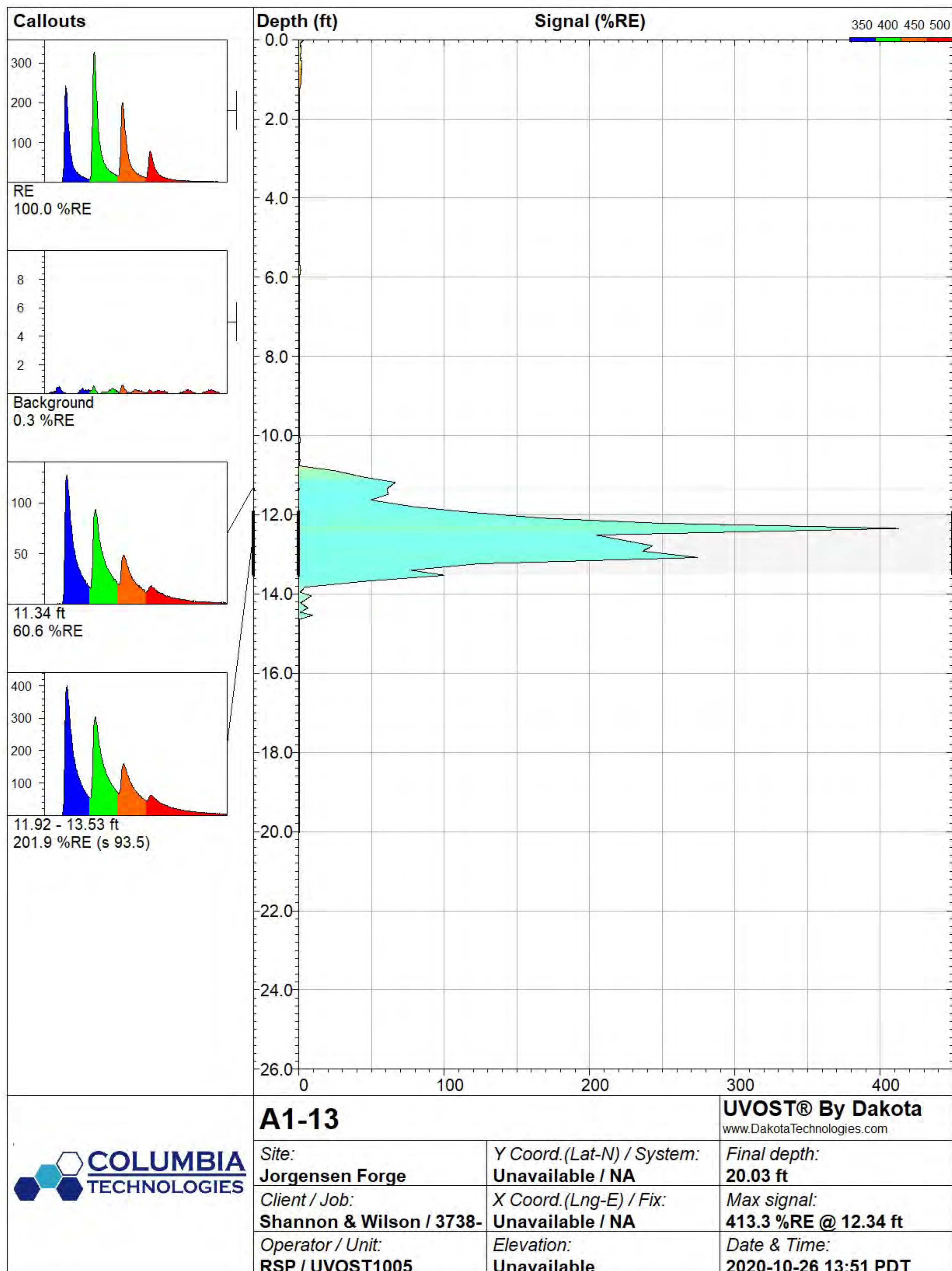
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Client / Job: Shannon & Wilson / 3738-	X Coord.(Lng-E) / Fix: Unavailable / NA	Max signal: 1.8 %RE @ 7.06 ft
Operator / Unit: RSP / UVOST1005	Elevation: Unavailable	Date & Time: 2020-10-27 13:29 PDT

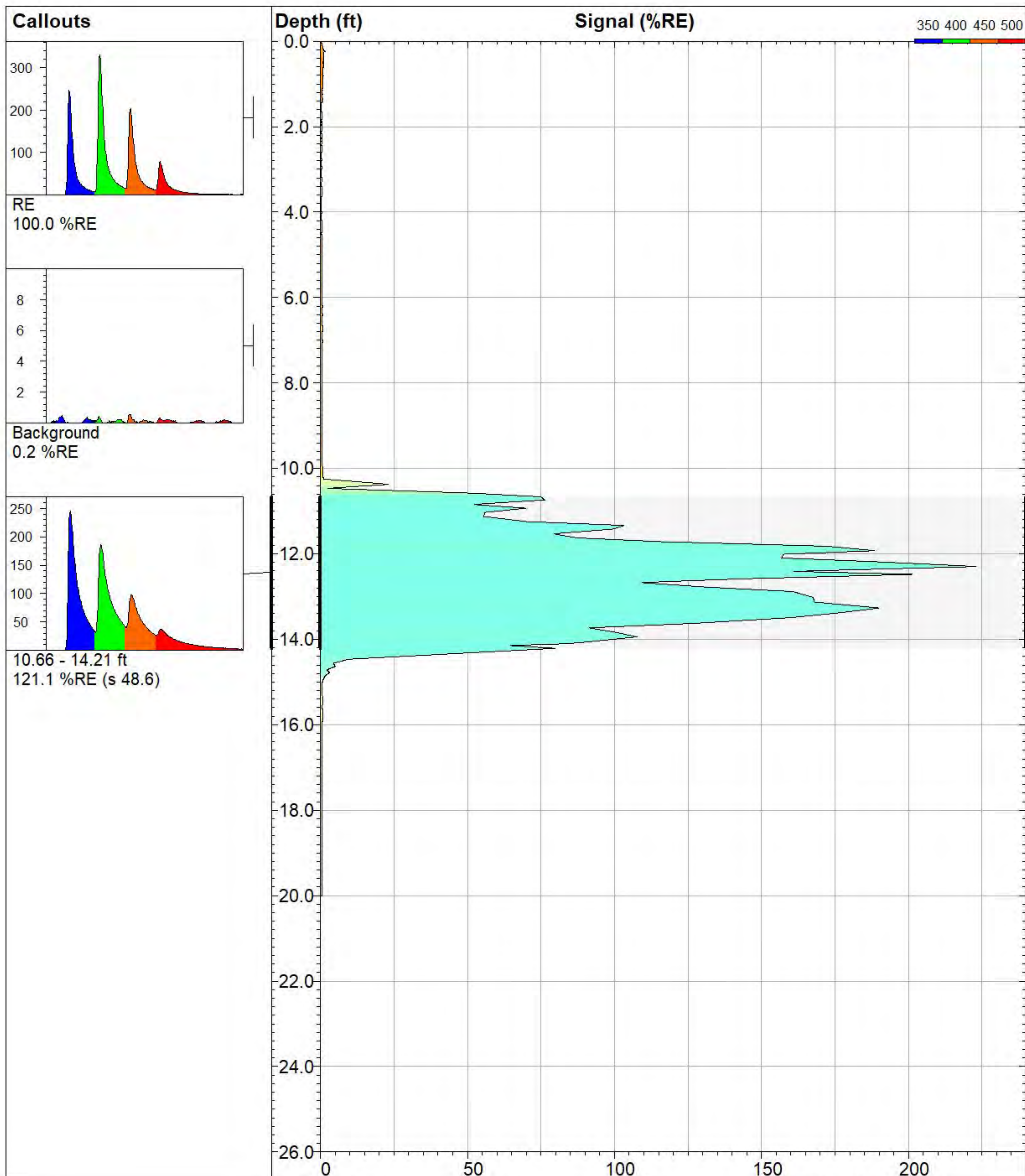












A1-14

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
20.01 ft

Client / Job:
Shannon & Wilson / 3738-

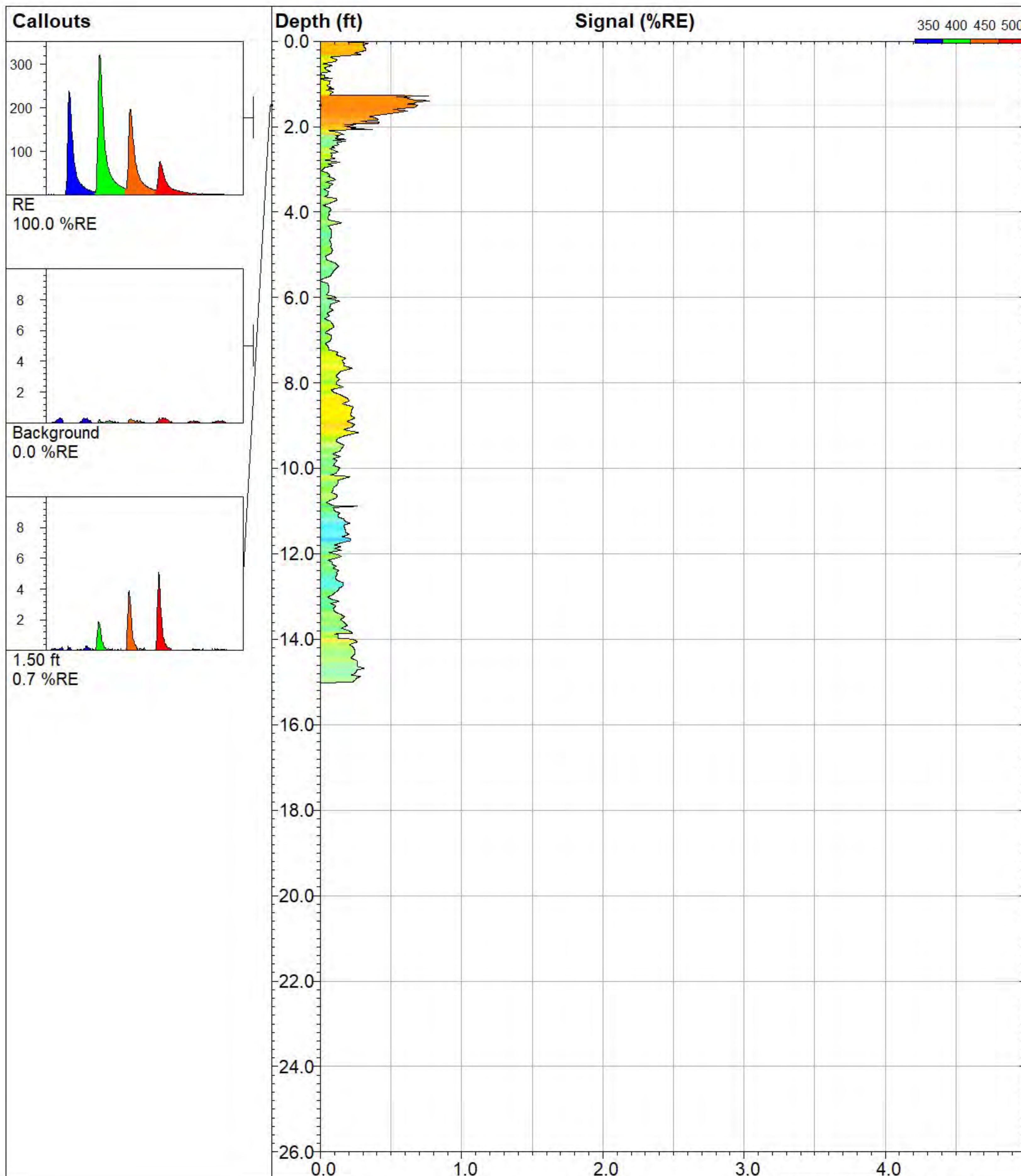
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
223.3 %RE @ 12.30 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-26 14:22 PDT



A1-15

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
15.01 ft

Client / Job:
Shannon & Wilson / 3738-

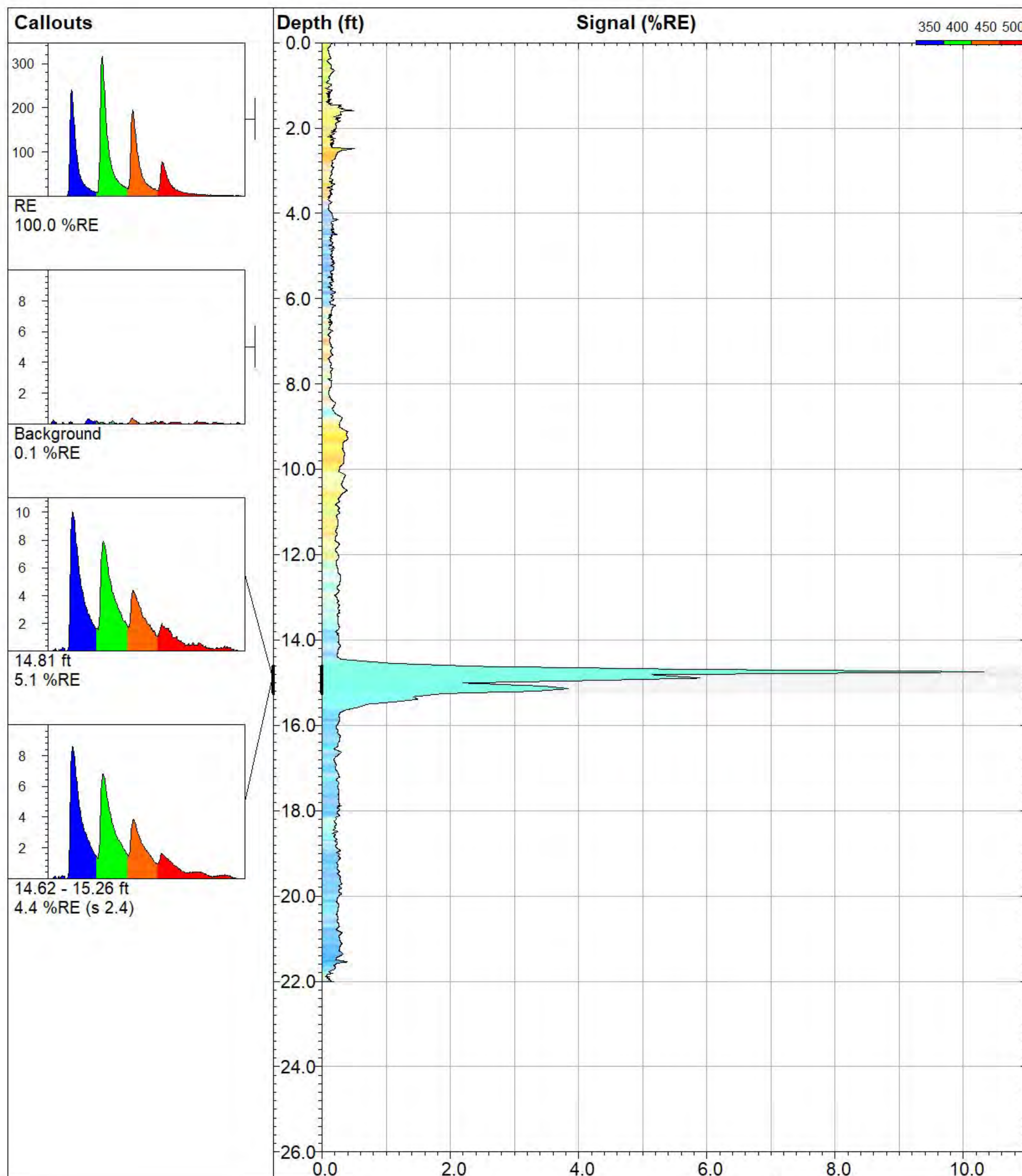
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Max signal:
0.8 %RE @ 1.28 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-27 14:02 PDT



A1-16

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
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Final depth:
22.01 ft

Client / Job:
Shannon & Wilson / 3738-

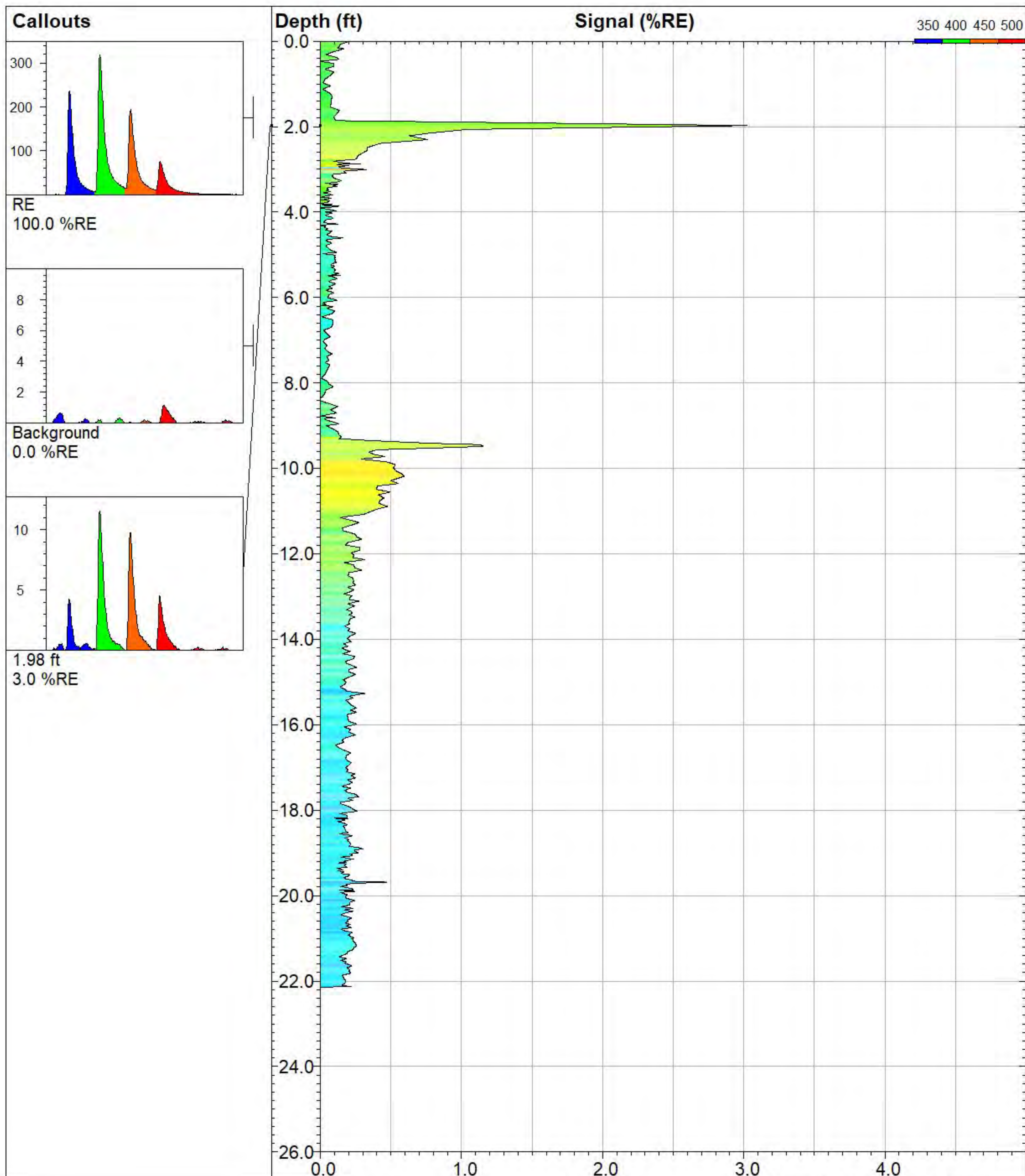
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Max signal:
10.4 %RE @ 14.75 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-28 09:22 PDT



A1-17

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.14 ft

Client / Job:
Shannon & Wilson / 3738-

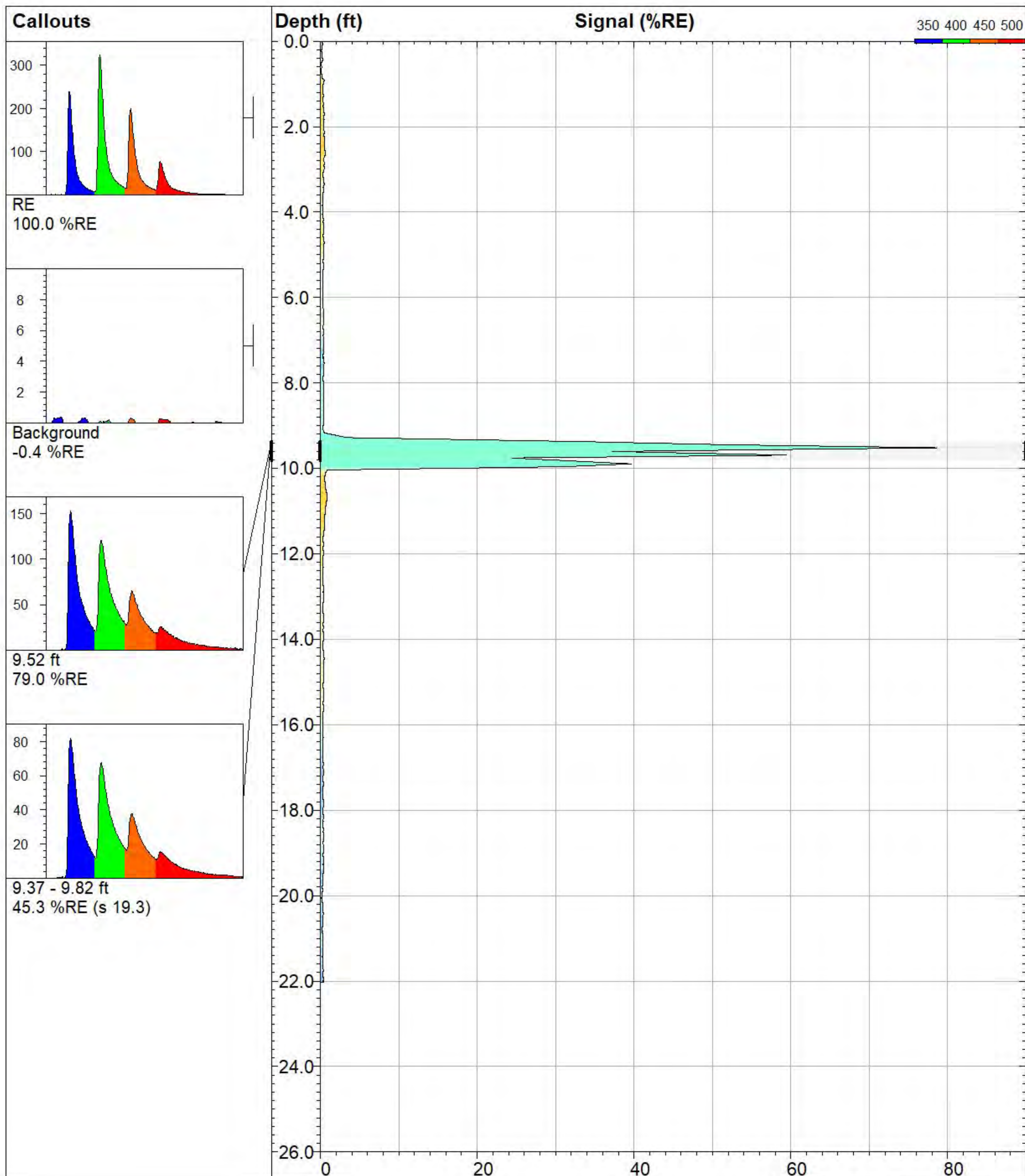
X Coord.(Lng-E) / Fix:
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Max signal:
3.0 %RE @ 1.98 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-28 11:53 PDT



A1-18

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.02 ft

Client / Job:
Shannon & Wilson / 3738-

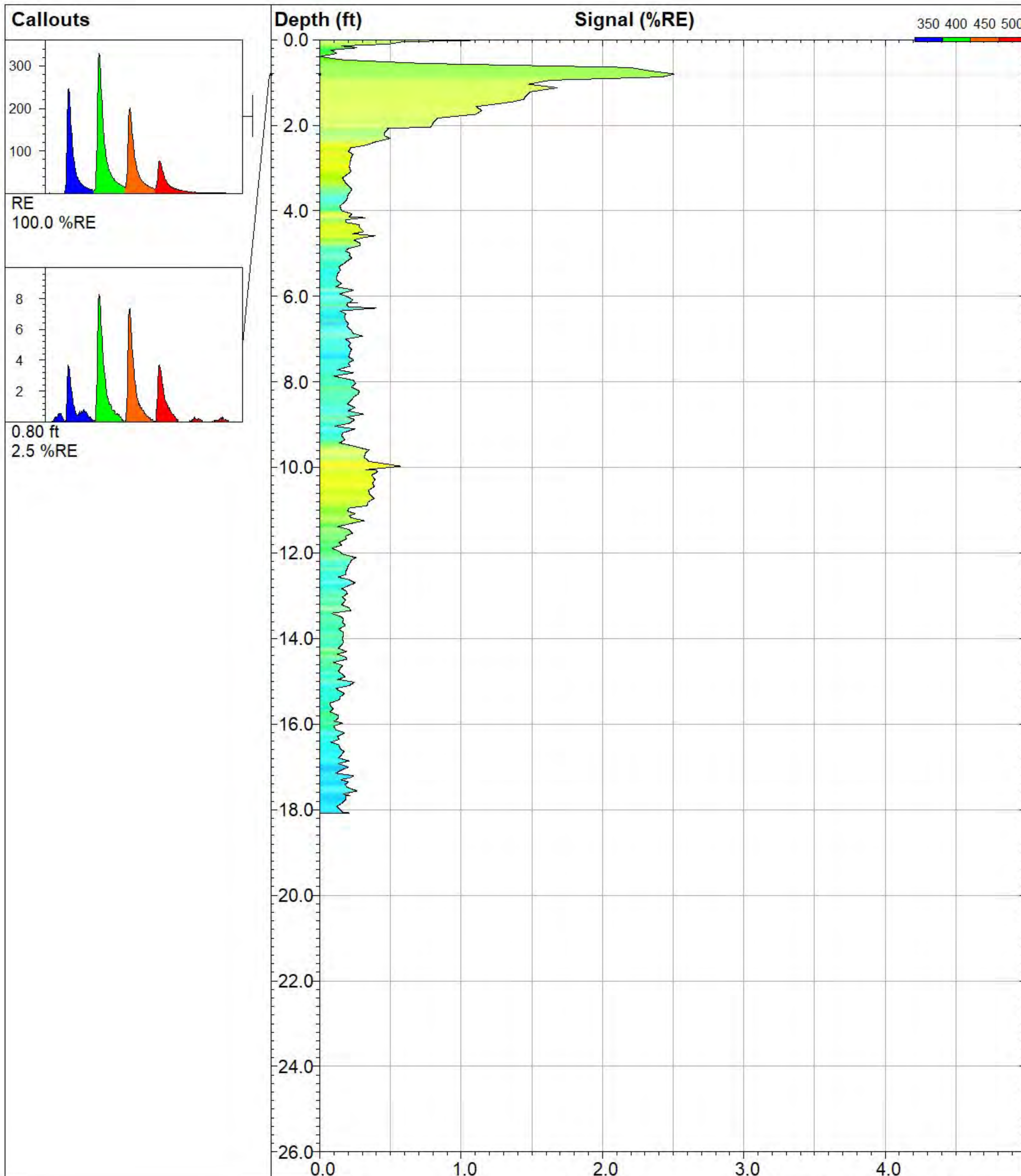
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79.0 %RE @ 9.52 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
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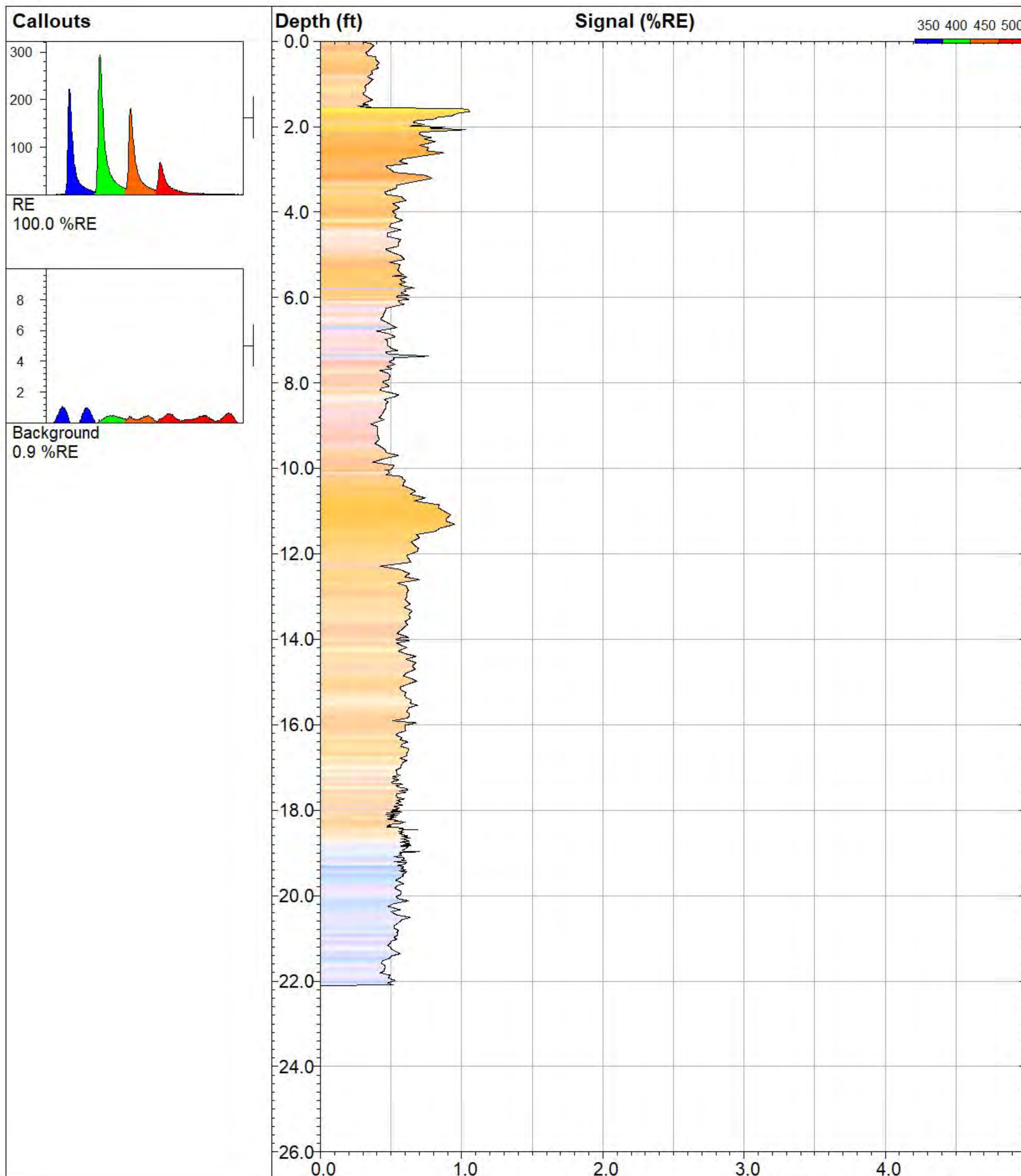
Date & Time:
2020-10-28 13:10 PDT



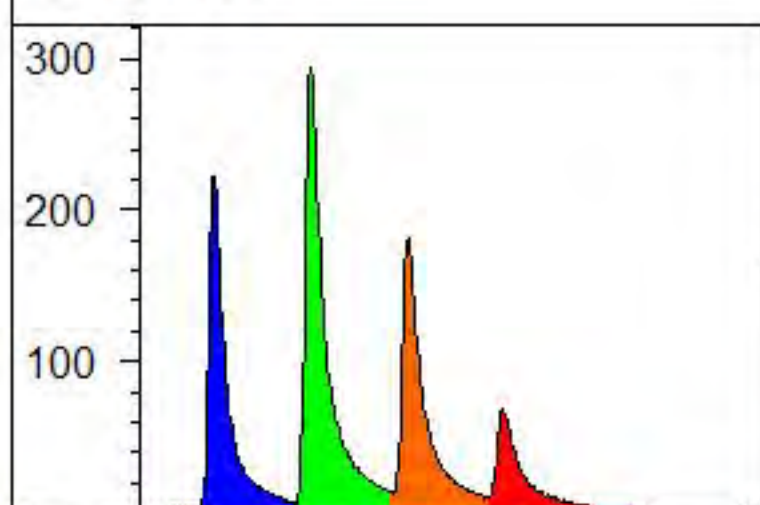
A1-19

UVOST® By Dakota
www.DakotaTechnologies.com

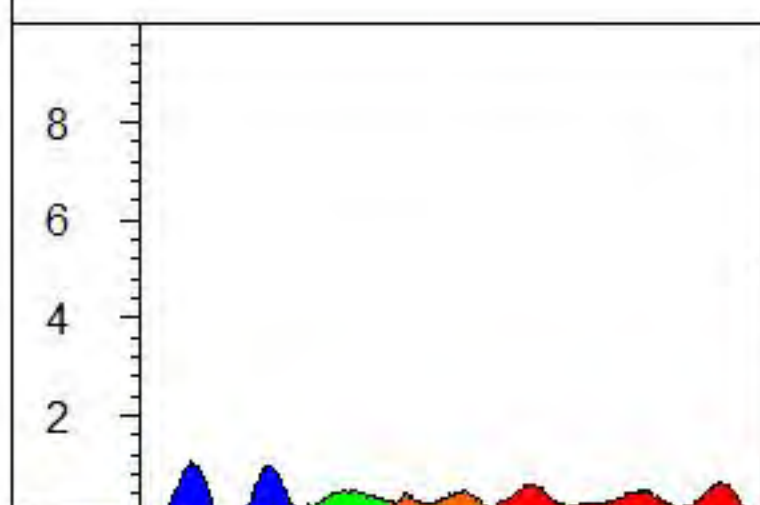
Site: Jorgensen Forge	Y Coord.(Lat-N) / System: Unavailable / NA	Final depth: 18.08 ft
Client / Job: Shannon & Wilson / 3738-	X Coord.(Lng-E) / Fix: Unavailable / NA	Max signal: 2.5 %RE @ 0.80 ft
Operator / Unit: RSP / UVOST1005	Elevation: Unavailable	Date & Time: 2020-10-28 14:03 PDT



Callouts



RE
100.0 %RE



Background
0.9 %RE



A1-20

UVOST® By Dakota

www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.10 ft

Client / Job:
Shannon & Wilson / 3738-

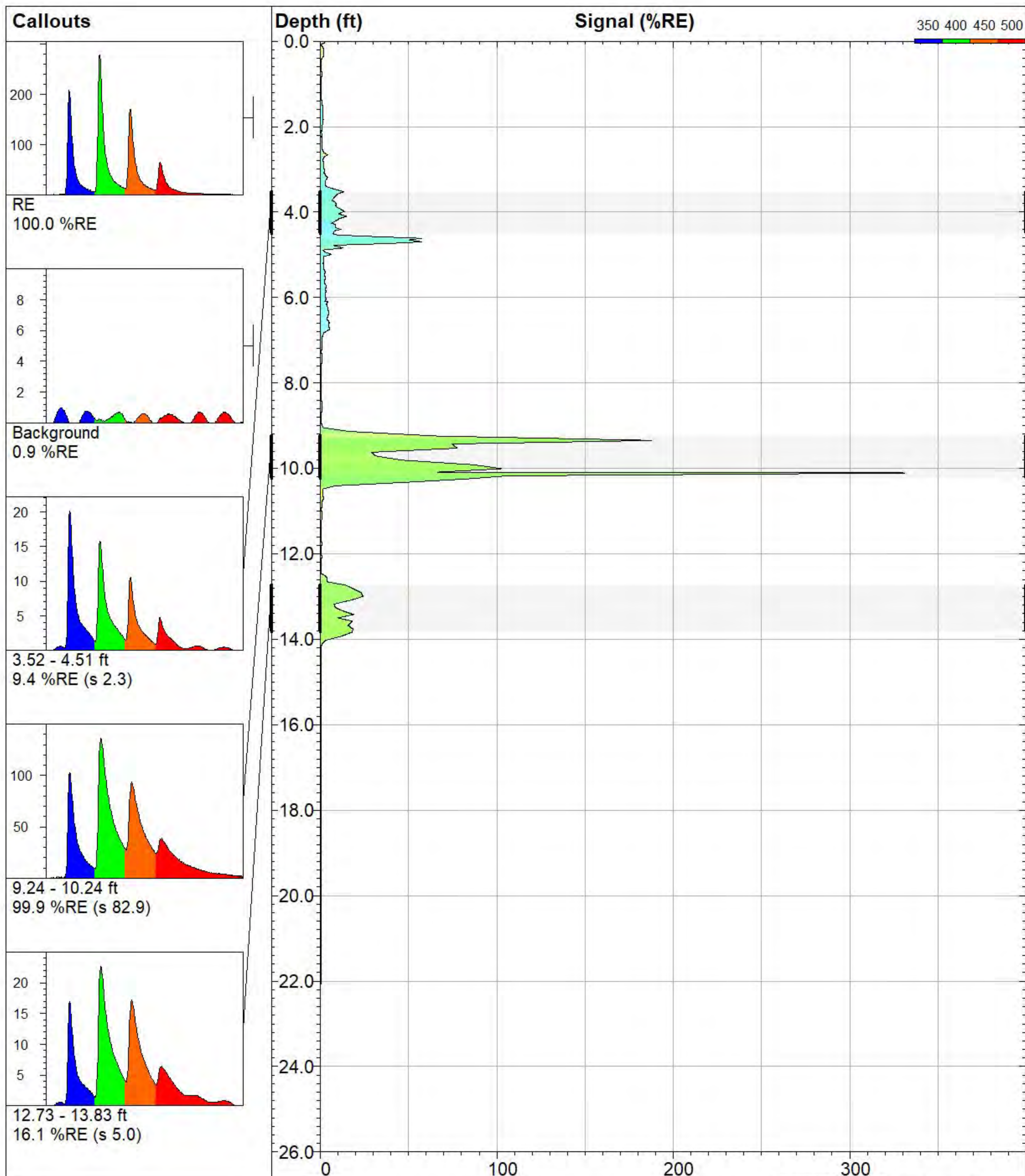
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
1.1 %RE @ 1.65 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-30 12:36 PDT



A1-21

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.06 ft

Client / Job:
Shannon & Wilson / 3738-

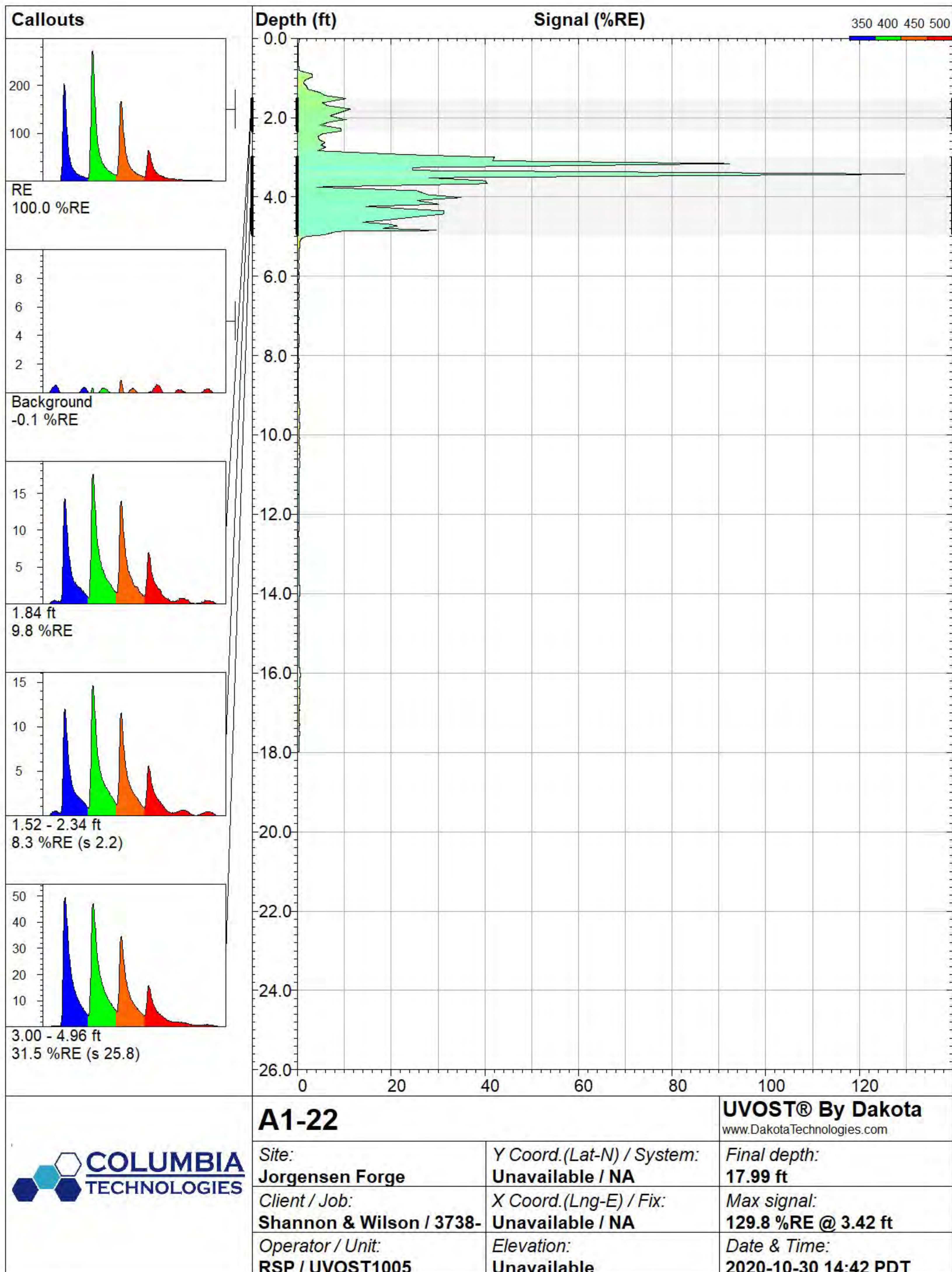
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
340.2 %RE @ 10.10 ft

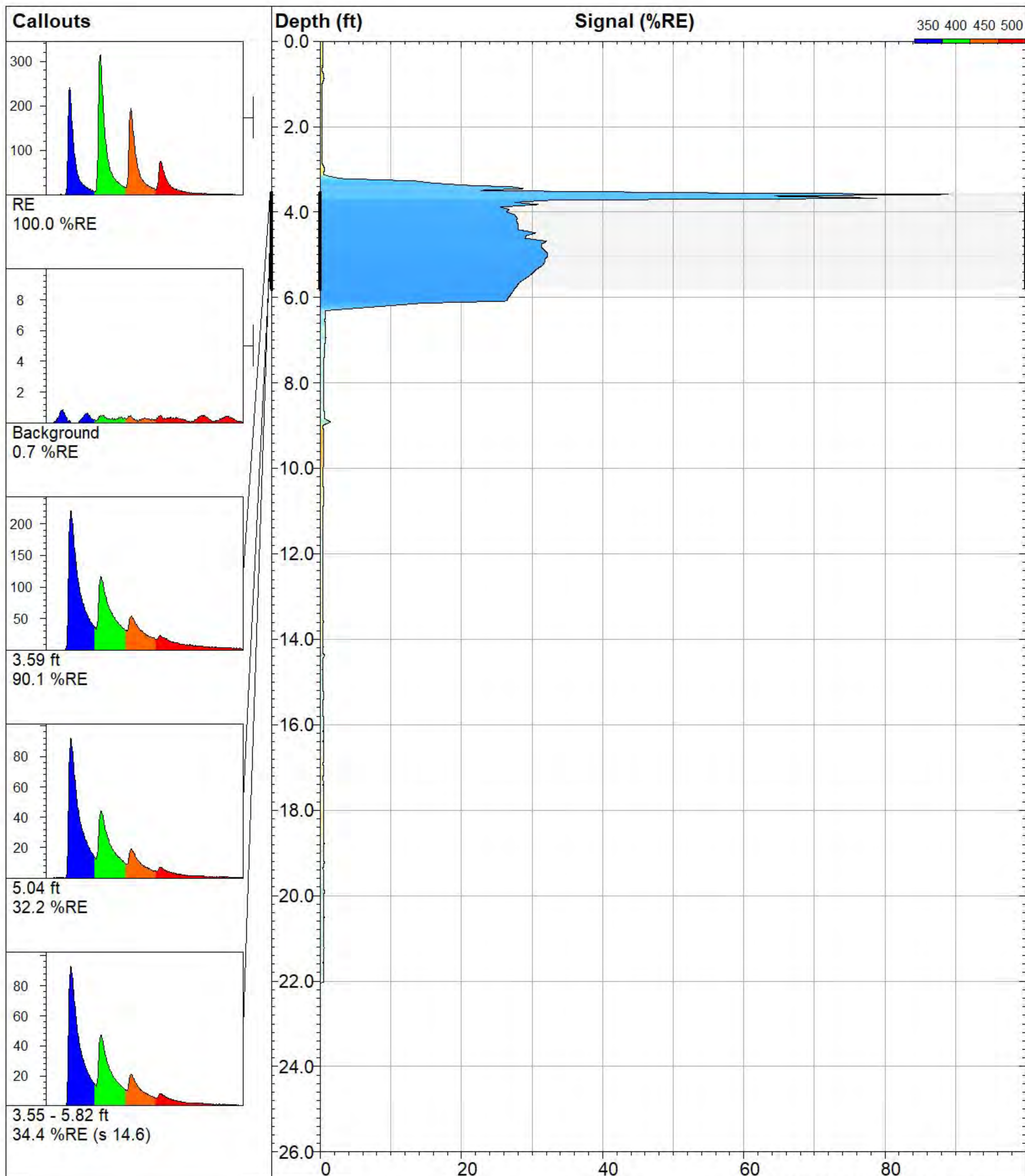
Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-30 13:34 PDT



APPENDIX D - UVOST® Logs for Area 2– Individual Scale



A2-01

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.04 ft

Client / Job:
Shannon & Wilson / 3738-

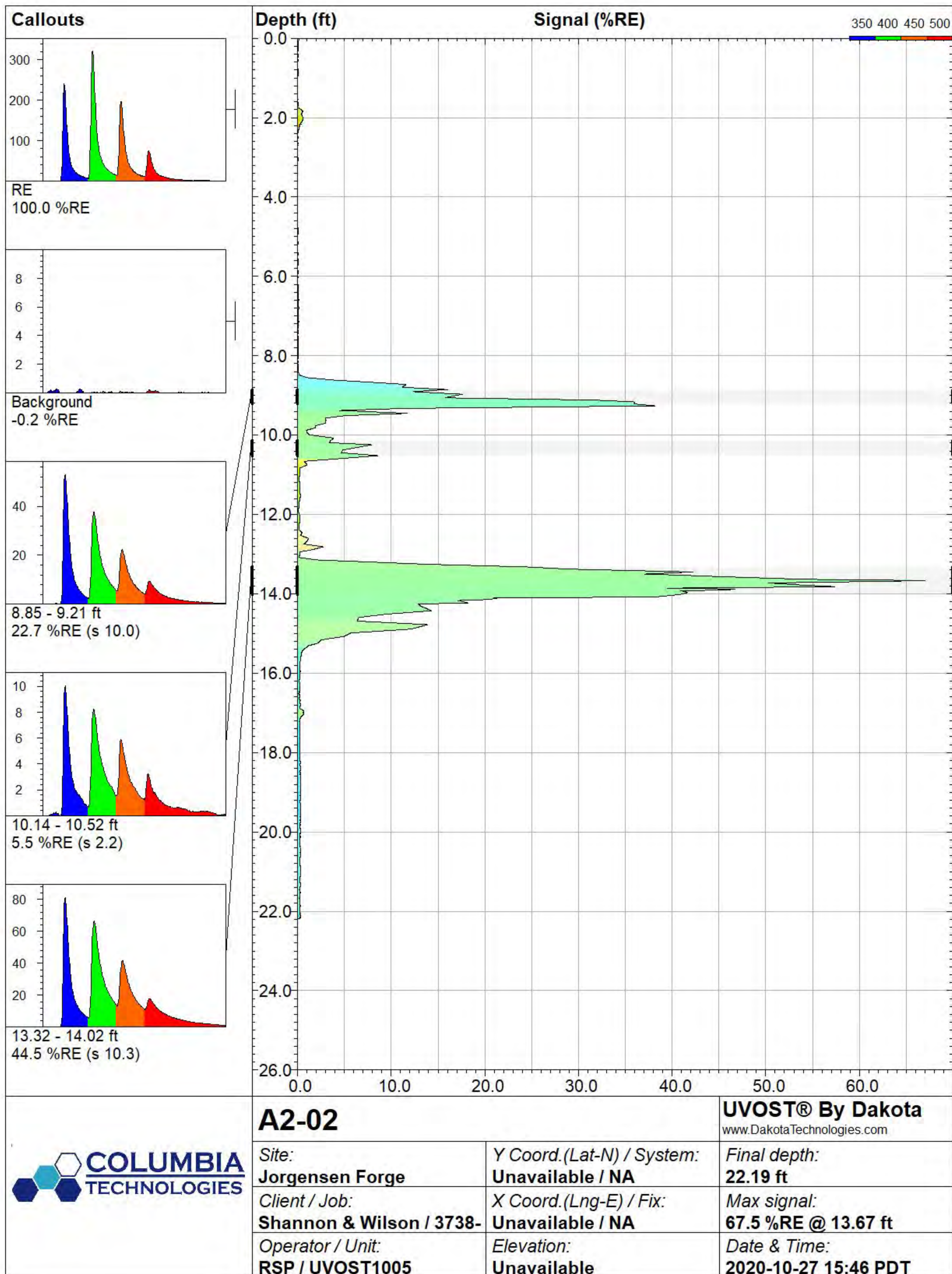
X Coord.(Lng-E) / Fix:
Unavailable / NA

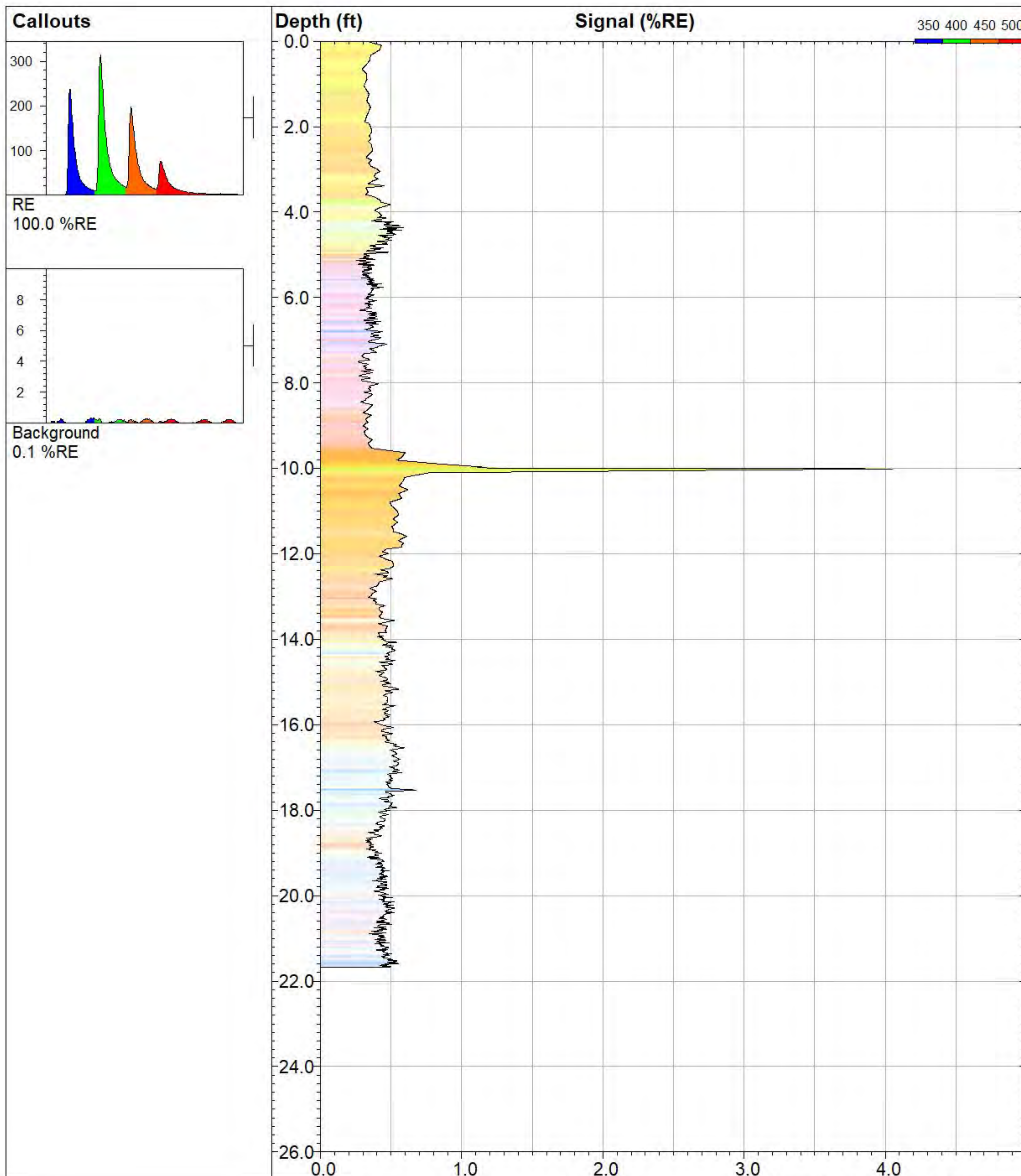
Max signal:
90.1 %RE @ 3.59 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-29 10:18 PDT

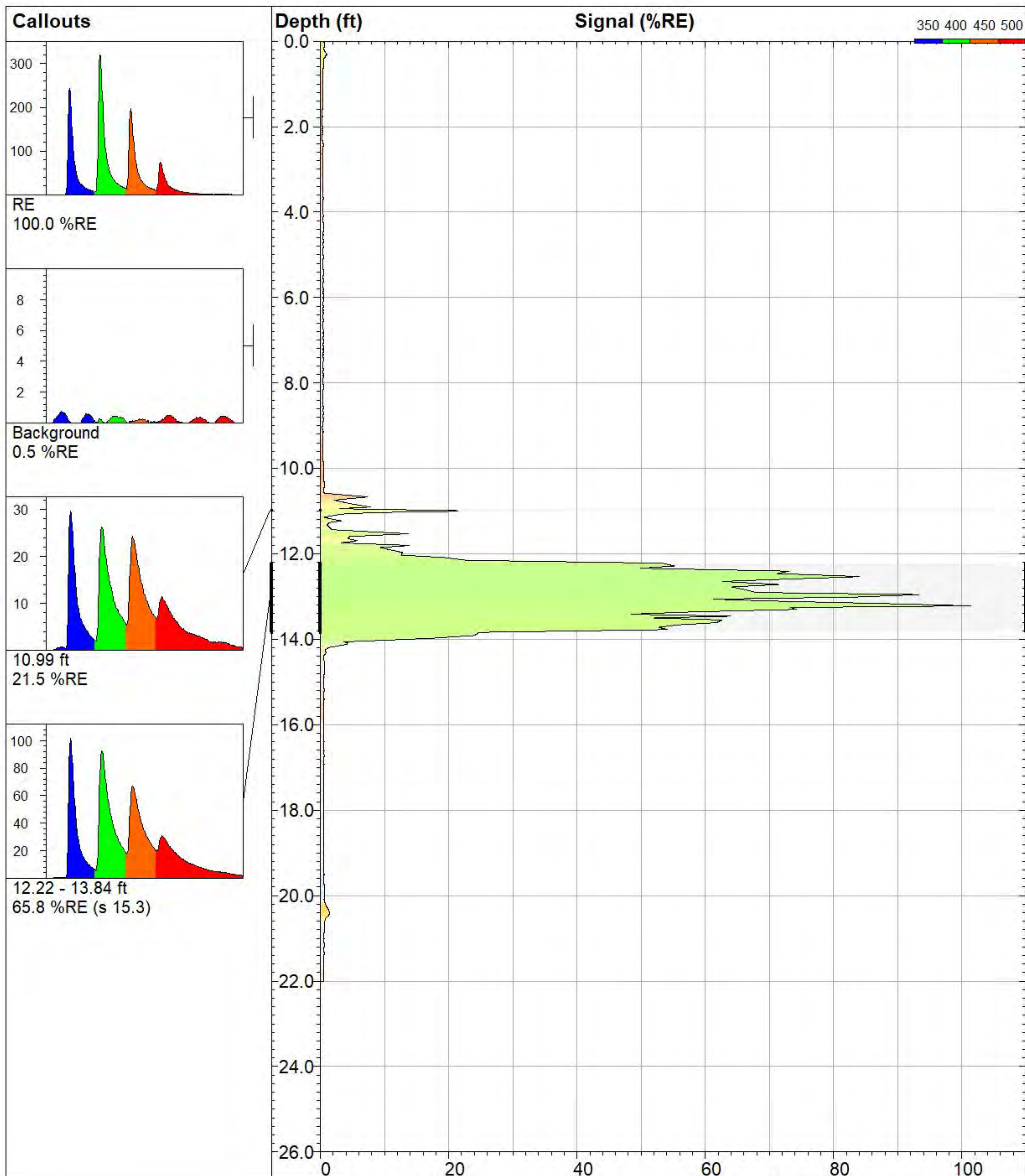




A2-03

UVOST® By Dakota
www.DakotaTechnologies.com

Site: Jorgensen Forge	Y Coord.(Lat-N) / System: Unavailable / NA	Final depth: 21.67 ft
Client / Job: Shannon & Wilson / 3738-	X Coord.(Lng-E) / Fix: Unavailable / NA	Max signal: 4.1 %RE @ 10.01 ft
Operator / Unit: RSP / UVOST1005	Elevation: Unavailable	Date & Time: 2020-10-29 09:16 PDT



A2-04

UVOST® By Dakota
www.DakotaTechnologies.com



Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.01 ft

Client / Job:
Shannon & Wilson / 3738-

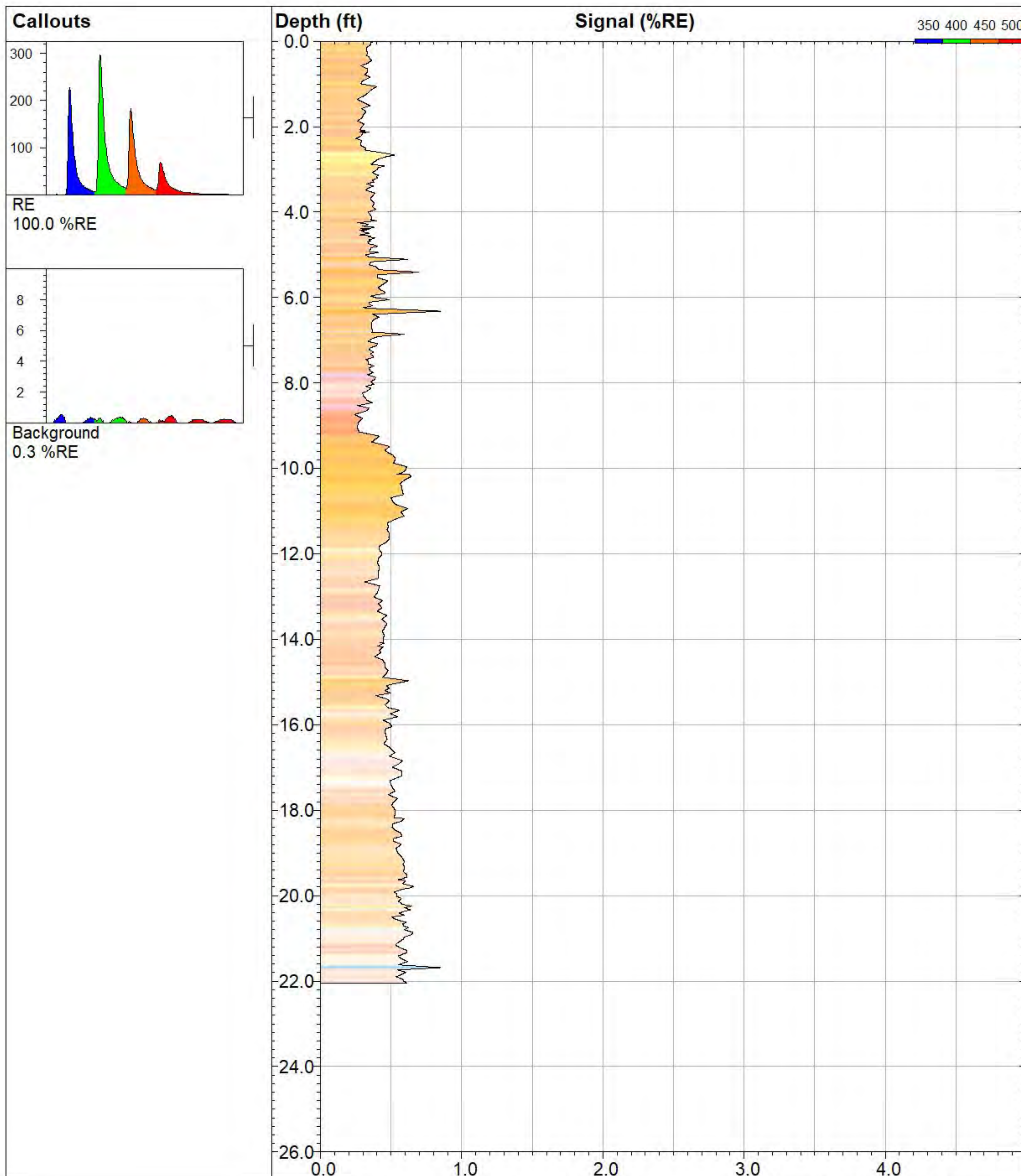
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
101.4 %RE @ 13.22 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-29 15:11 PDT



A2-05

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.05 ft

Client / Job:
Shannon & Wilson / 3738-

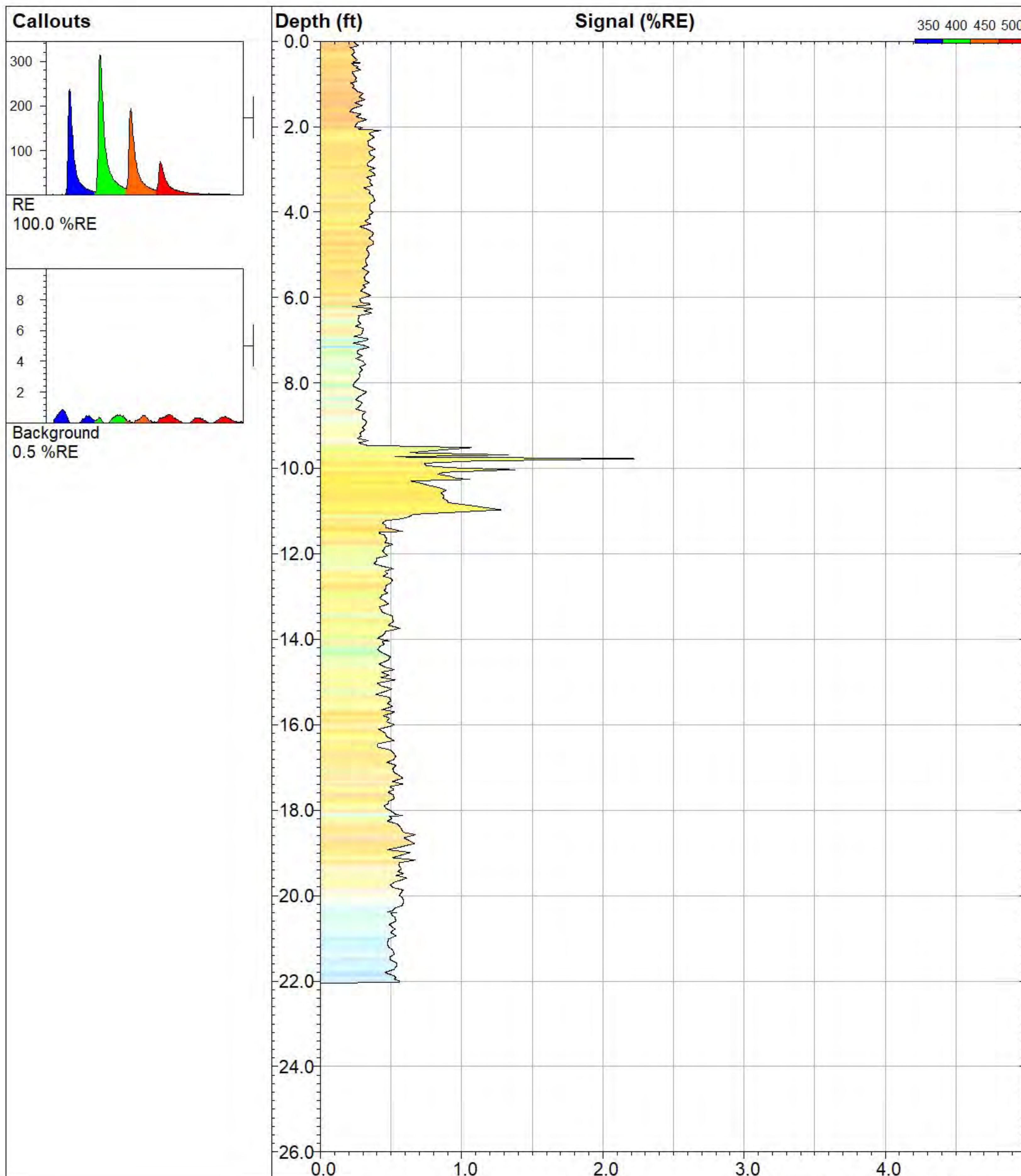
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
0.9 %RE @ 6.32 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-29 11:58 PDT



A2-06

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord. (Lat-N) / System:
Unavailable / NA

Final depth:
22.04 ft

Client / Job:
Shannon & Wilson / 3738-

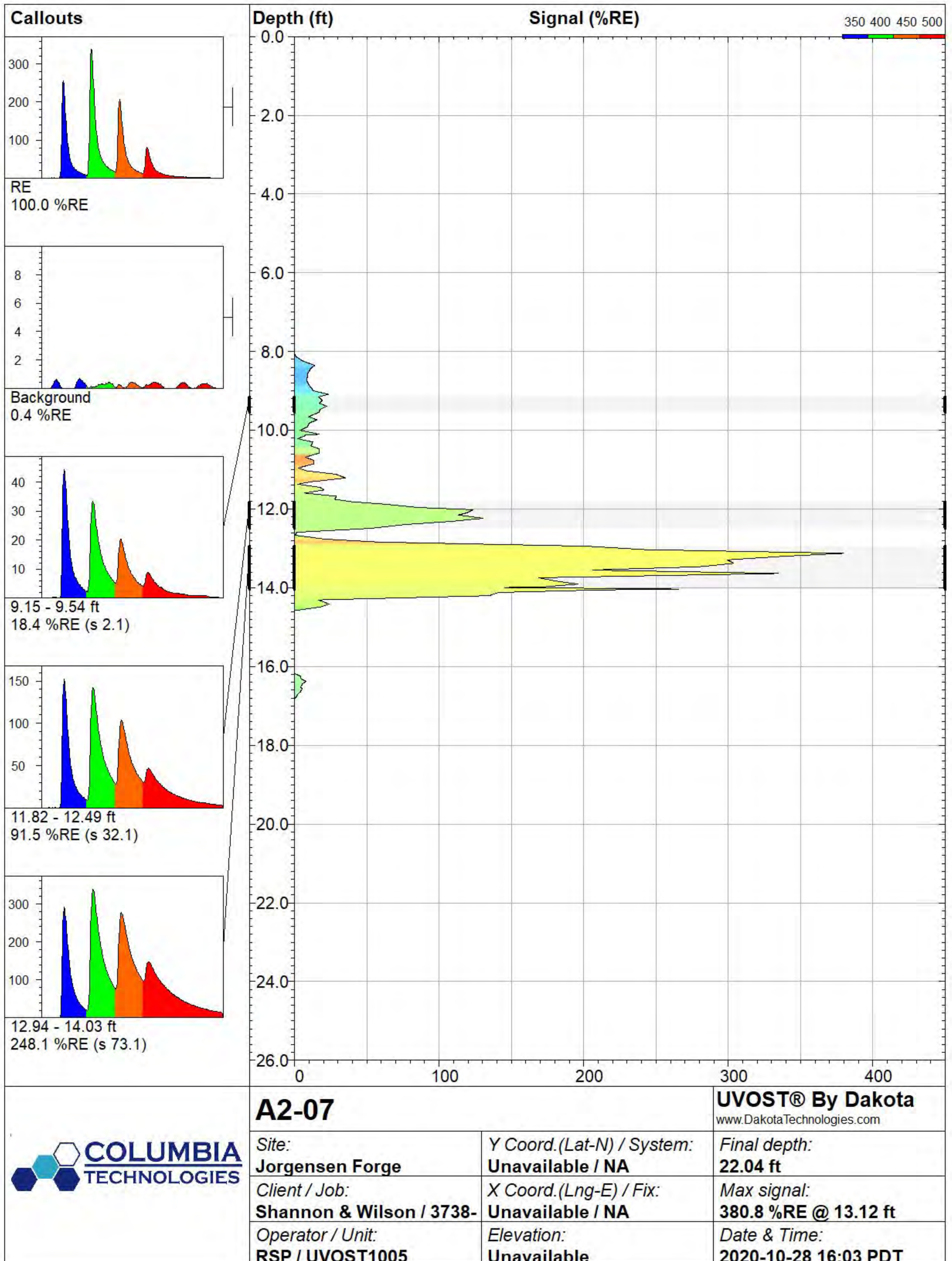
X Coord. (Lng-E) / Fix:
Unavailable / NA

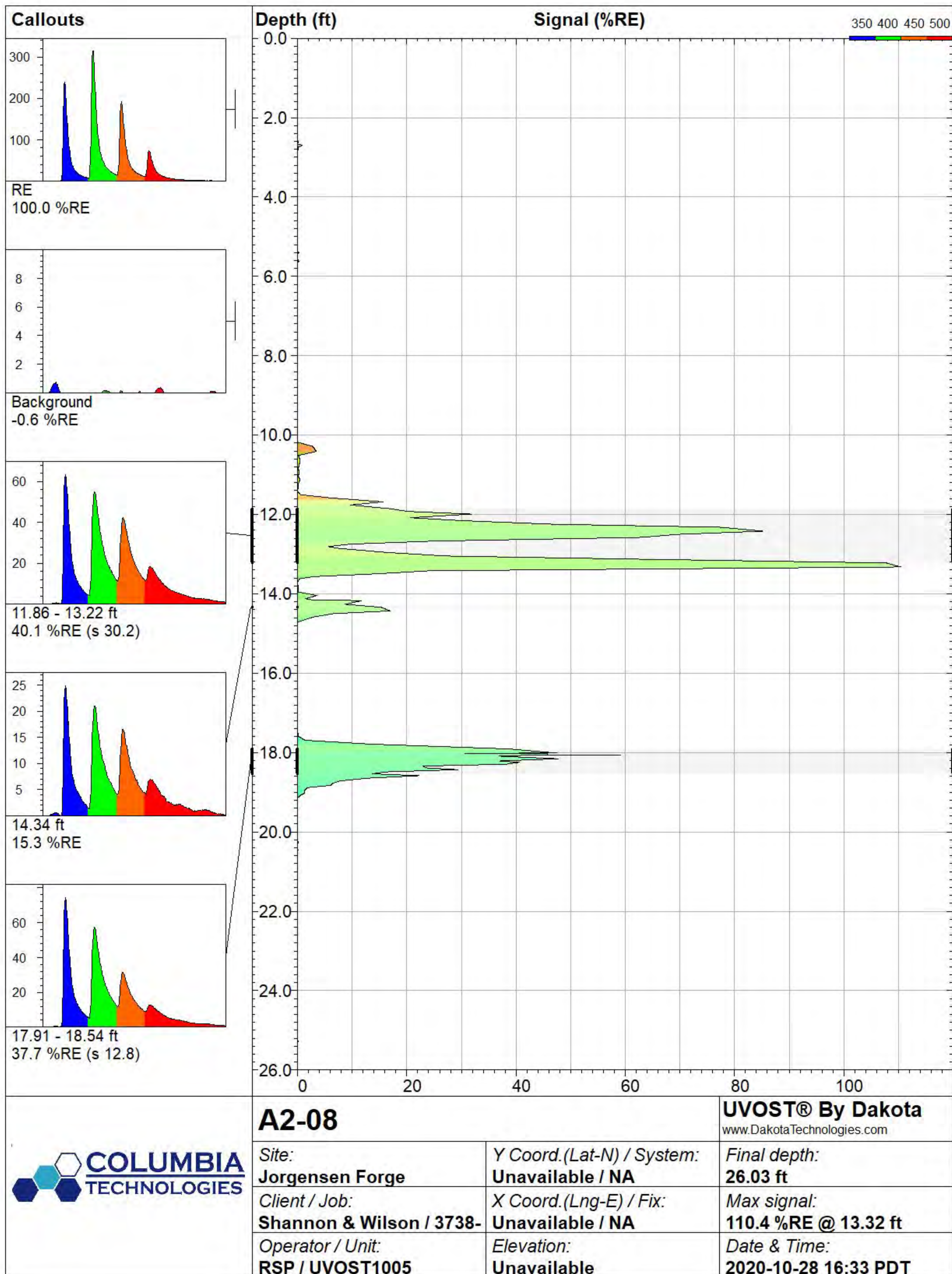
Max signal:
2.3 %RE @ 9.77 ft

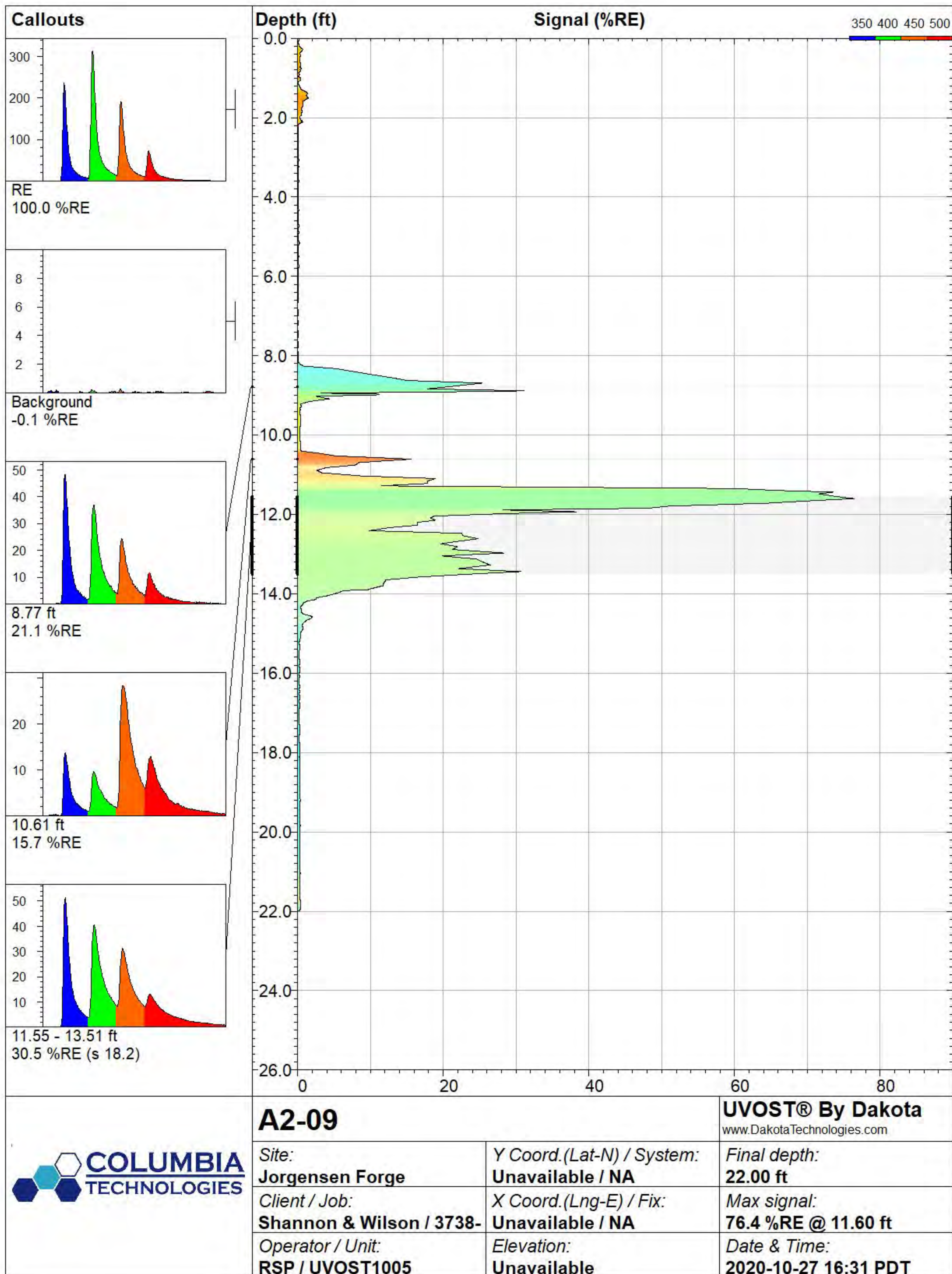
Operator / Unit:
RSP / UVOST1005

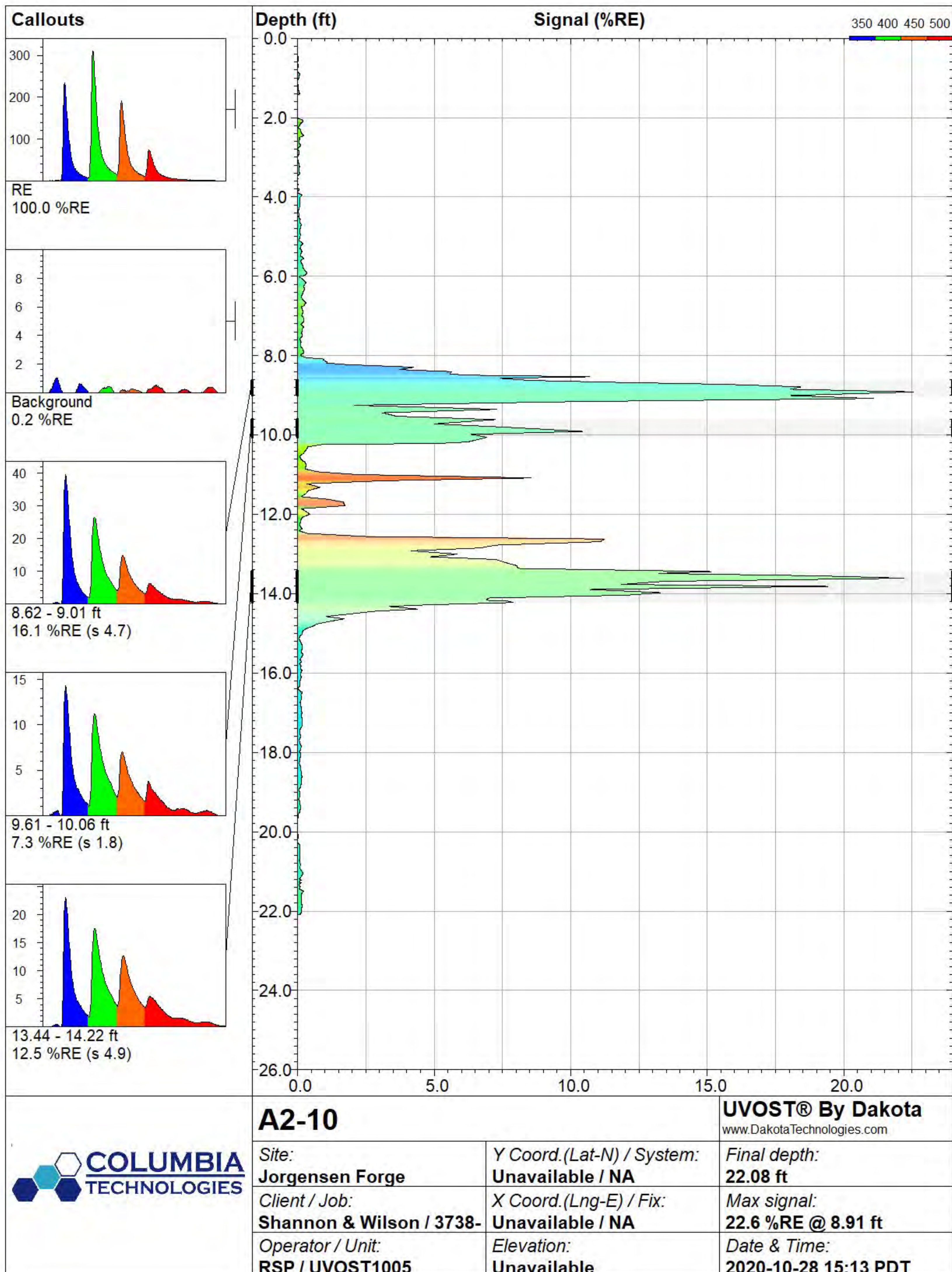
Elevation:
Unavailable

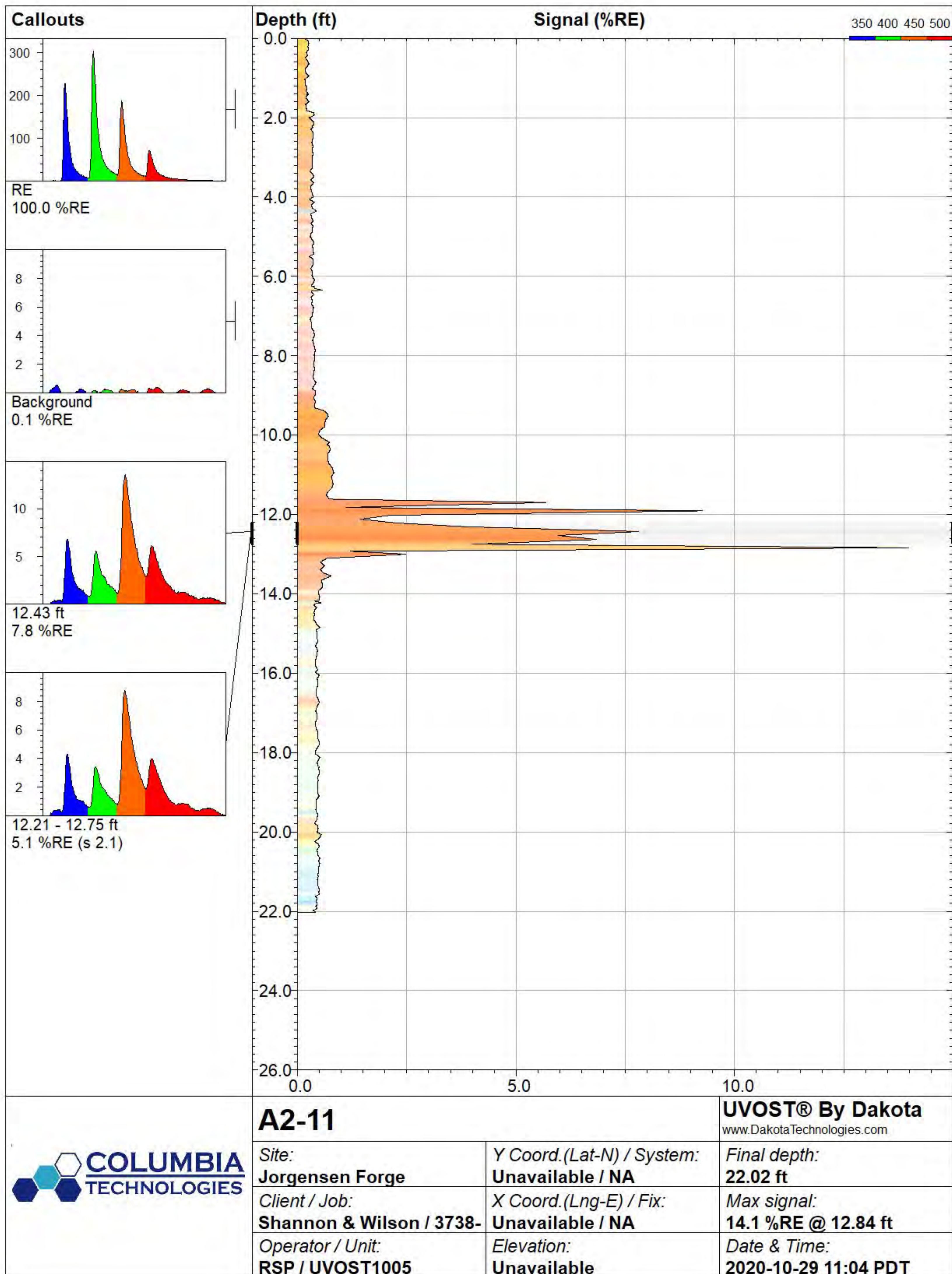
Date & Time:
2020-10-29 14:37 PDT

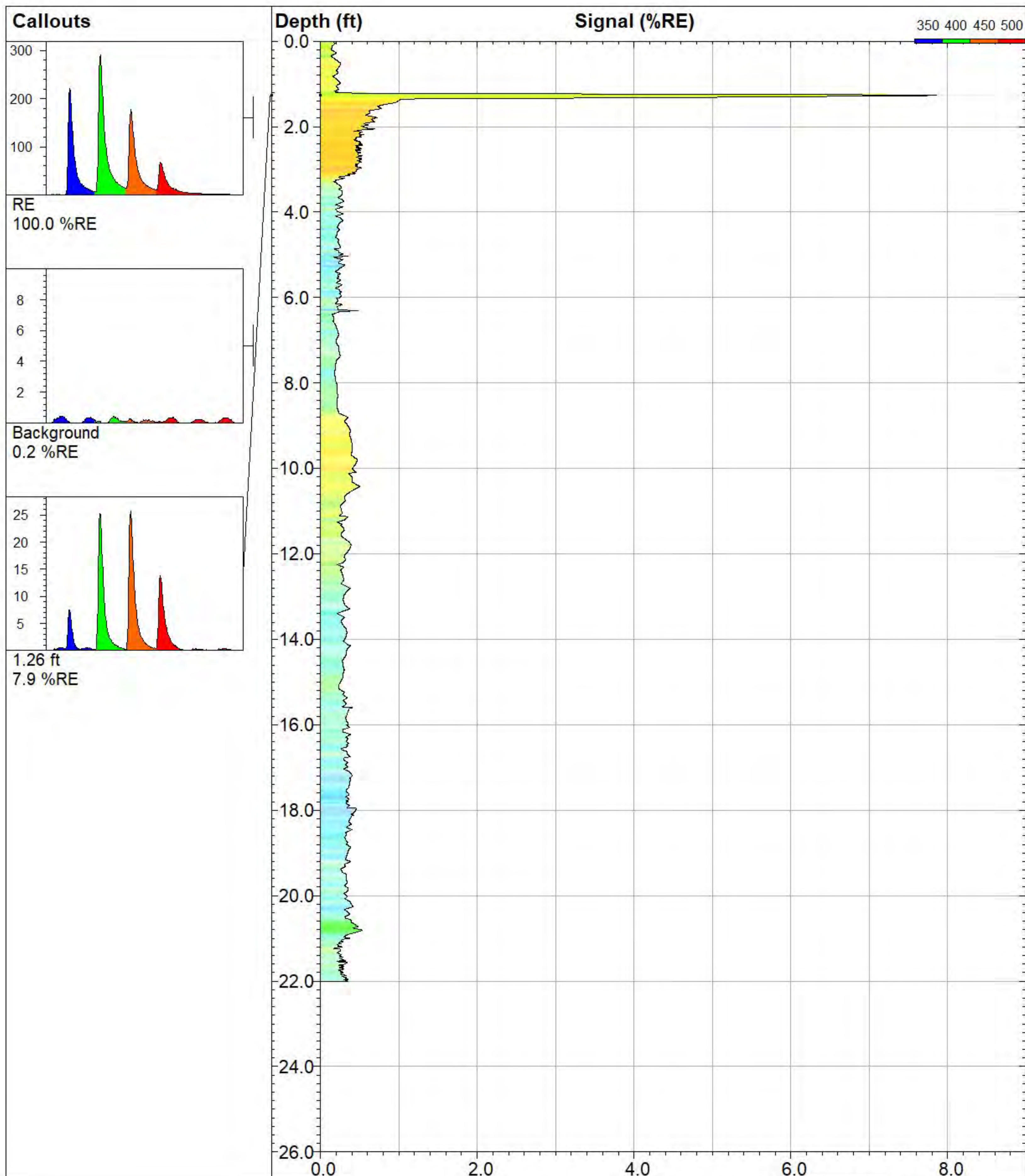












A2-12

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.01 ft

Client / Job:
Shannon & Wilson / 3738-

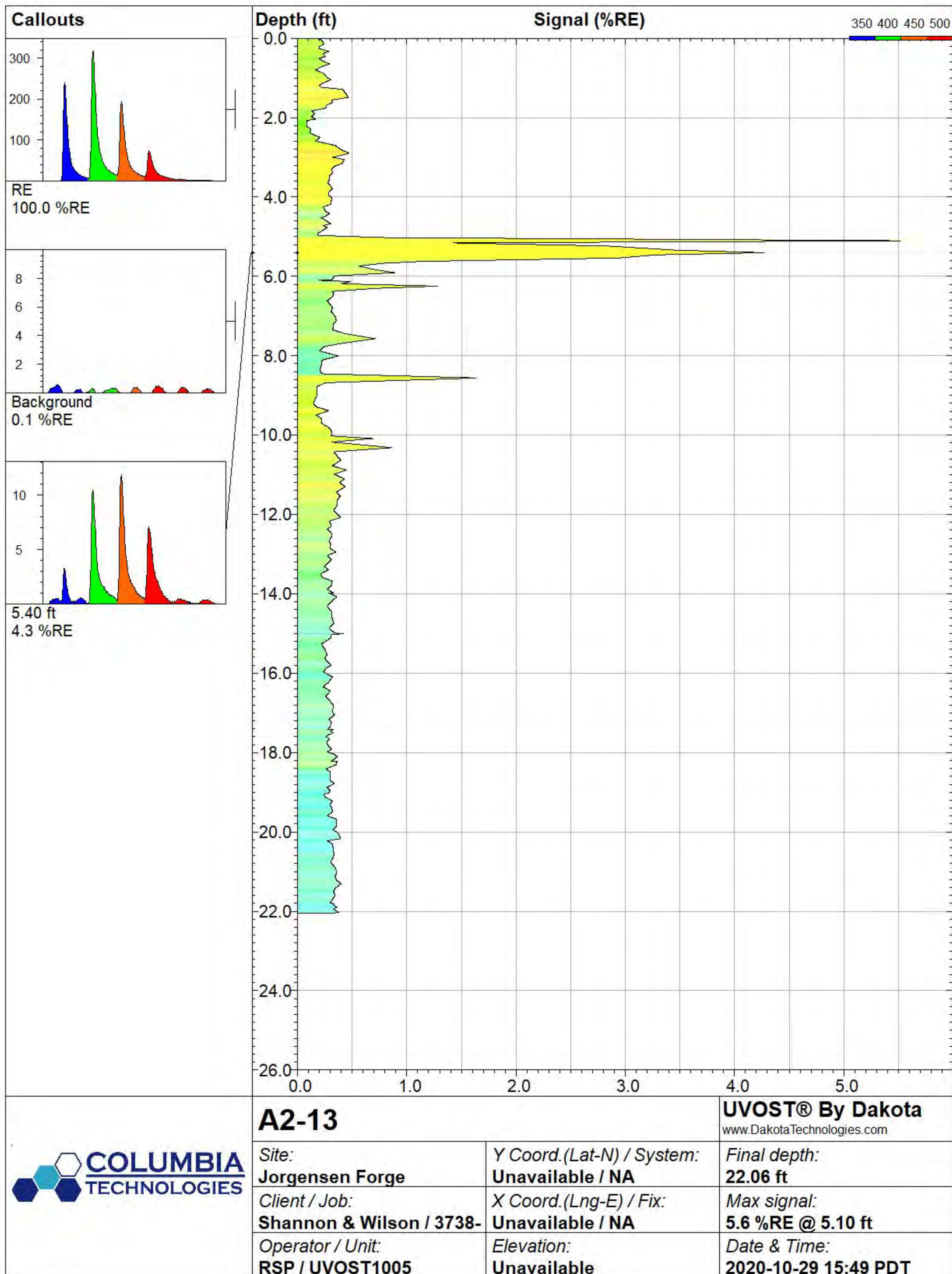
X Coord.(Lng-E) / Fix:
Unavailable / NA

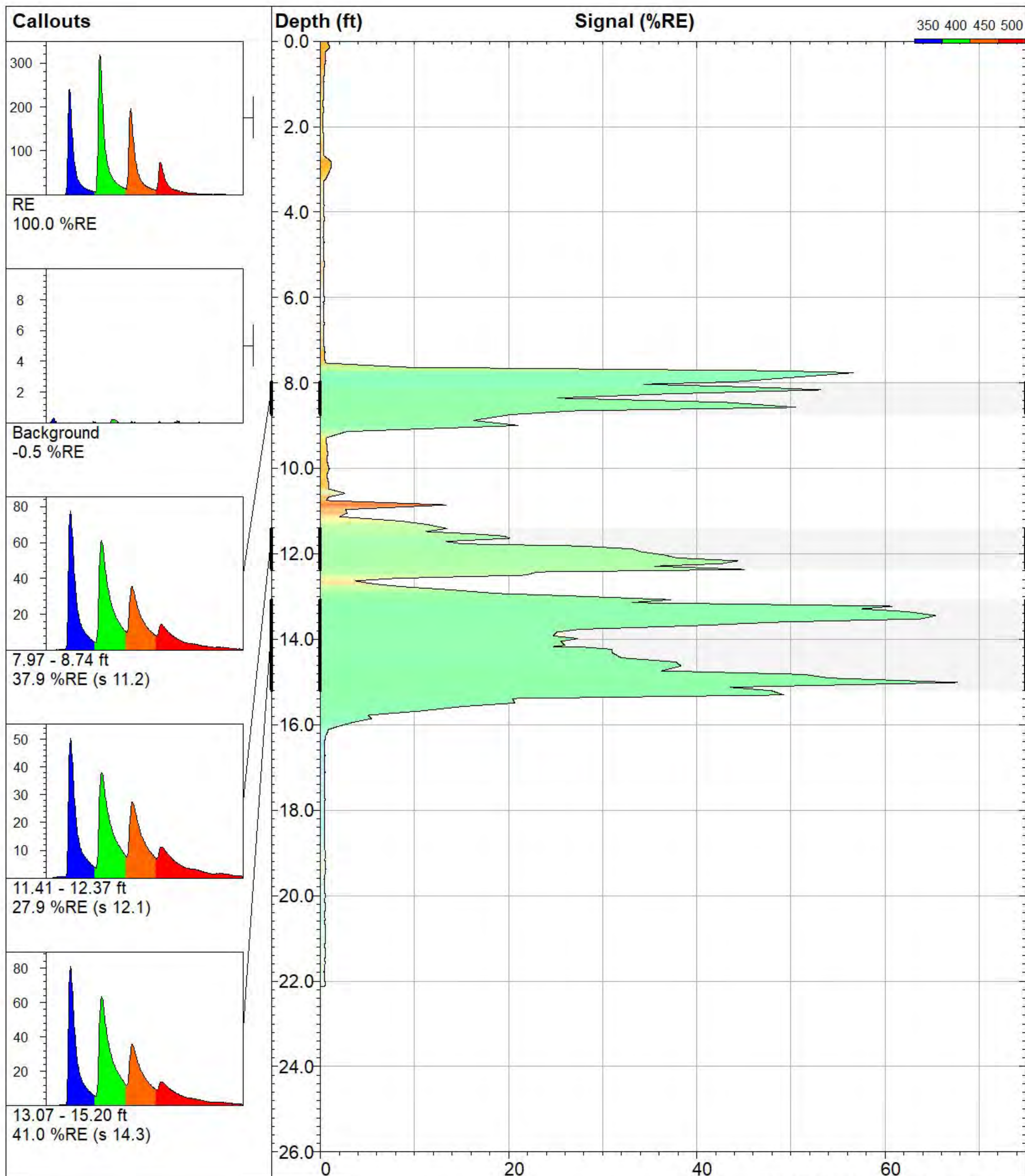
Max signal:
7.9 %RE @ 1.26 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-29 13:53 PDT





A2-14

UVOST® By Dakota

www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.12 ft

Client / Job:
Shannon & Wilson / 3738-

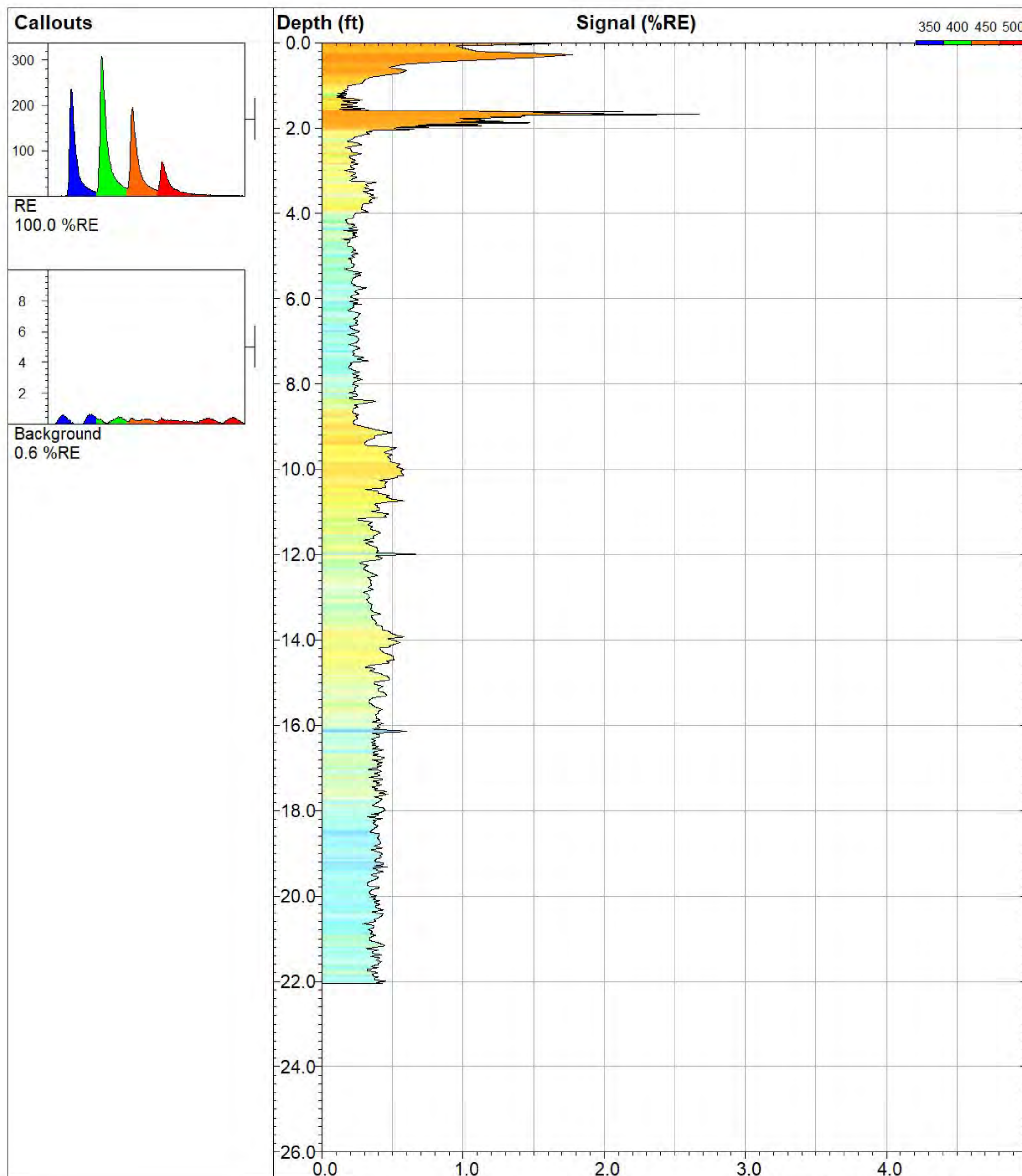
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
67.8 %RE @ 15.01 ft

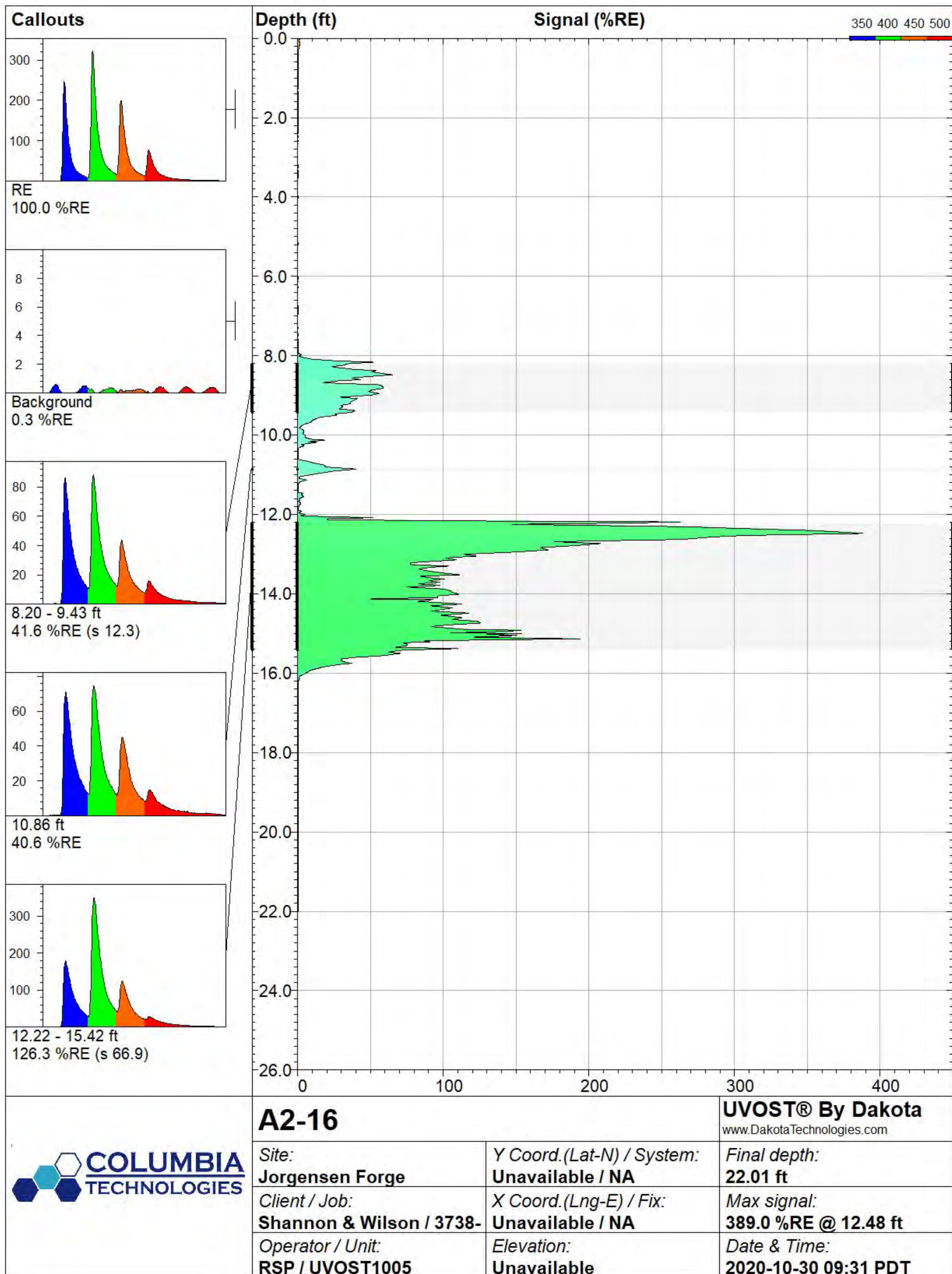
Operator / Unit:
RSP / UVOST1005

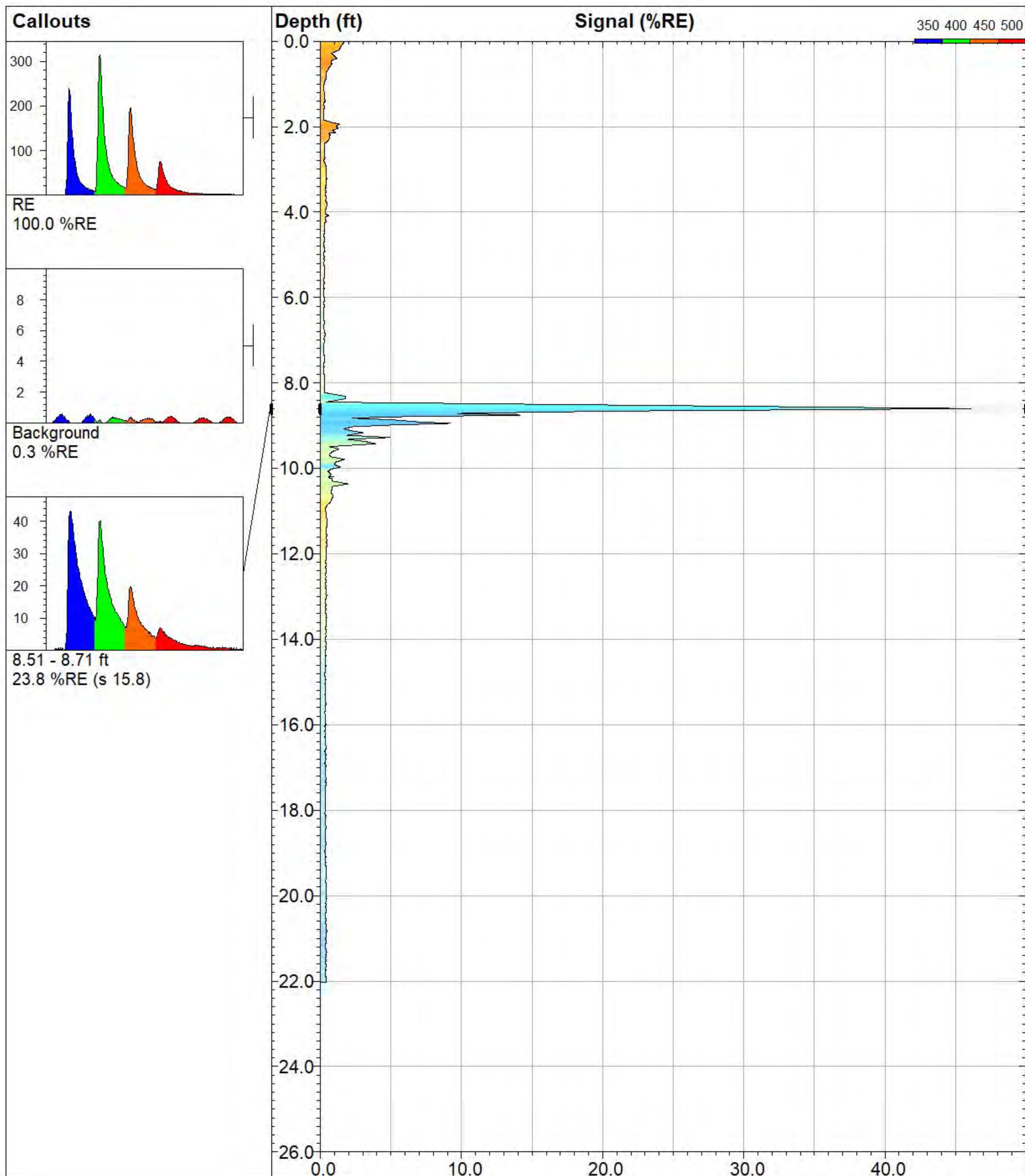
Elevation:
Unavailable

Date & Time:
2020-10-29 16:23 PDT



	A2-15		UVOST® By Dakota www.DakotaTechnologies.com
	Site: Jorgensen Forge	Y Coord.(Lat-N) / System: Unavailable / NA	Final depth: 22.05 ft
	Client / Job: Shannon & Wilson / 3738-	X Coord.(Lng-E) / Fix: Unavailable / NA	Max signal: 2.7 %RE @ 1.68 ft
	Operator / Unit: RSP / UVOST1005	Elevation: Unavailable	Date & Time: 2020-10-30 08:47 PDT





A2-17

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.03 ft

Client / Job:
Shannon & Wilson / 3738-

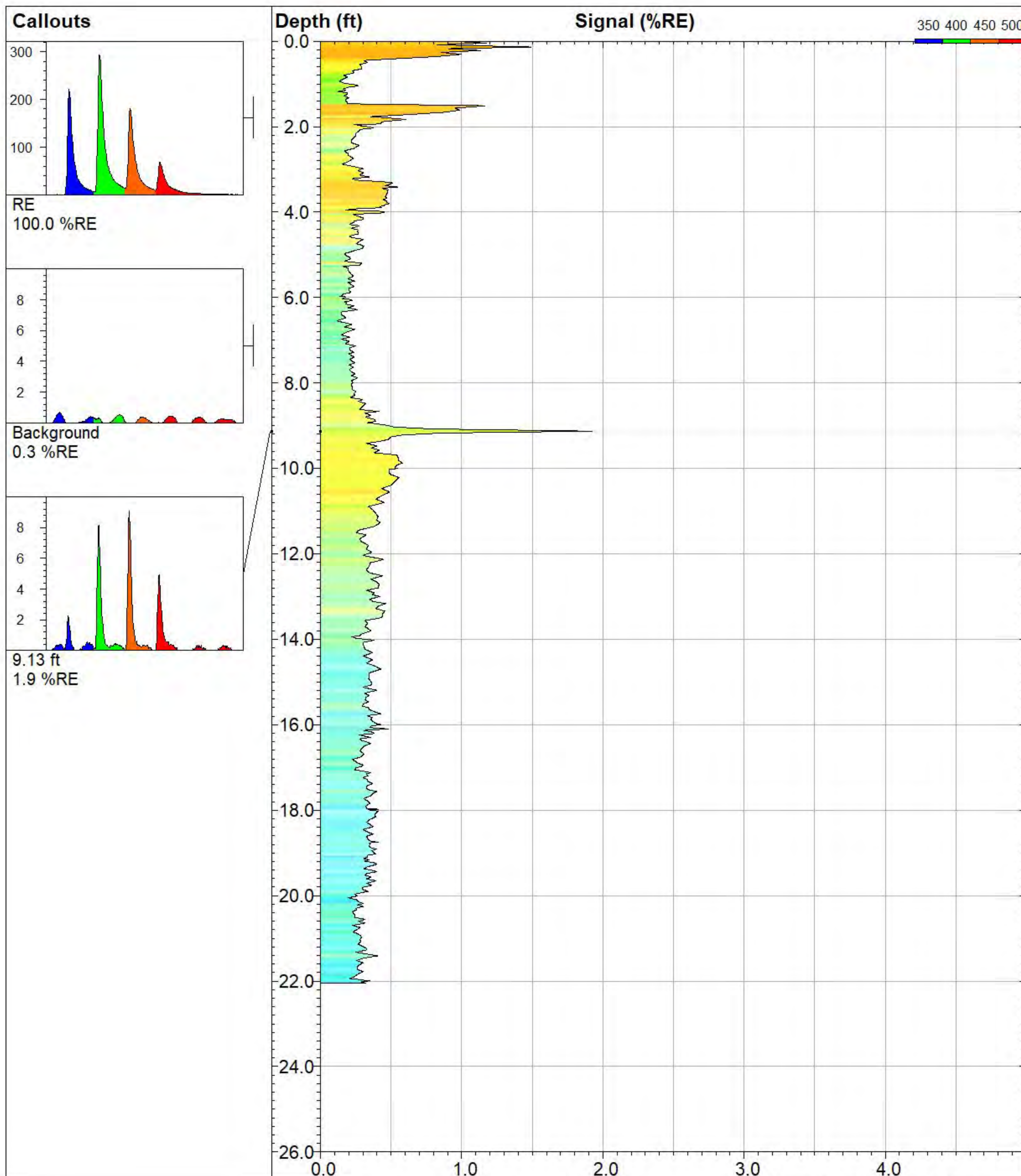
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
46.4 %RE @ 8.60 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-30 10:14 PDT

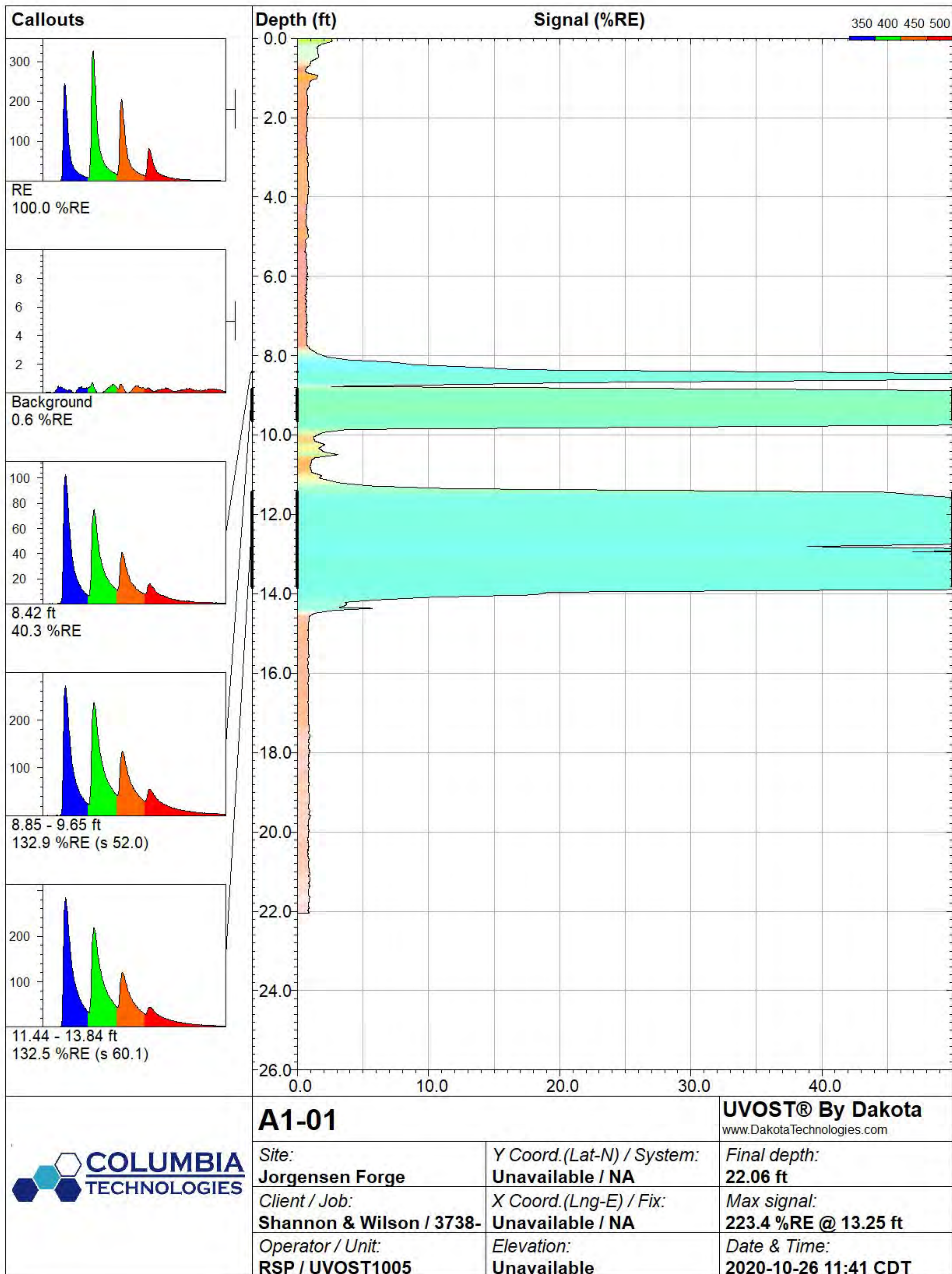


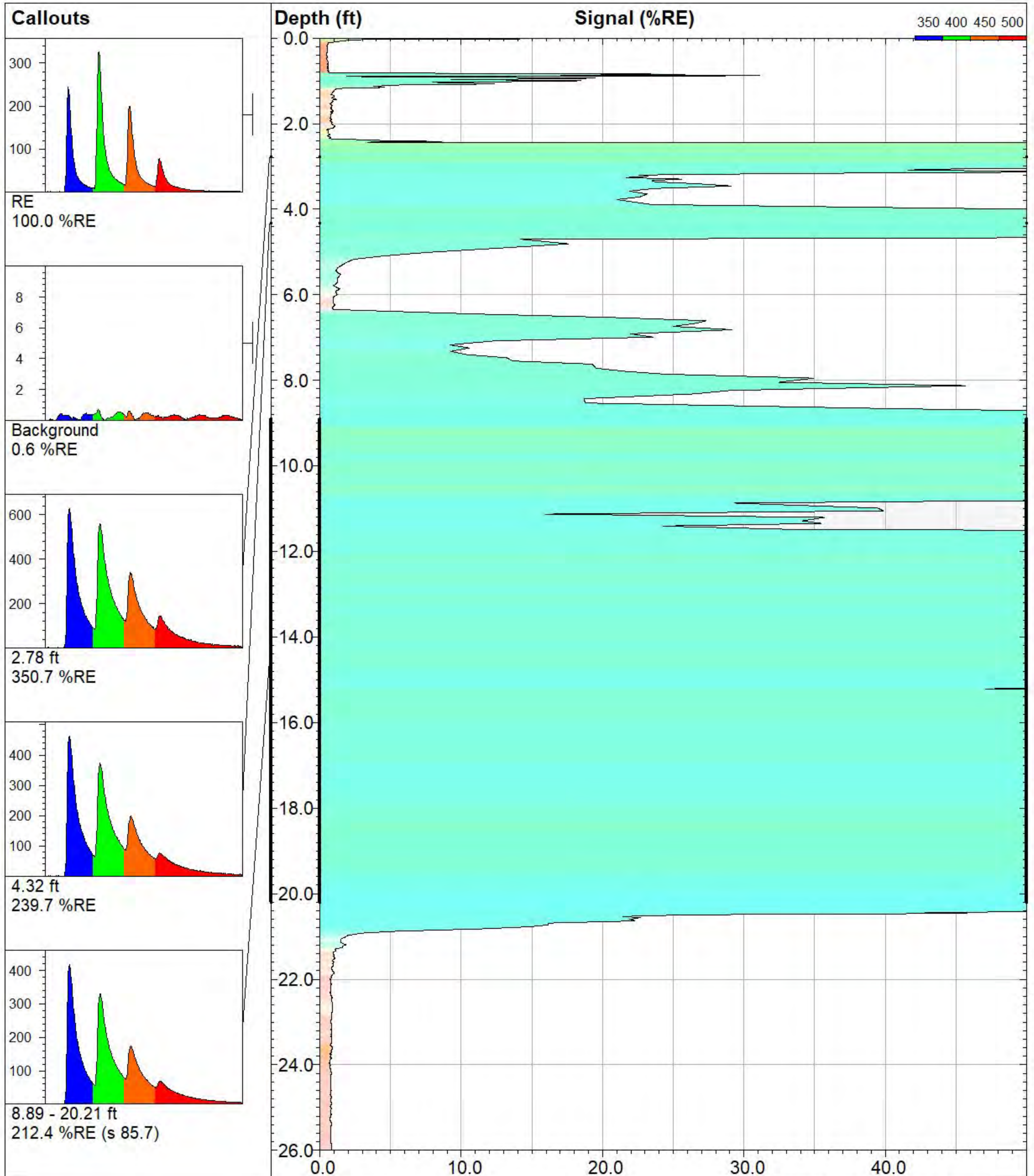
A2-18

UVOST® By Dakota
www.DakotaTechnologies.com

Site: Jorgensen Forge	Y Coord.(Lat-N) / System: Unavailable / NA	Final depth: 22.04 ft
Client / Job: Shannon & Wilson / 3738-	X Coord.(Lng-E) / Fix: Unavailable / NA	Max signal: 1.9 %RE @ 9.13 ft
Operator / Unit: RSP / UVOST1005	Elevation: Unavailable	Date & Time: 2020-10-30 10:50 PDT

APPENDIX E - UVOST® Logs for Area 1 - Collective Scale





A1-02

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
26.19 ft

Client / Job:
Shannon & Wilson / 3738-

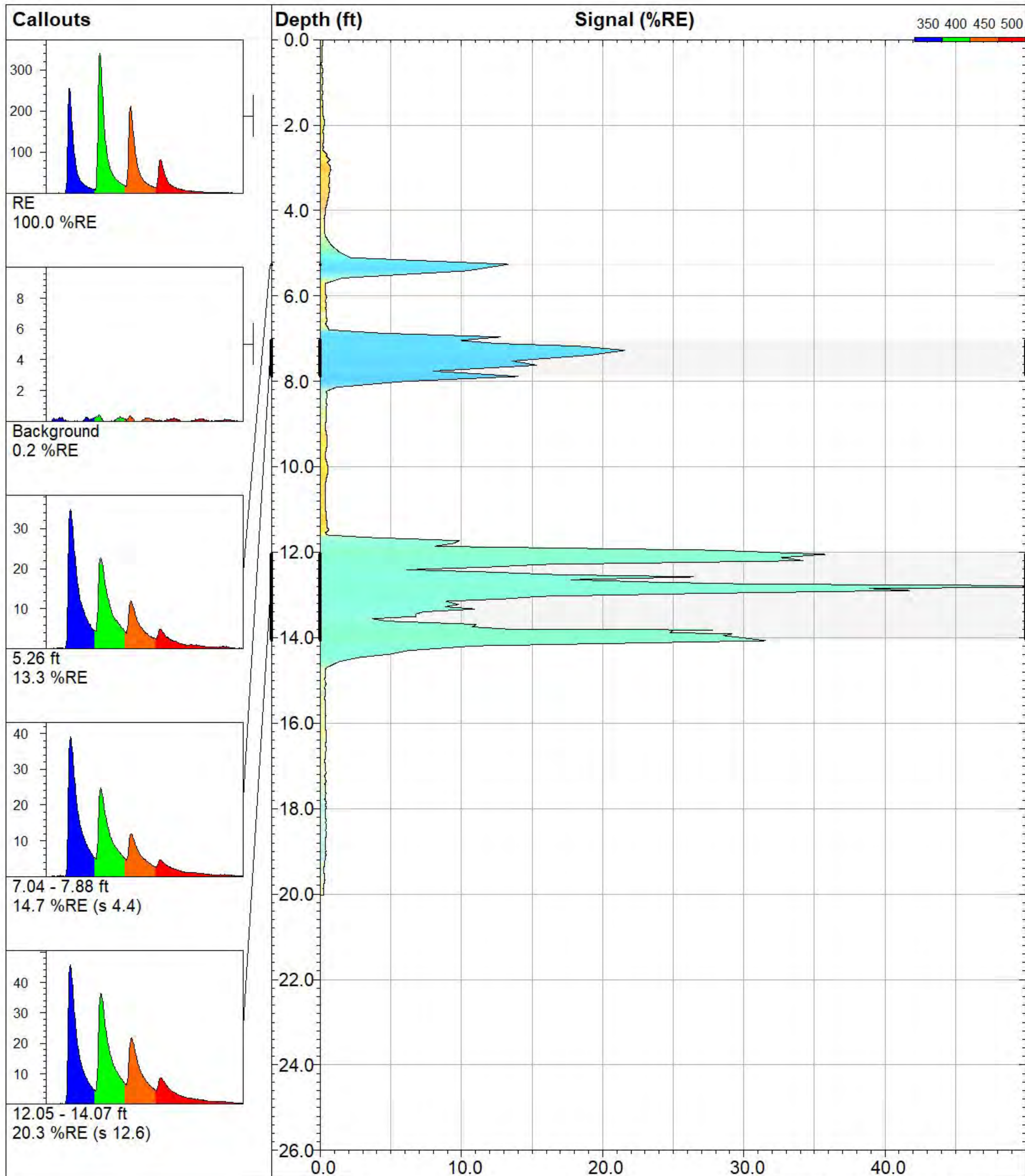
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
397.8 %RE @ 10.56 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-26 10:43 PDT



A1-03

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
20.03 ft

Client / Job:
Shannon & Wilson / 3738-

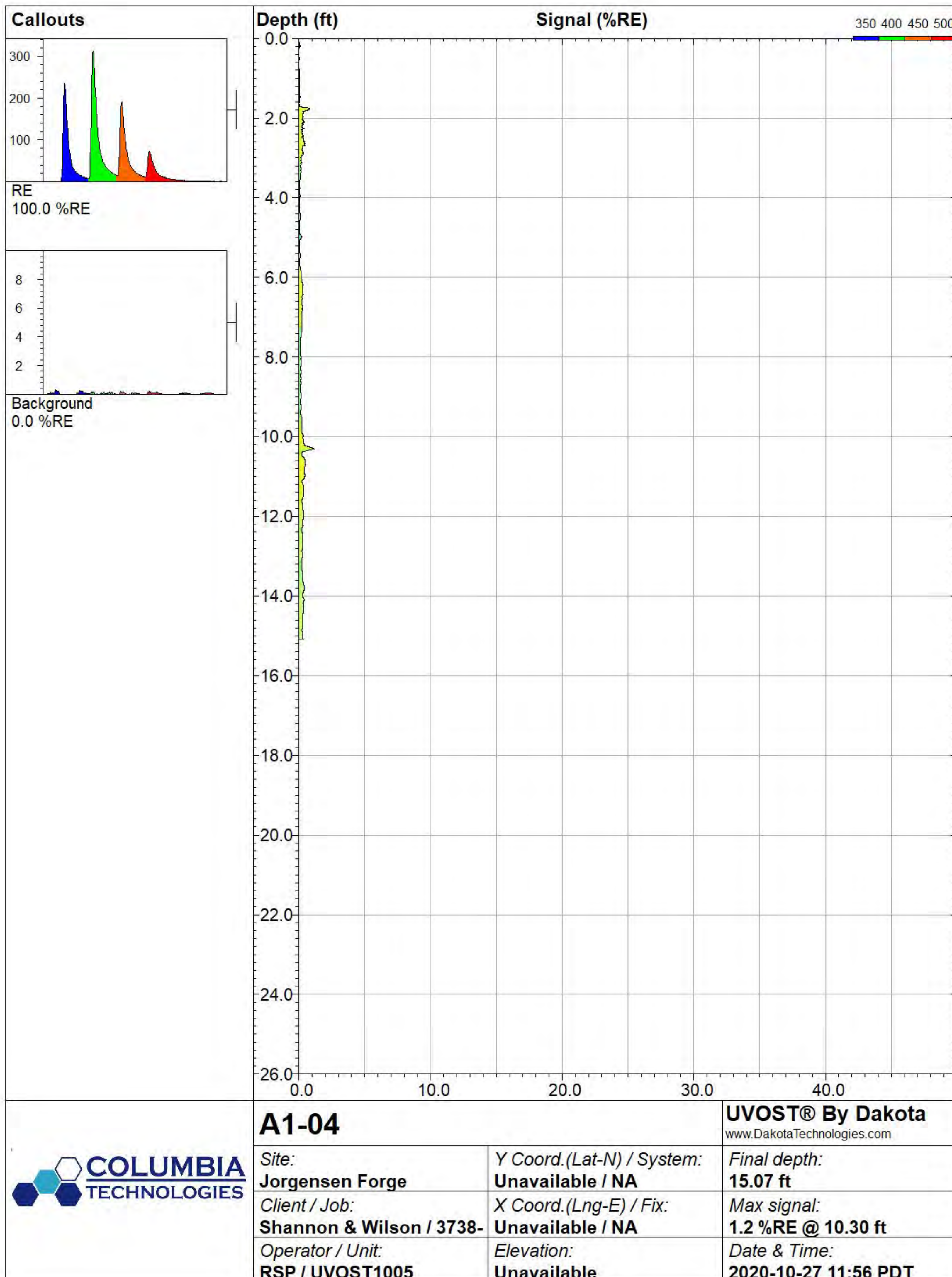
X Coord.(Lng-E) / Fix:
Unavailable / NA

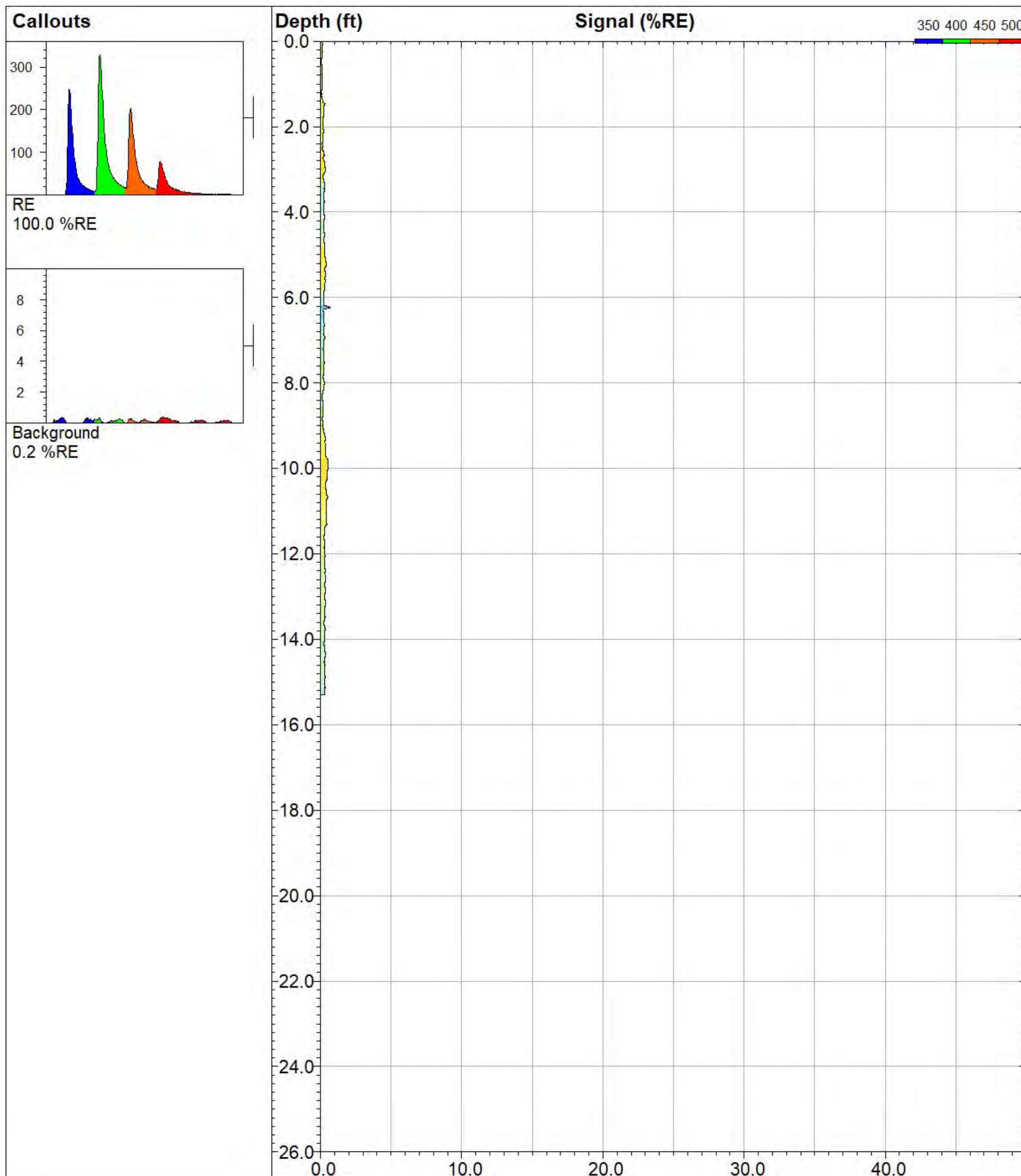
Max signal:
57.9 %RE @ 12.80 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-27 09:29 PDT

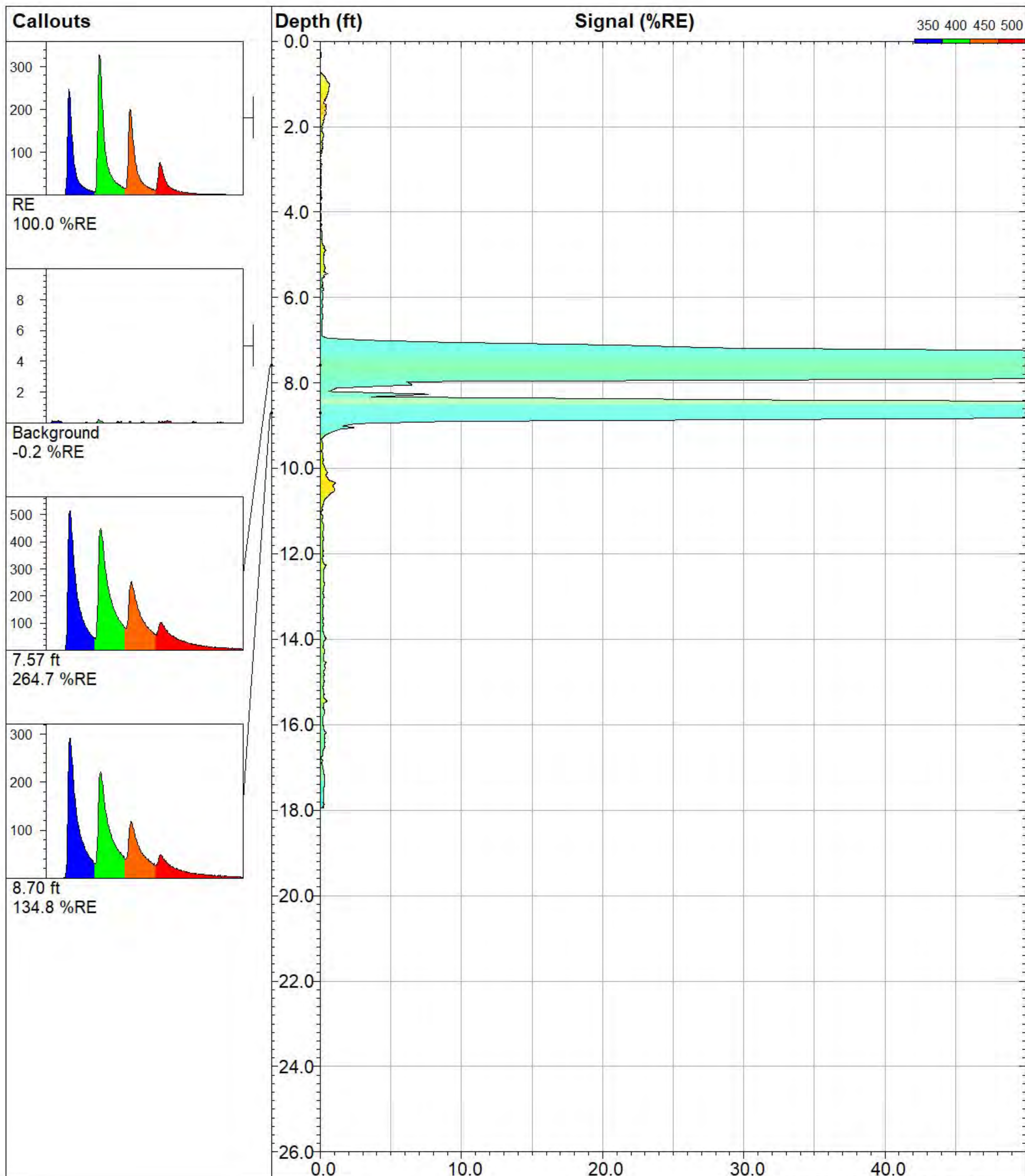




A1-05

UVOST® By Dakota
www.DakotaTechnologies.com

<i>Site:</i> Jorgensen Forge	<i>Y Coord.(Lat-N) / System:</i> Unavailable / NA	<i>Final depth:</i> 15.30 ft
<i>Client / Job:</i> Shannon & Wilson / 3738-	<i>X Coord.(Lng-E) / Fix:</i> Unavailable / NA	<i>Max signal:</i> 0.7 %RE @ 6.23 ft
<i>Operator / Unit:</i> RSP / UVOST1005	<i>Elevation:</i> Unavailable	<i>Date & Time:</i> 2020-10-27 10:40 PDT



A1-06

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
17.95 ft

Client / Job:
Shannon & Wilson / 3738-

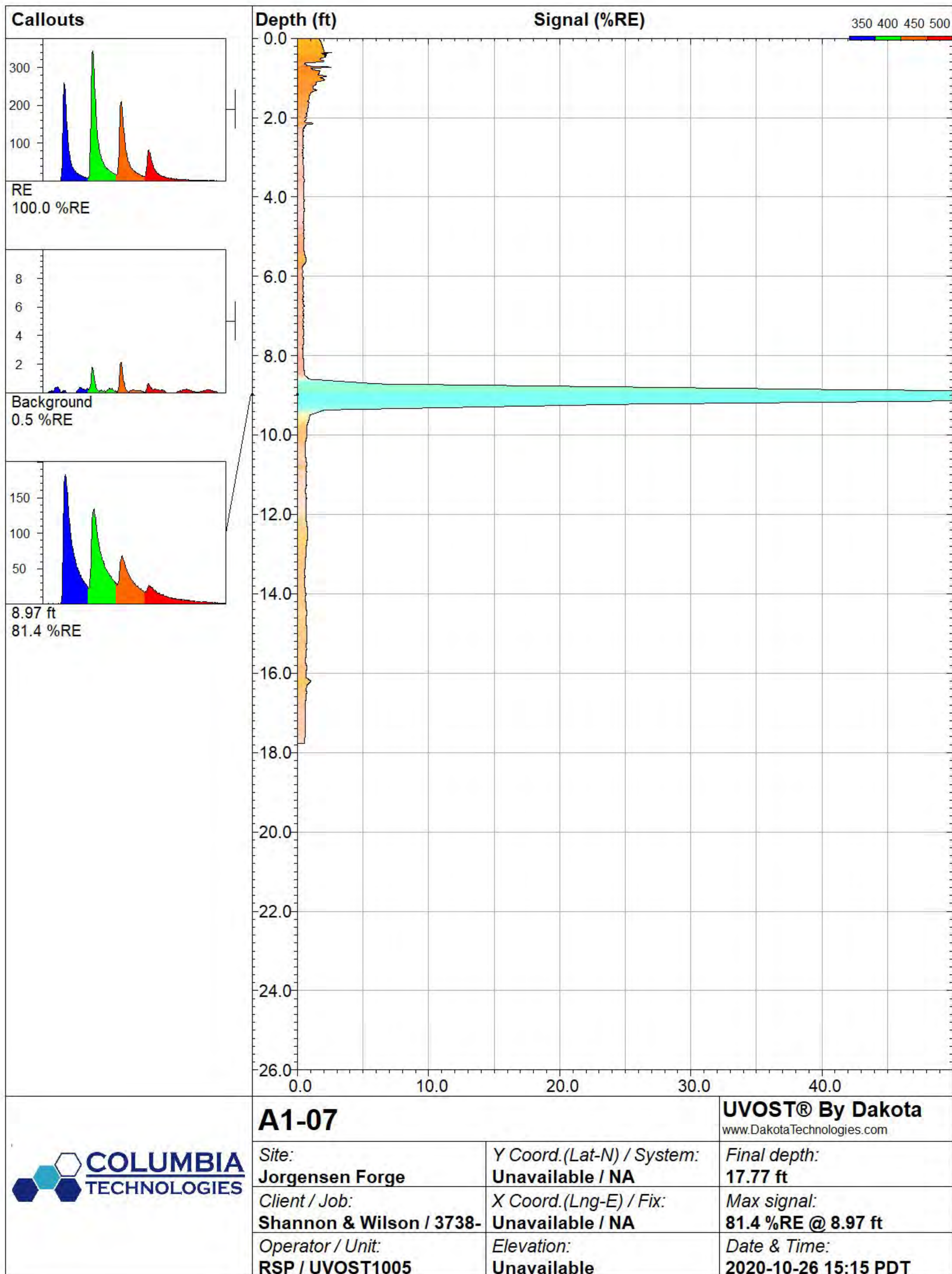
X Coord.(Lng-E) / Fix:
Unavailable / NA

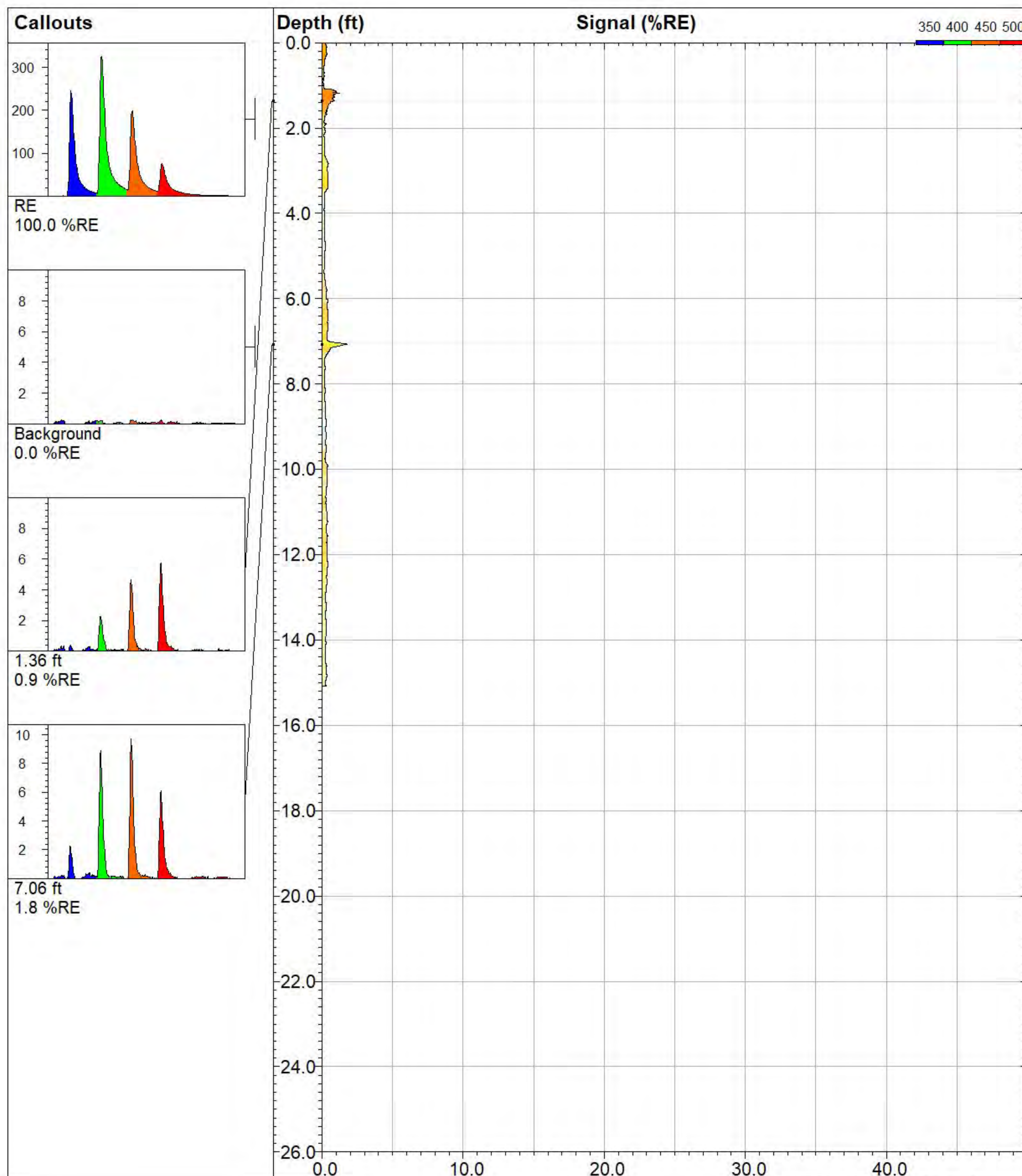
Max signal:
281.4 %RE @ 7.65 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-27 14:59 PDT





A1-08

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord. (Lat-N) / System:
Unavailable / NA

Final depth:
15.08 ft

Client / Job:
Shannon & Wilson / 3738-

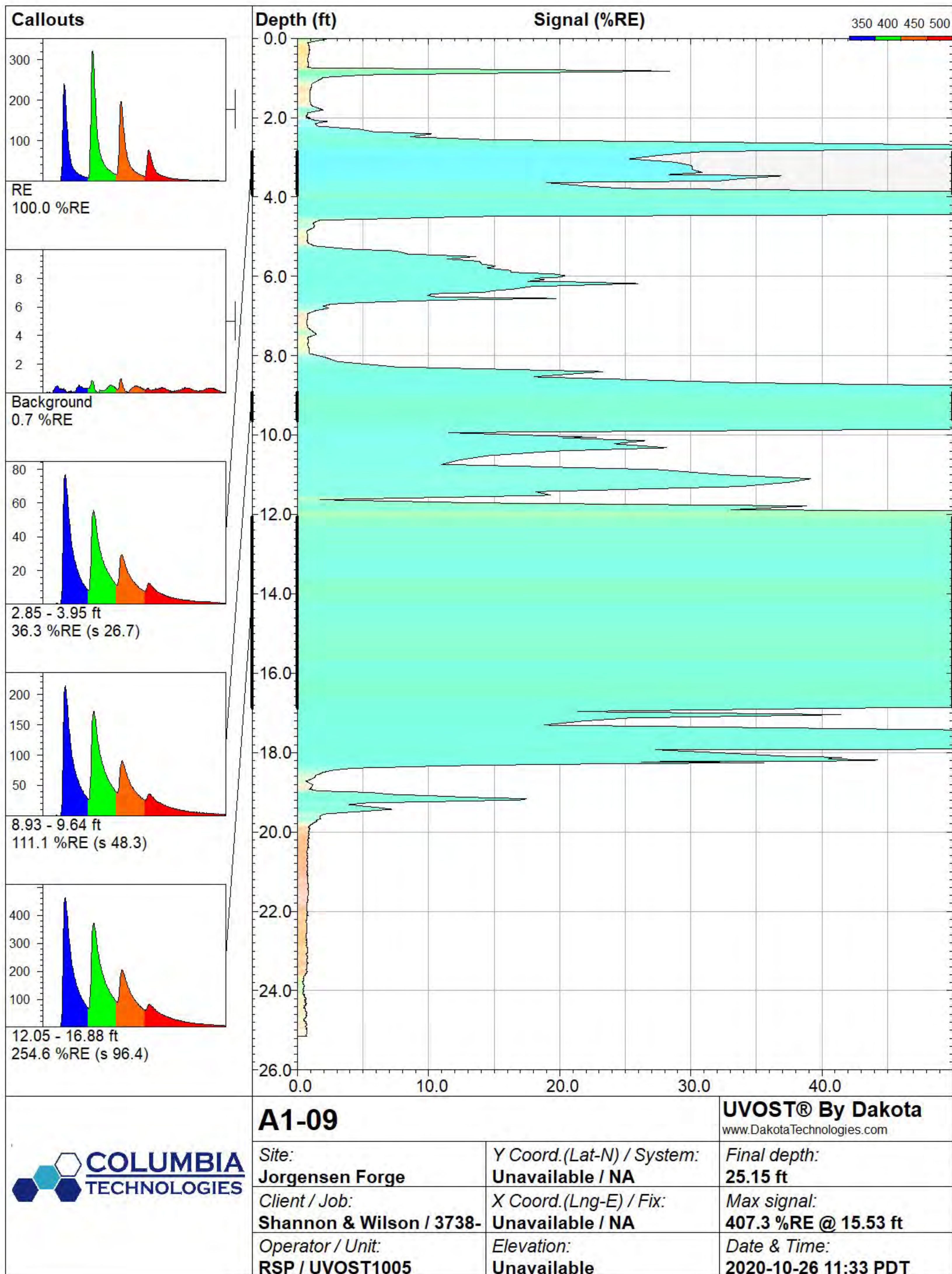
X Coord. (Lng-E) / Fix:
Unavailable / NA

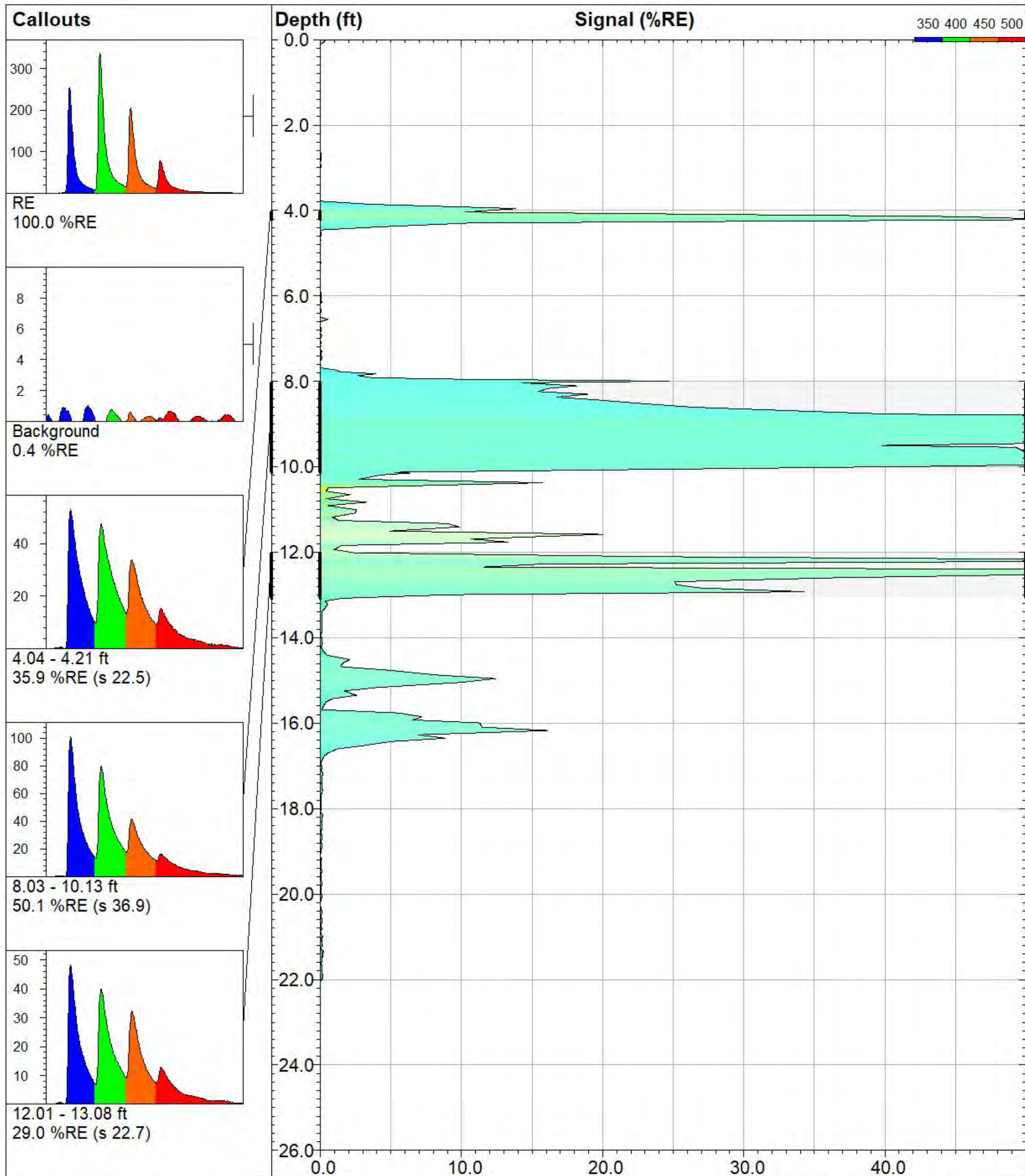
Max signal:
1.8 %RE @ 7.06 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-27 13:29 PDT





A1-10

UVOST® By Dakota

www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.02 ft

Client / Job:
Shannon & Wilson / 3738-

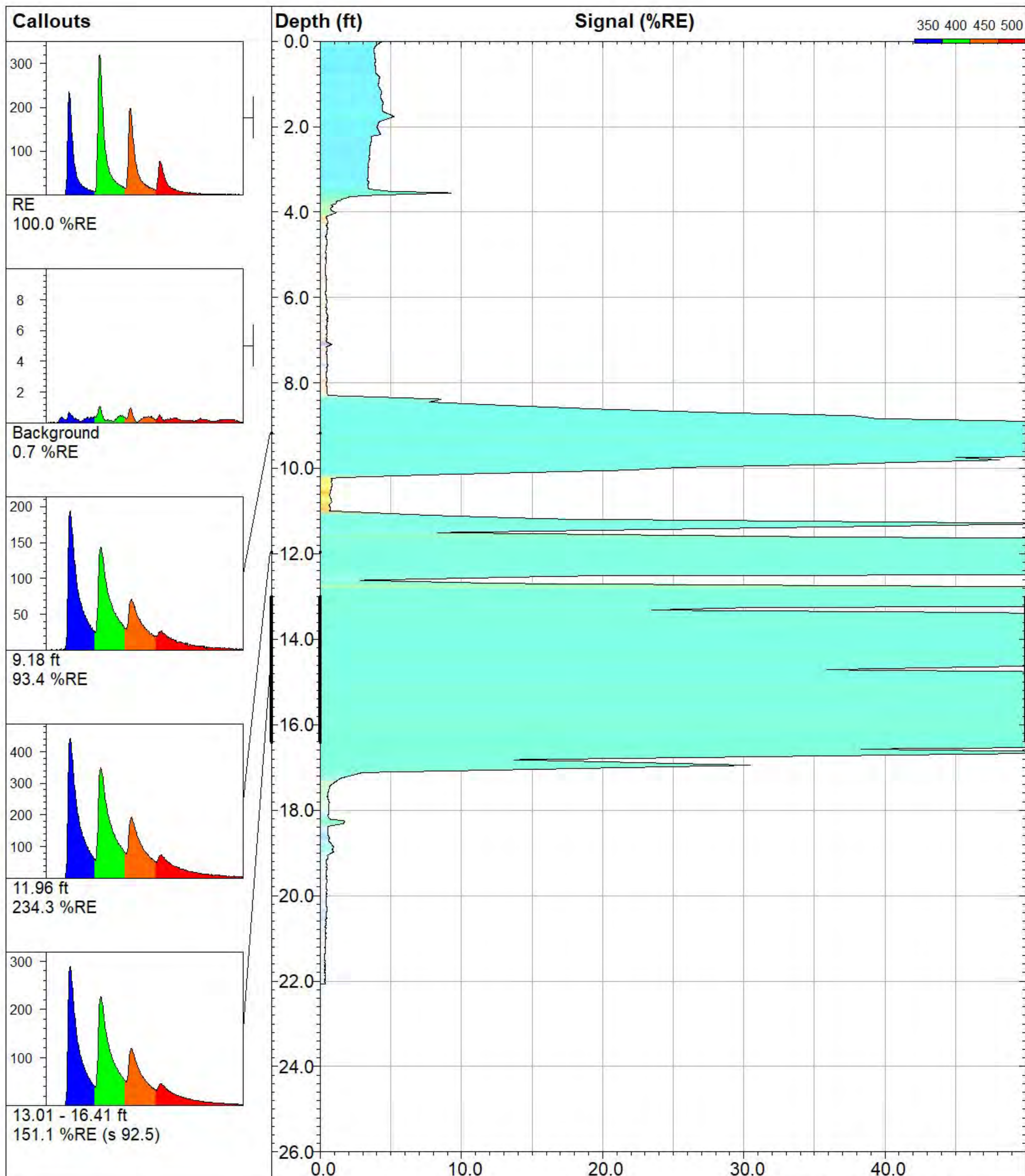
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
132.2 %RE @ 9.12 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-28 14:32 PDT



A1-11

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.07 ft

Client / Job:
Shannon & Wilson / 3738-

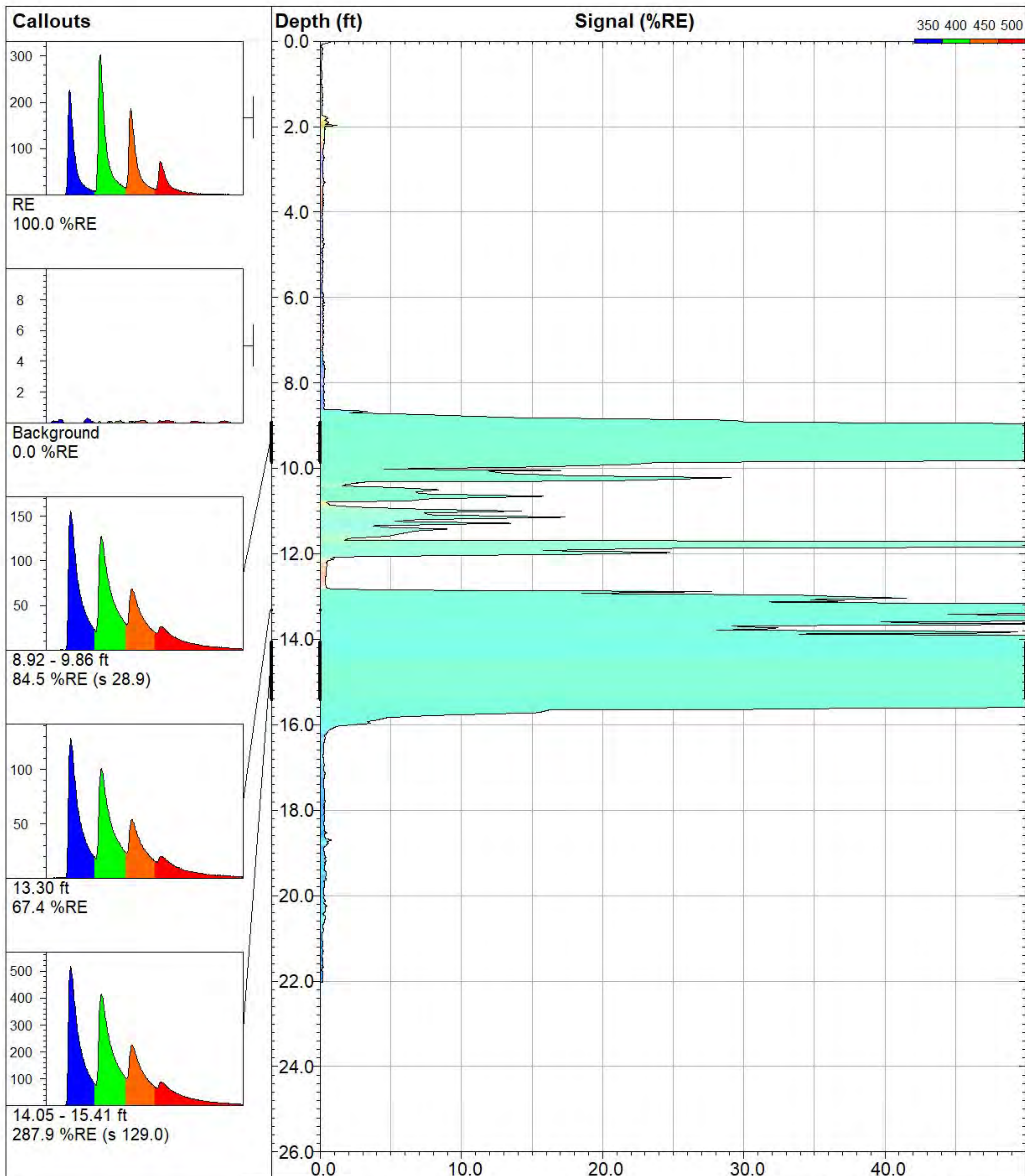
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
397.9 %RE @ 15.97 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-26 13:08 PDT



A1-12

UVOST® By Dakota

www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.04 ft

Client / Job:
Shannon & Wilson / 3738-

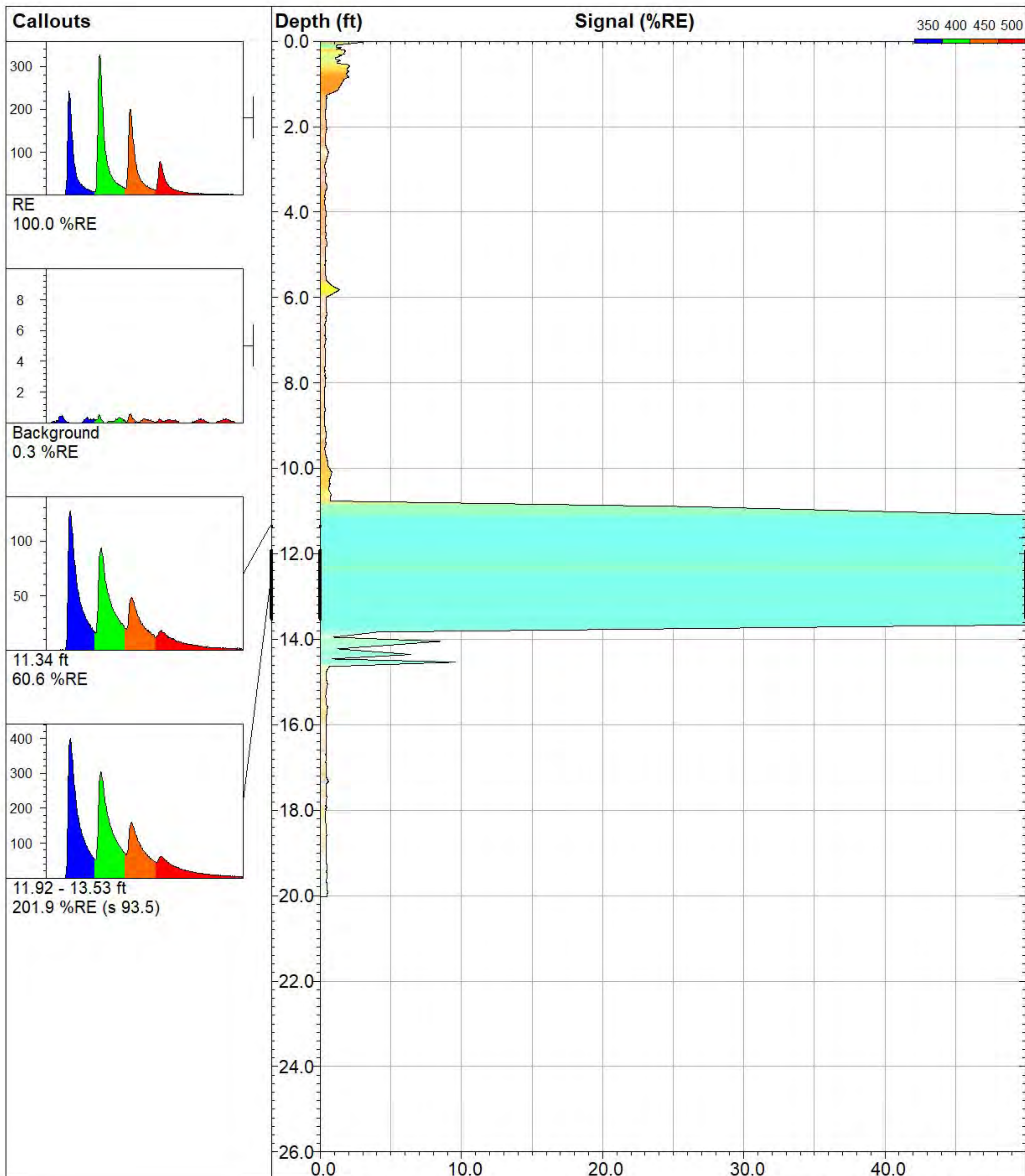
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
418.5 %RE @ 14.95 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-28 10:54 PDT



A1-13

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
20.03 ft

Client / Job:
Shannon & Wilson / 3738-

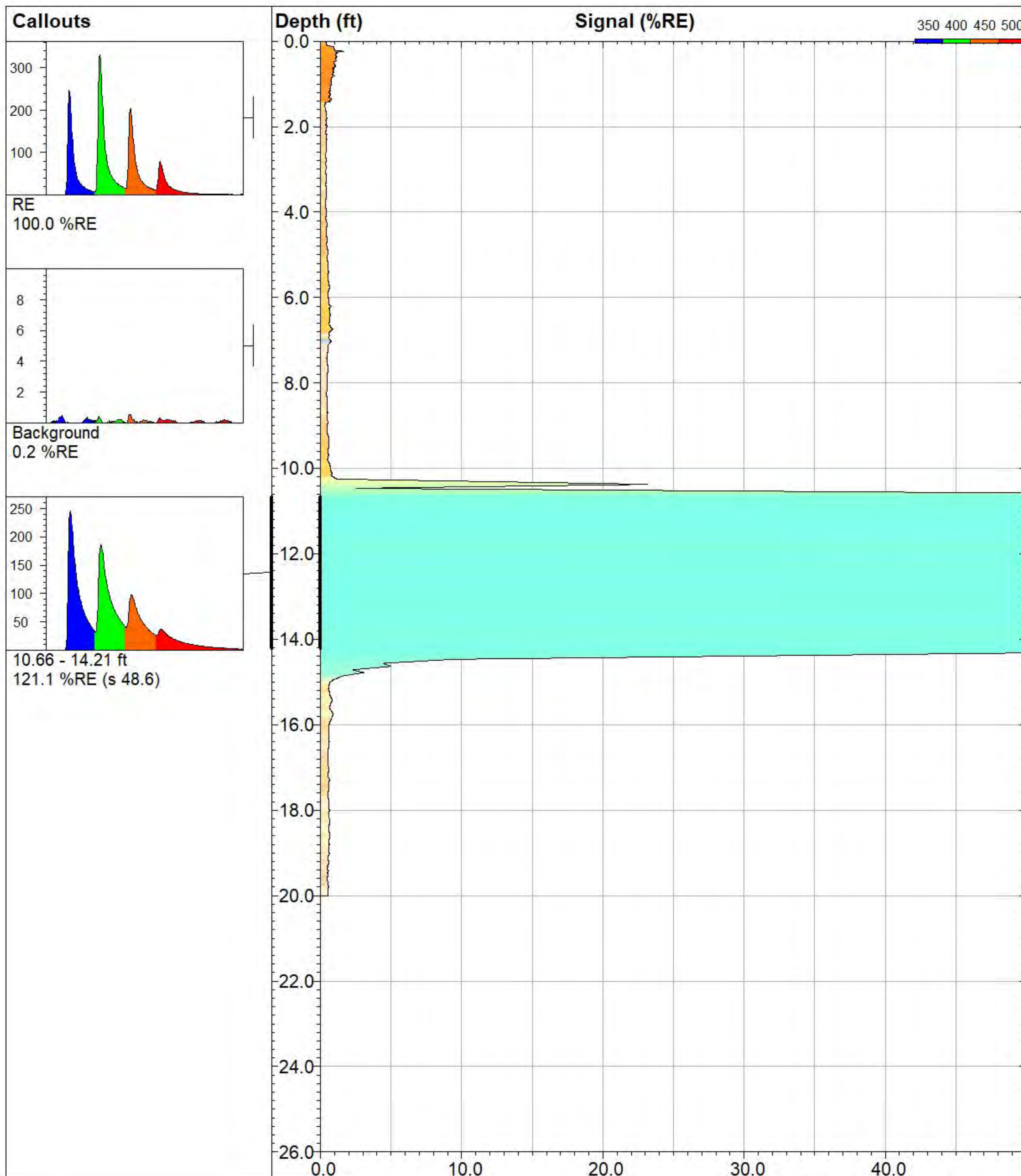
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
413.3 %RE @ 12.34 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-26 13:51 PDT



A1-14

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
20.01 ft

Client / Job:
Shannon & Wilson / 3738-

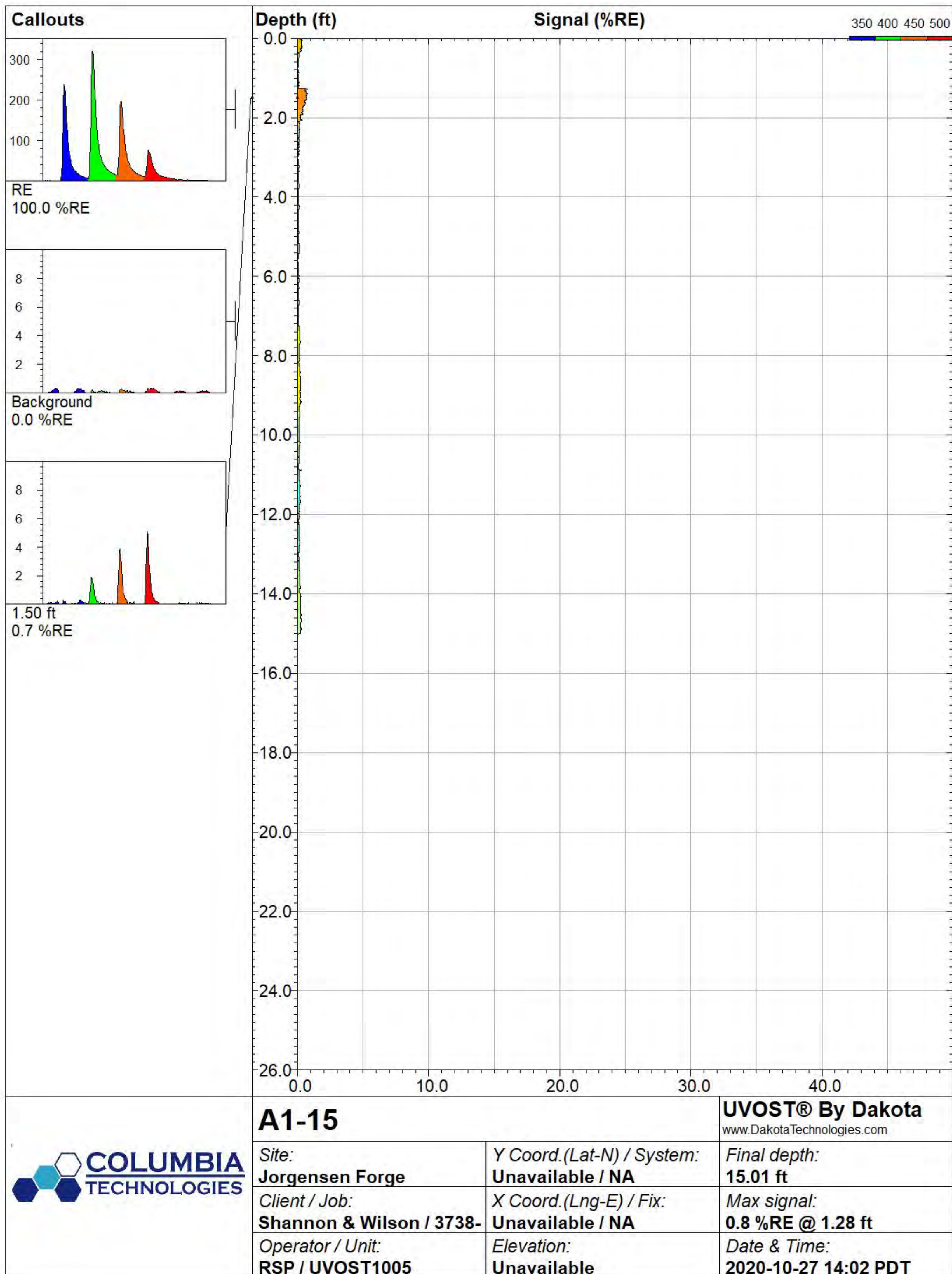
X Coord.(Lng-E) / Fix:
Unavailable / NA

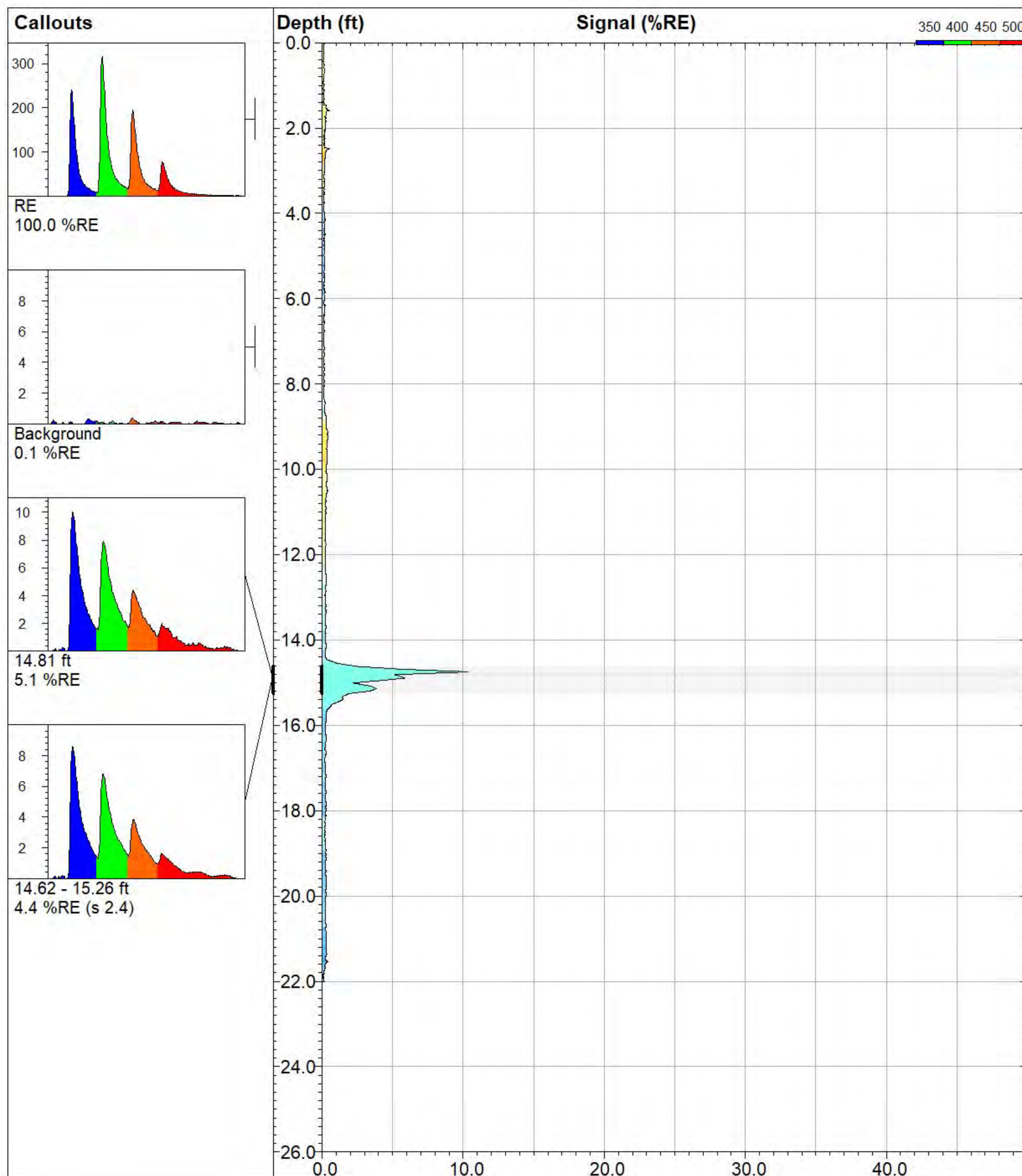
Max signal:
223.3 %RE @ 12.30 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-26 14:22 PDT





A1-16

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.01 ft

Client / Job:
Shannon & Wilson / 3738-

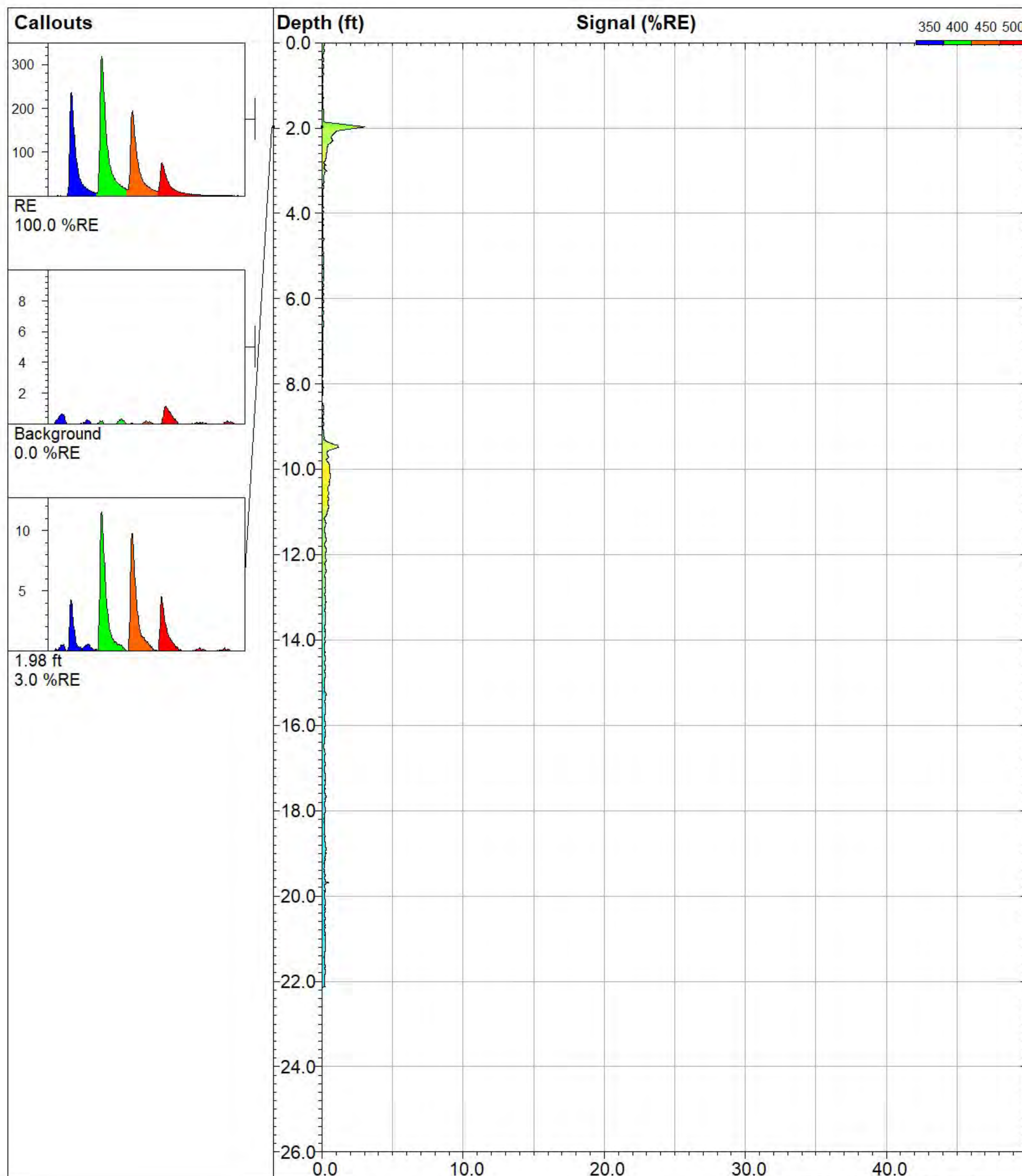
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
10.4 %RE @ 14.75 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-28 09:22 PDT



A1-17

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.14 ft

Client / Job:
Shannon & Wilson / 3738-

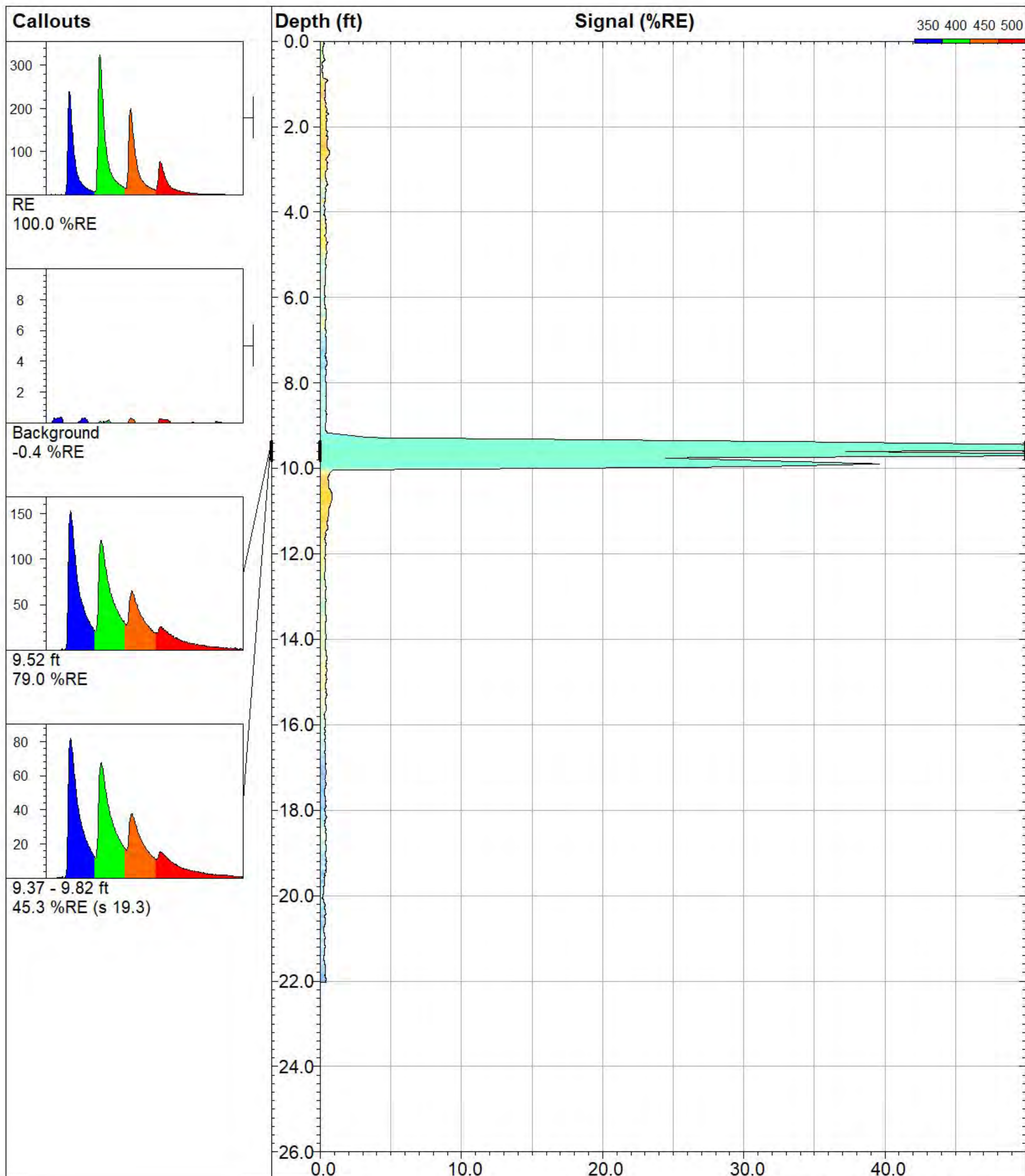
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
3.0 %RE @ 1.98 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-28 11:53 PDT



A1-18

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.02 ft

Client / Job:
Shannon & Wilson / 3738-

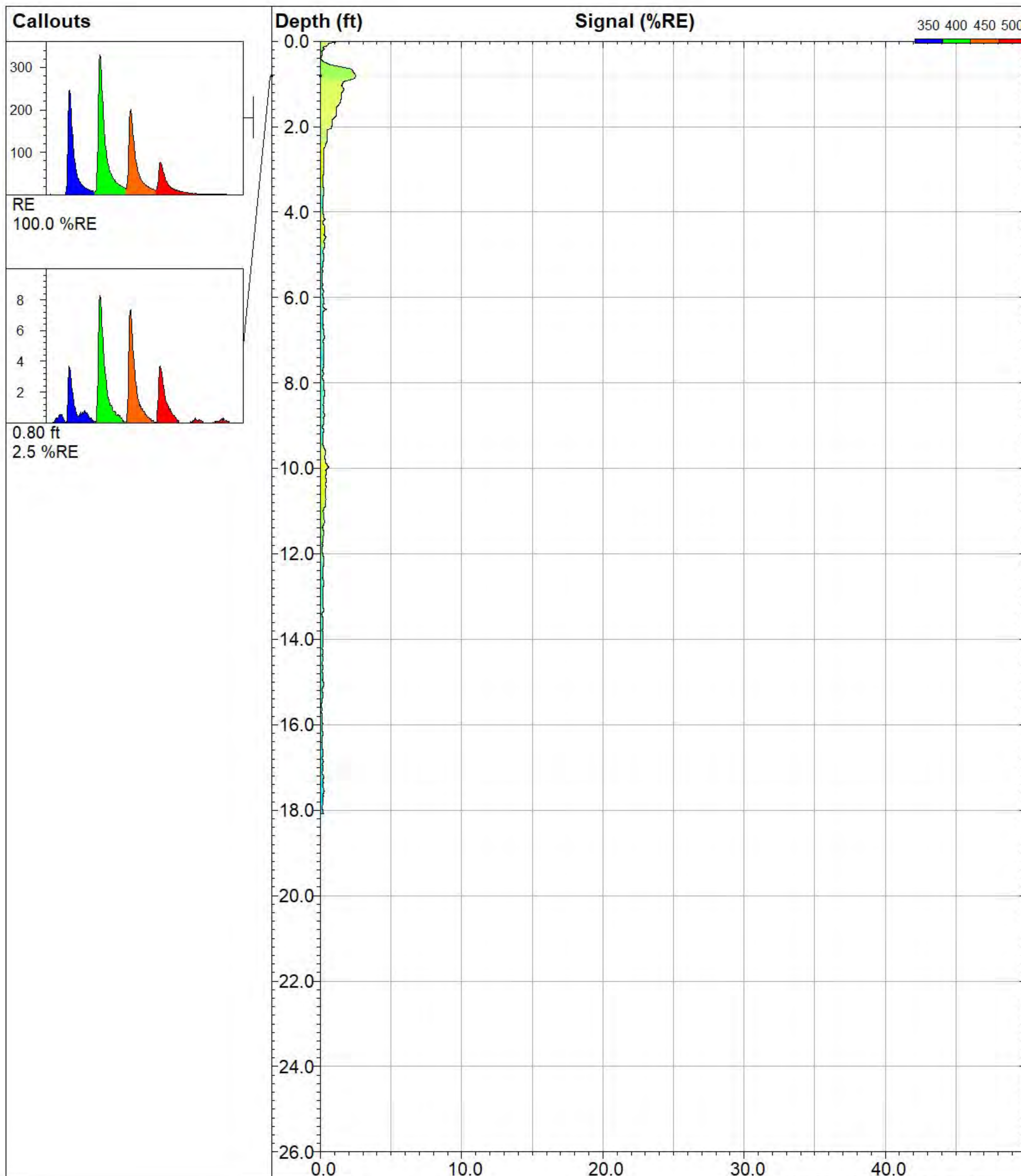
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
79.0 %RE @ 9.52 ft

Operator / Unit:
RSP / UVOST1005

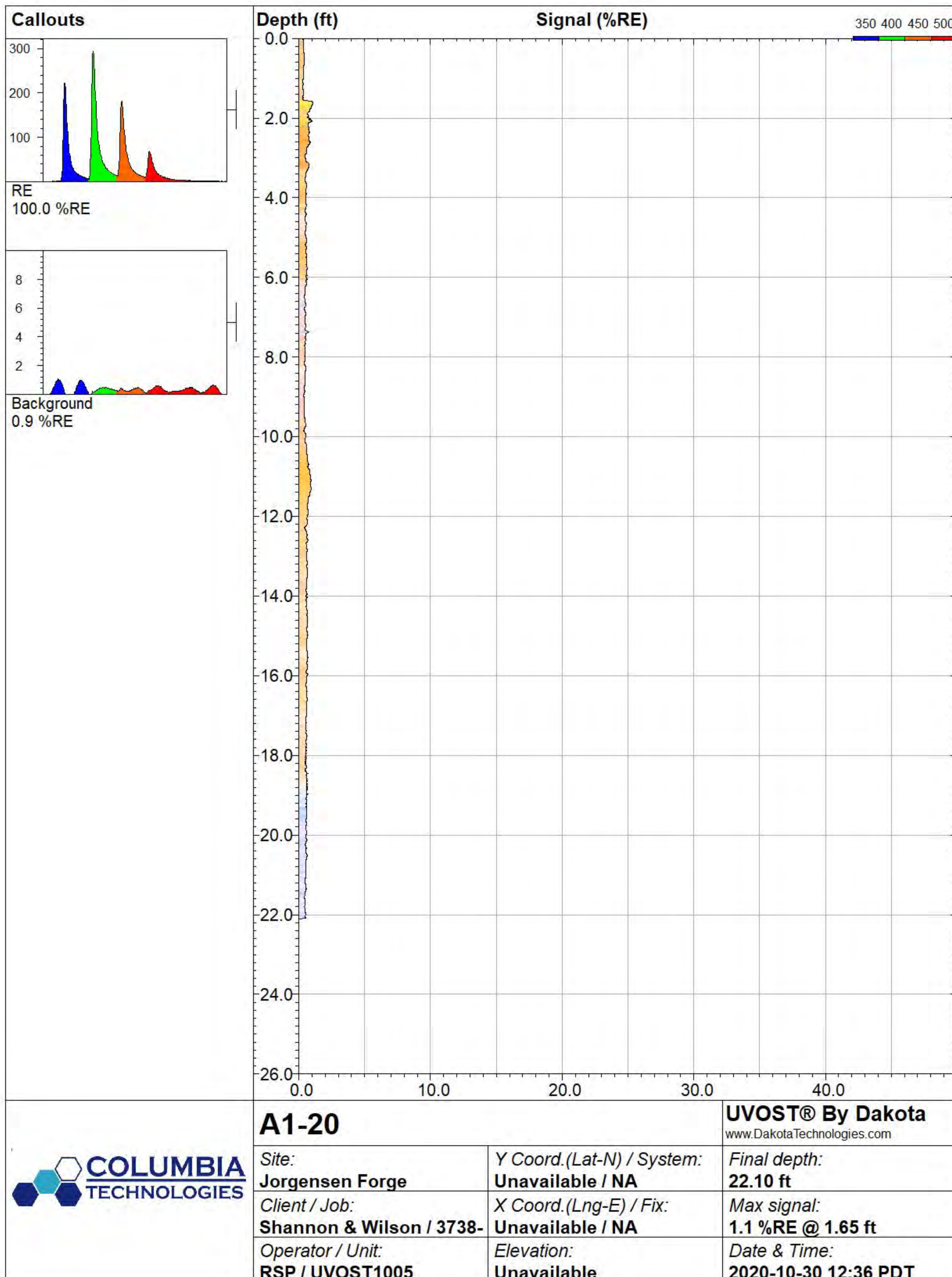
Elevation:
Unavailable

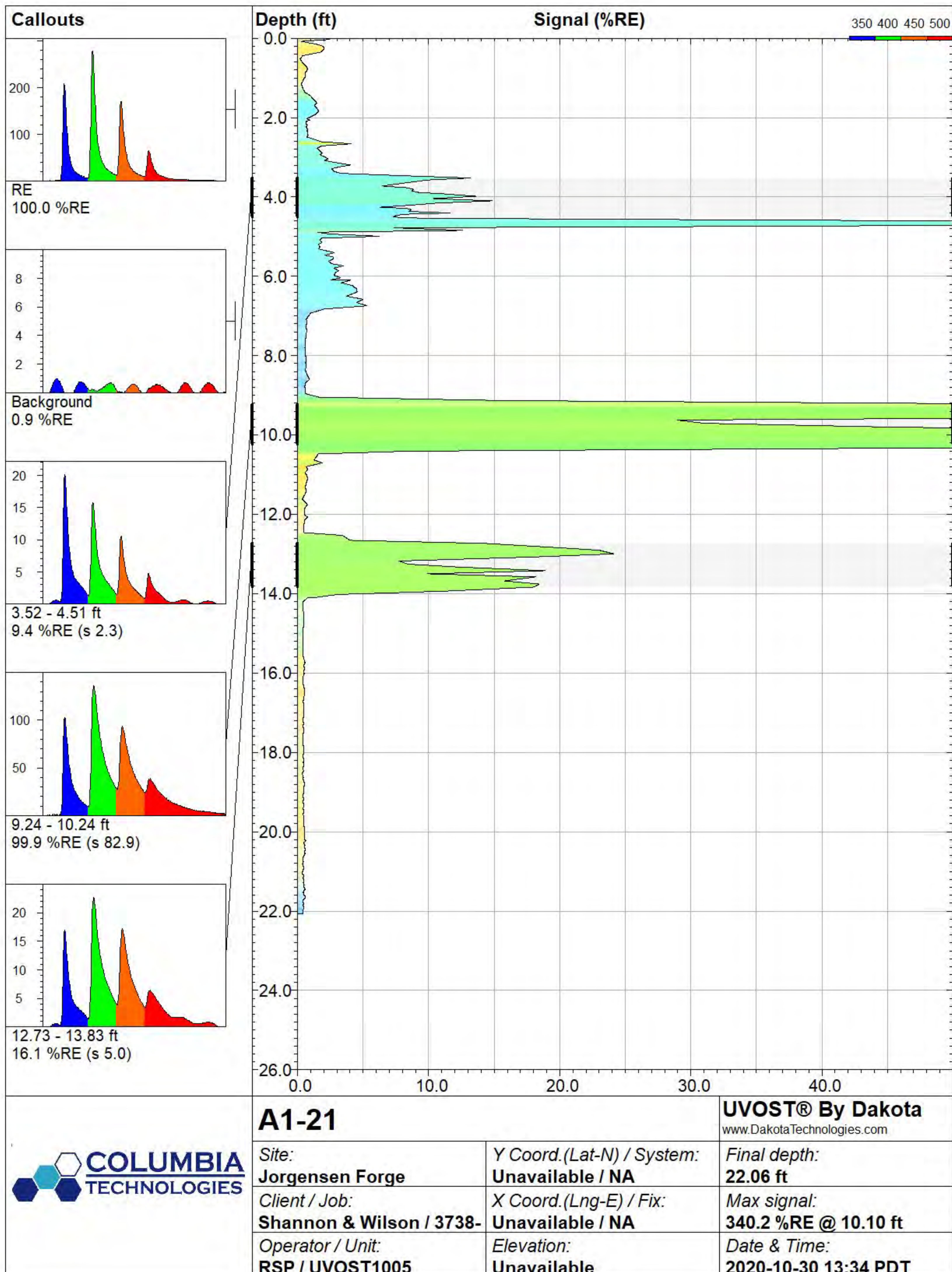
Date & Time:
2020-10-28 13:10 PDT

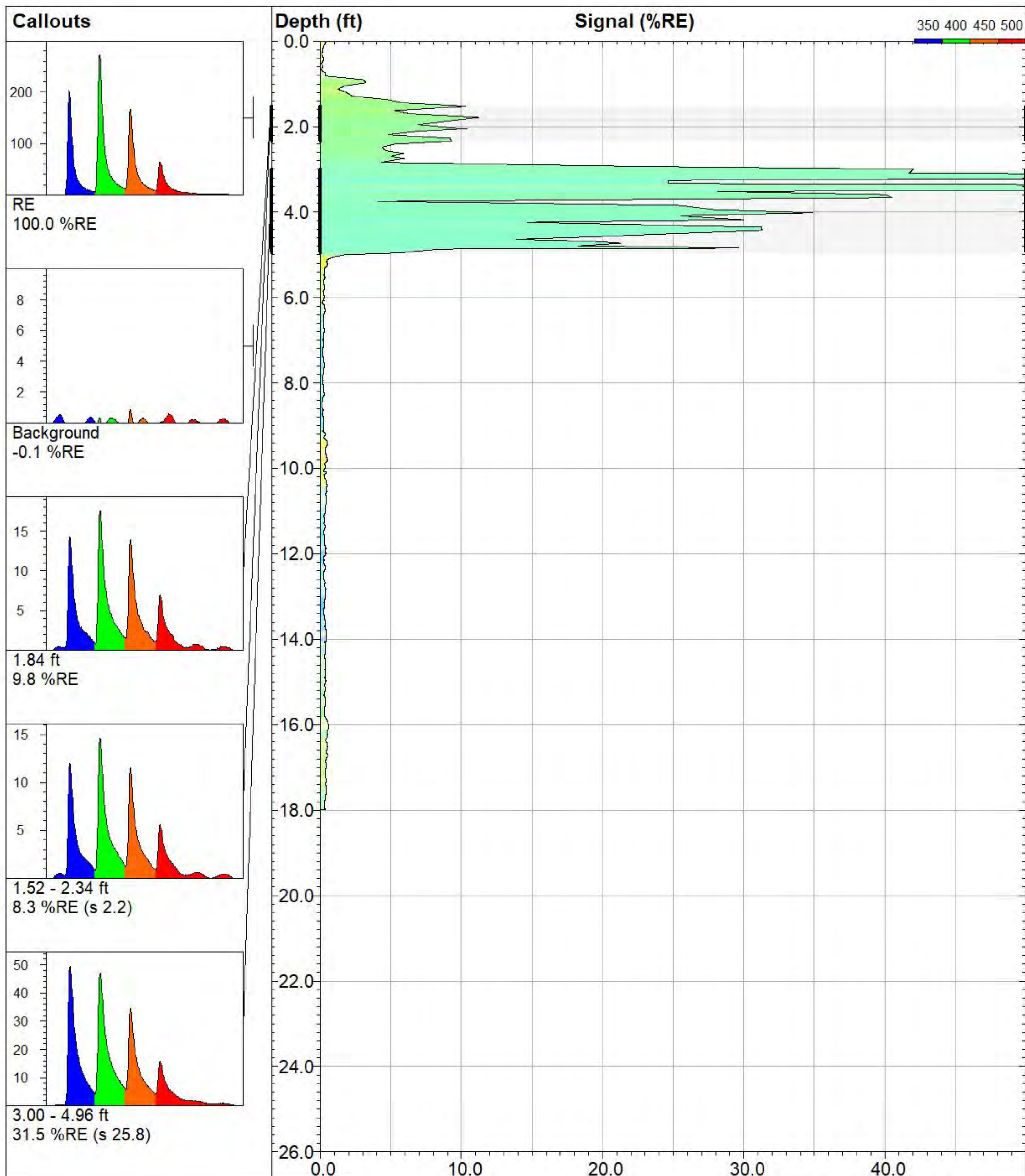


A1-19		UVOST® By Dakota www.DakotaTechnologies.com
Site: Jorgensen Forge	Y Coord. (Lat-N) / System: Unavailable / NA	Final depth: 18.08 ft
Client / Job: Shannon & Wilson / 3738-	X Coord. (Lng-E) / Fix: Unavailable / NA	Max signal: 2.5 %RE @ 0.80 ft
Operator / Unit: RSP / UVOST1005	Elevation: Unavailable	Date & Time: 2020-10-28 14:03 PDT









A1-22

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
17.99 ft

Client / Job:
Shannon & Wilson / 3738-

X Coord.(Lng-E) / Fix:
Unavailable / NA

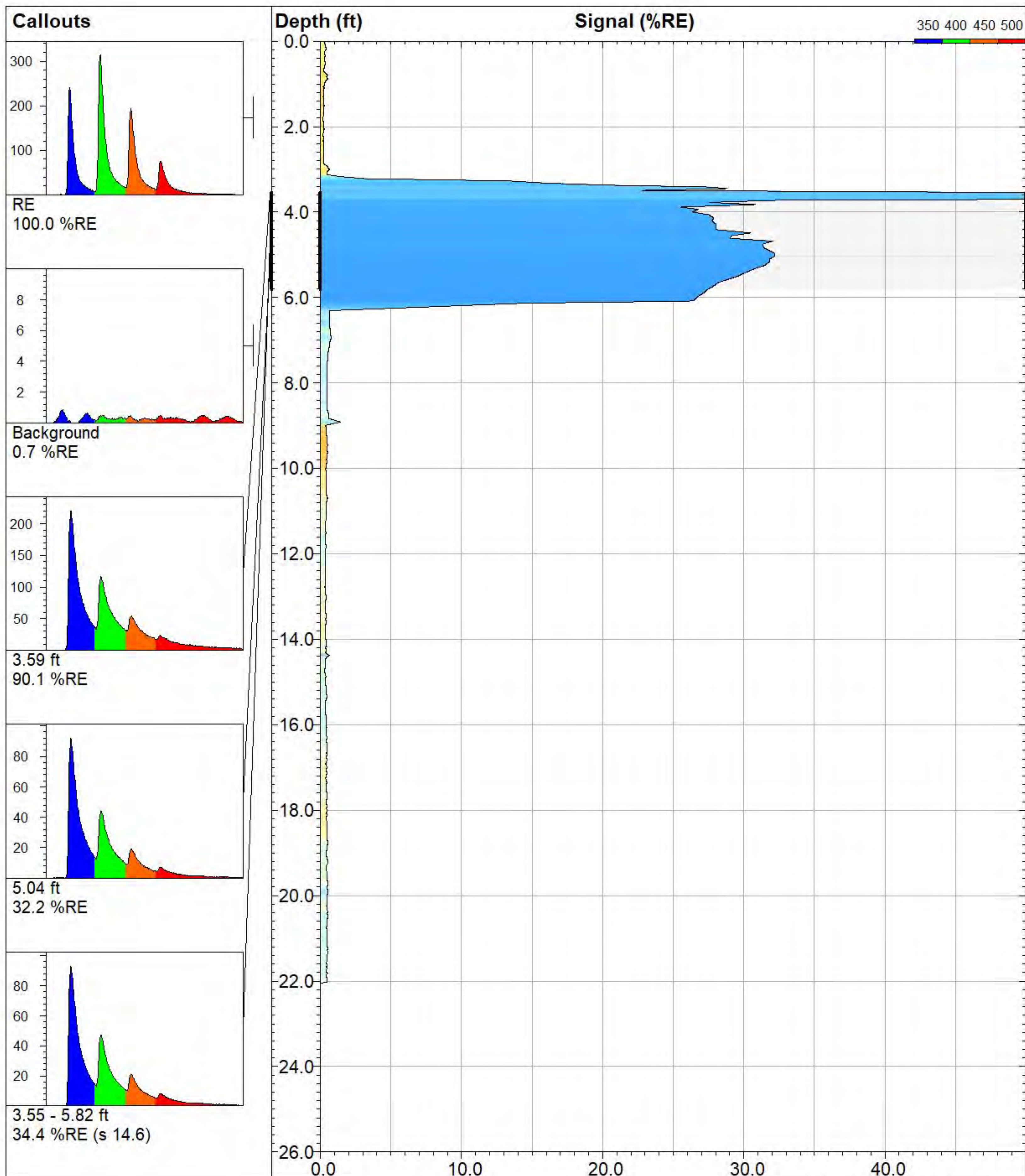
Max signal:
129.8 %RE @ 3.42 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-30 14:42 PDT

APPENDIX F - UVOST® Logs for Area 2 - Collective Scale



A2-01

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.04 ft

Client / Job:
Shannon & Wilson / 3738-

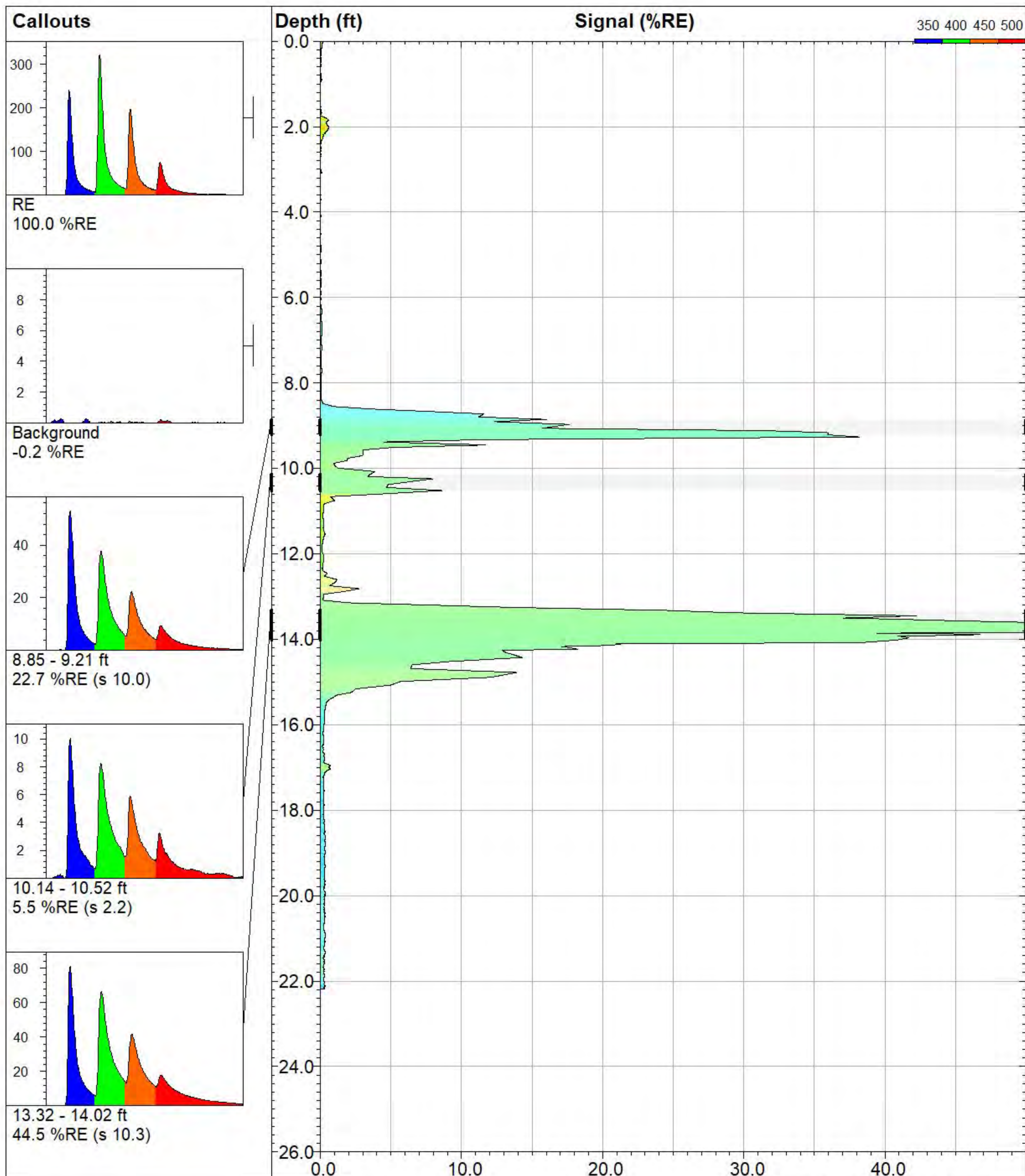
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
90.1 %RE @ 3.59 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-29 10:18 PDT



A2-02

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.19 ft

Client / Job:
Shannon & Wilson / 3738-

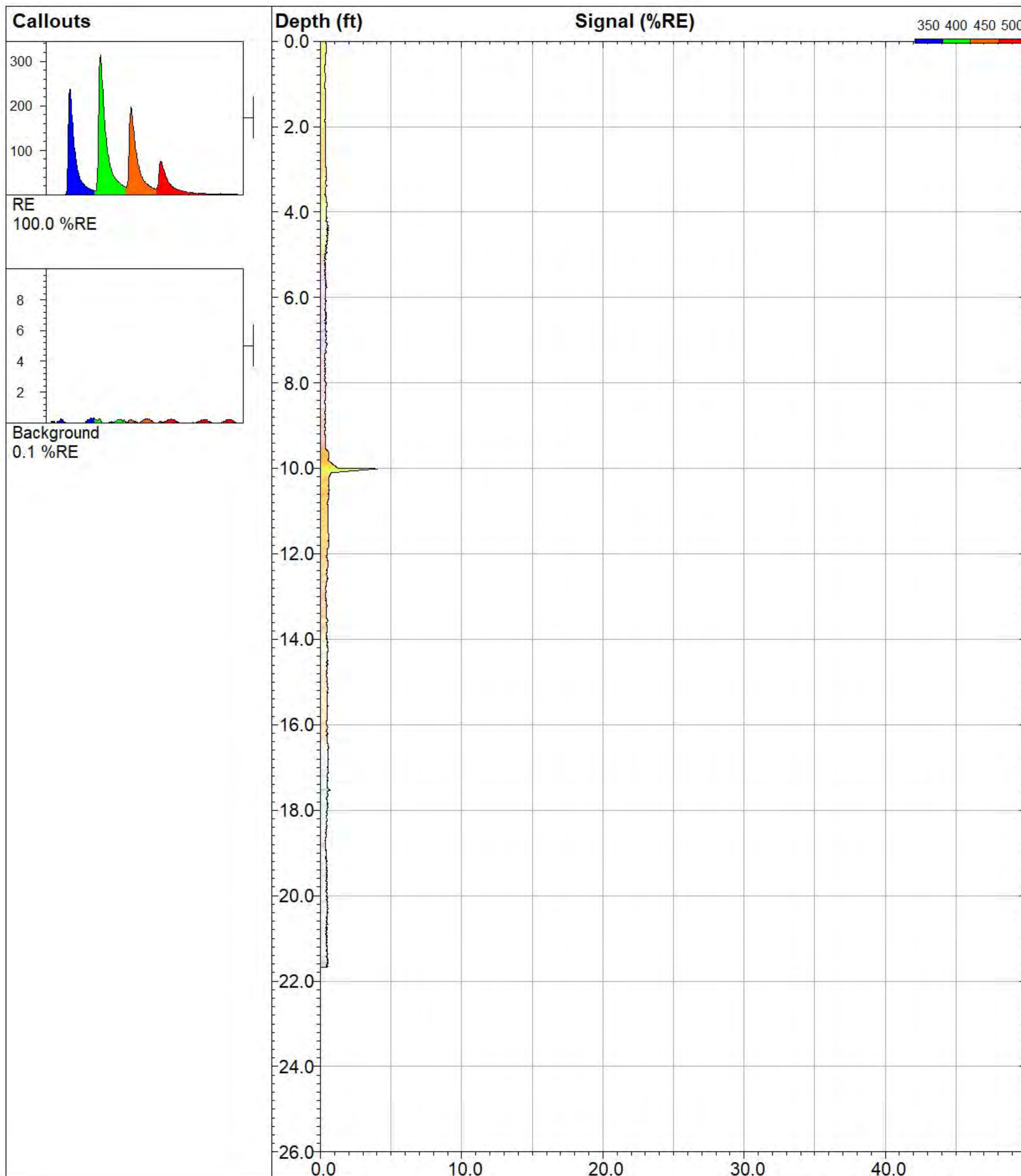
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
67.5 %RE @ 13.67 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-27 15:46 PDT



A2-03

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
21.67 ft

Client / Job:
Shannon & Wilson / 3738-

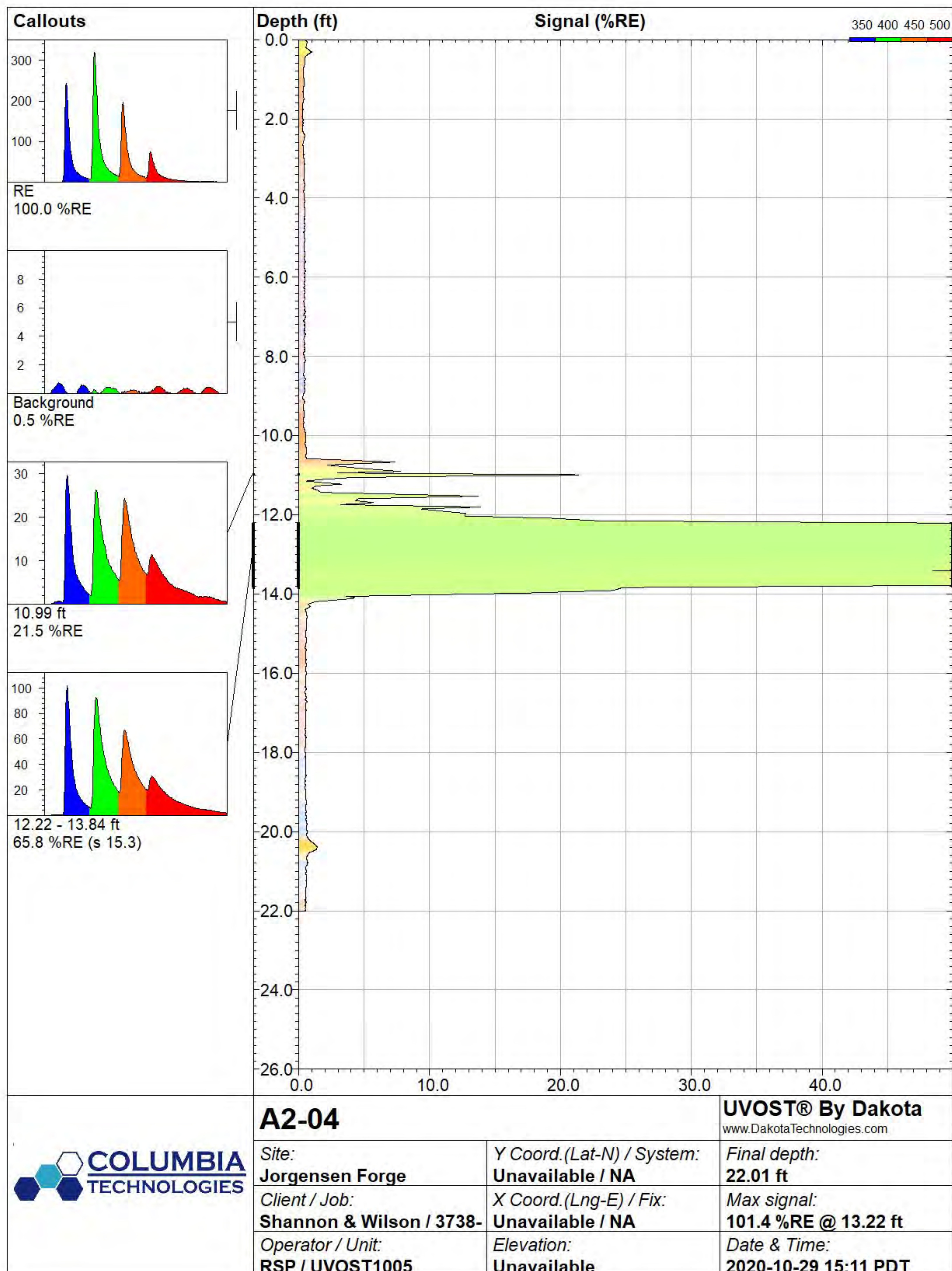
X Coord.(Lng-E) / Fix:
Unavailable / NA

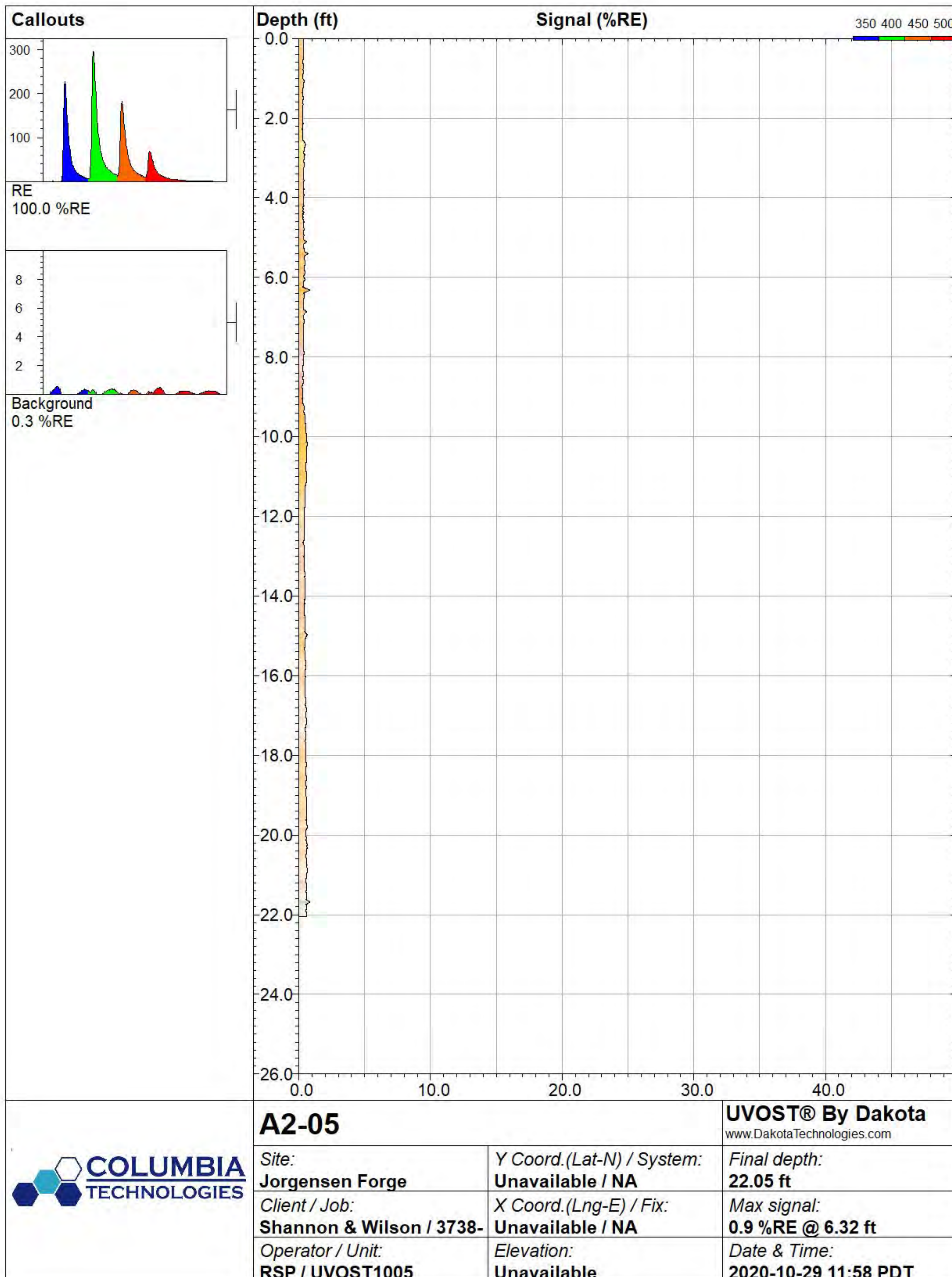
Max signal:
4.1 %RE @ 10.01 ft

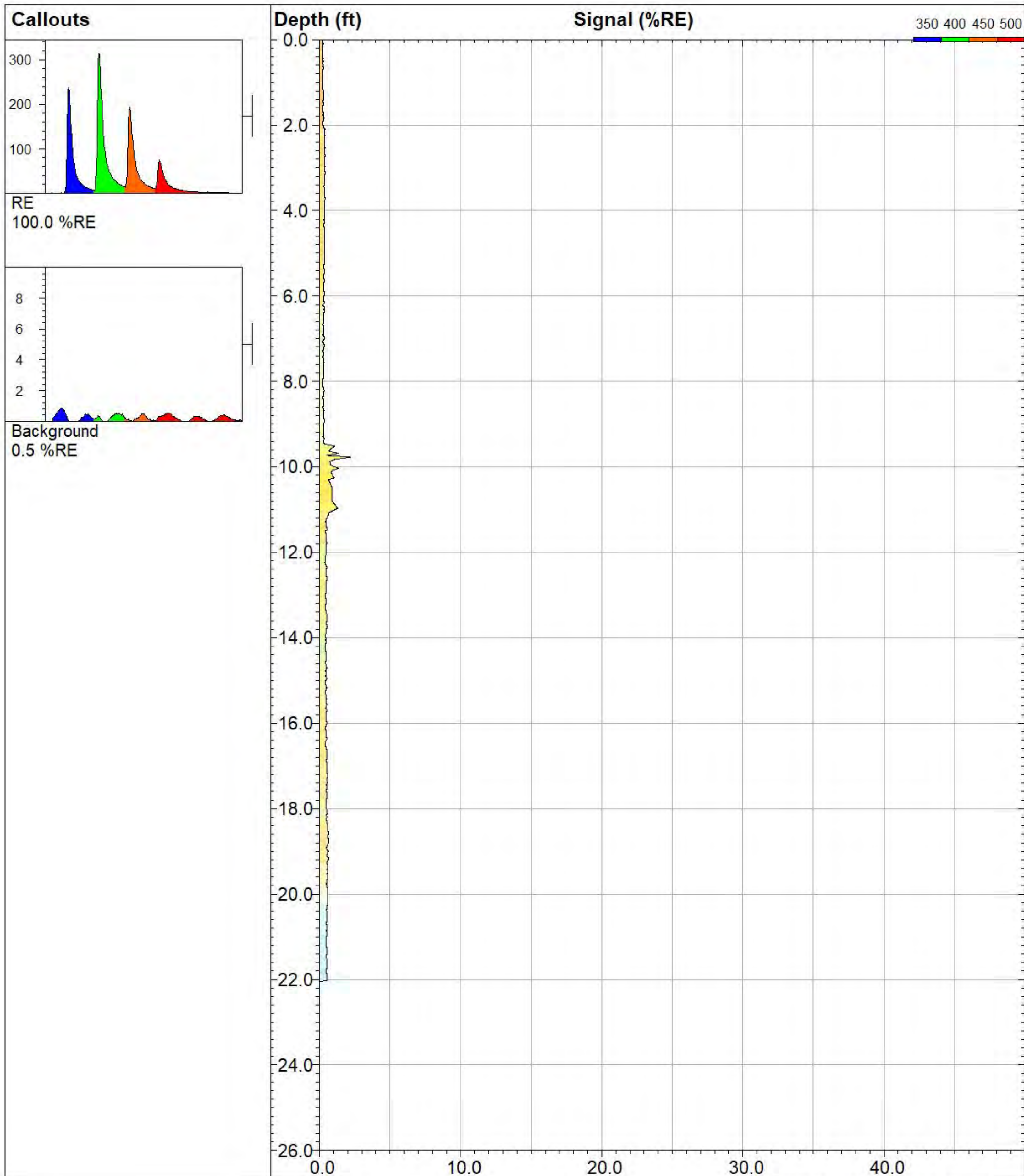
Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-29 09:16 PDT







A2-06

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.04 ft

Client / Job:
Shannon & Wilson / 3738-

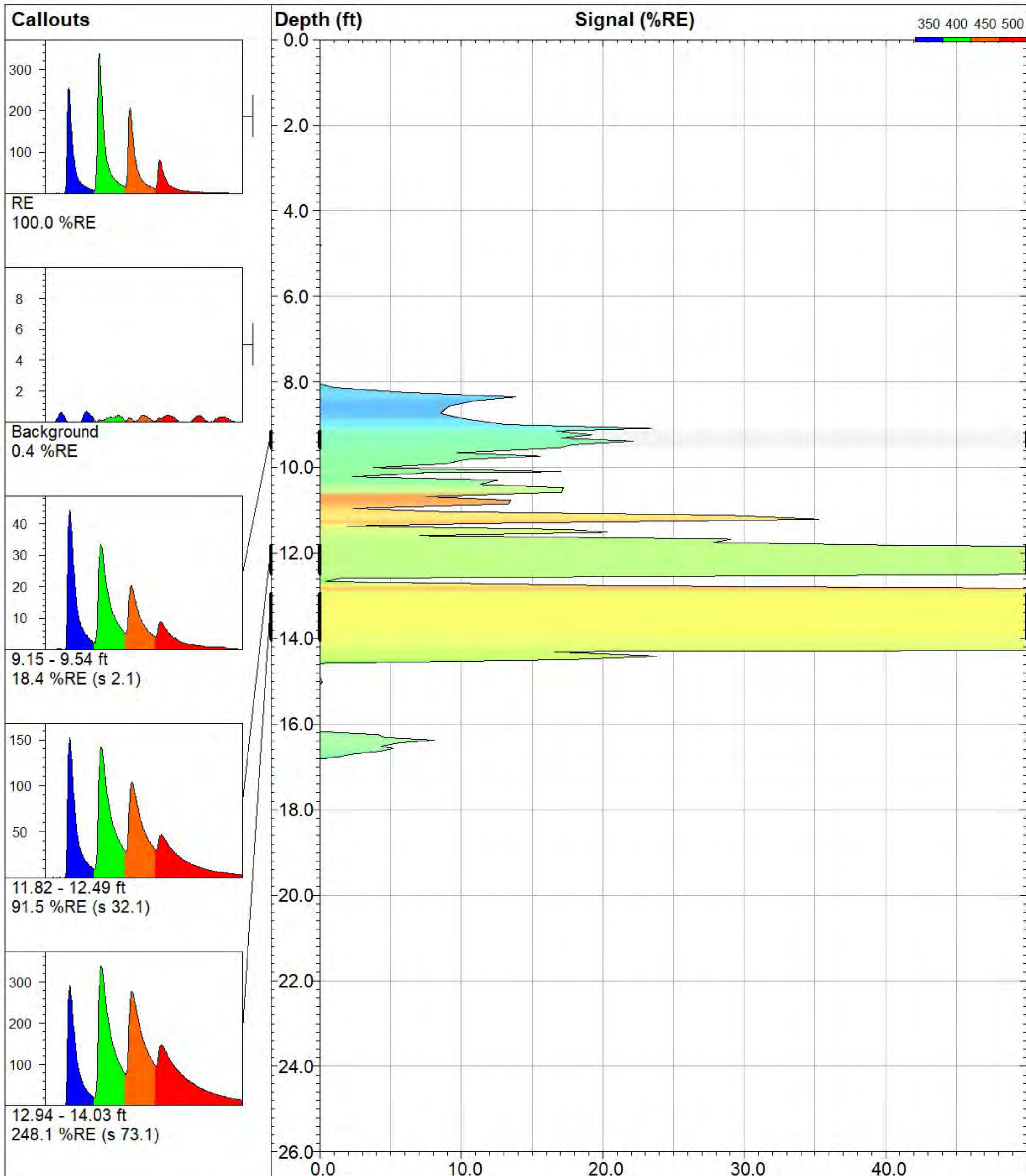
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
2.3 %RE @ 9.77 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-29 14:37 PDT



A2-07

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.04 ft

Client / Job:
Shannon & Wilson / 3738-

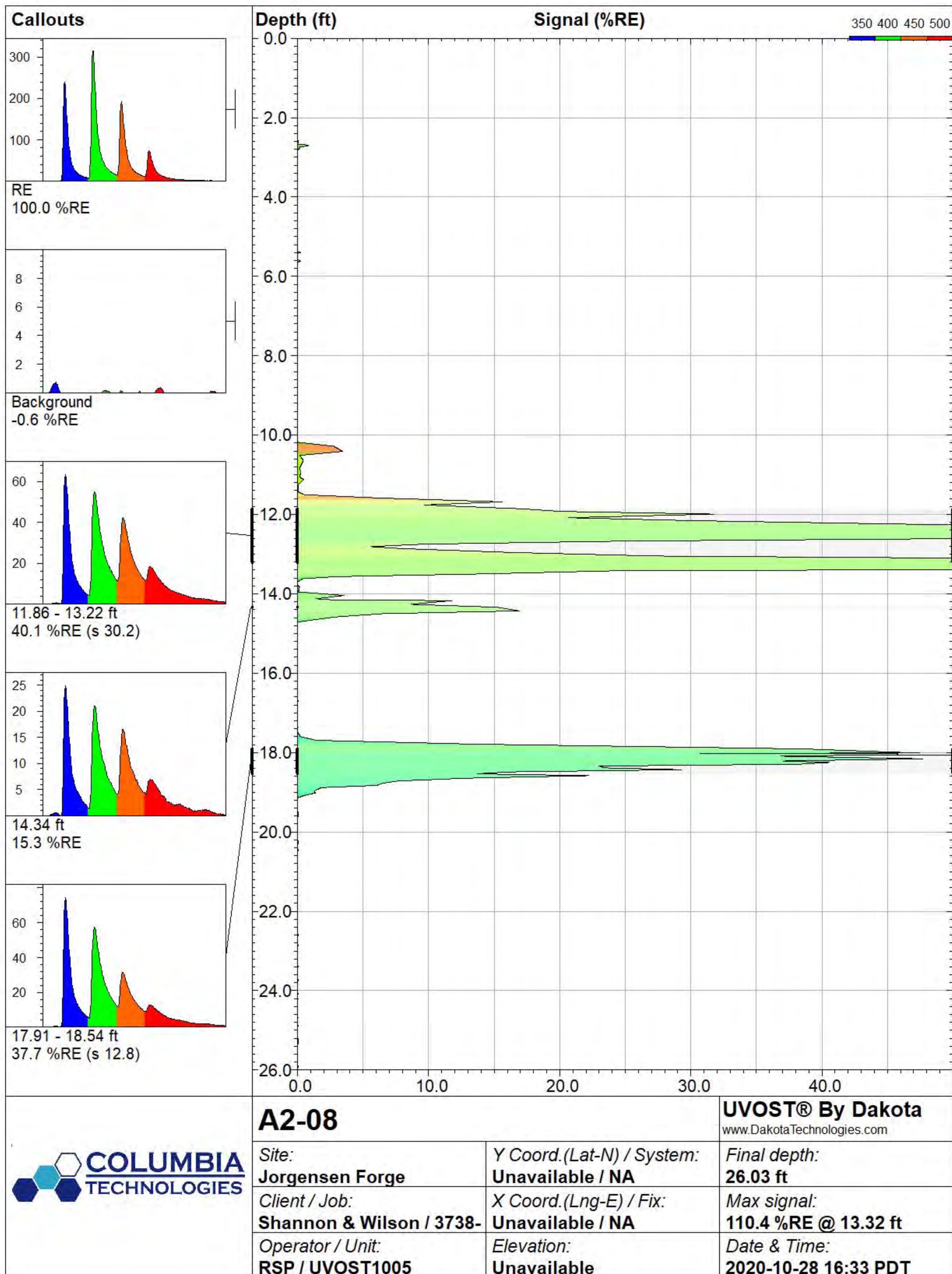
X Coord.(Lng-E) / Fix:
Unavailable / NA

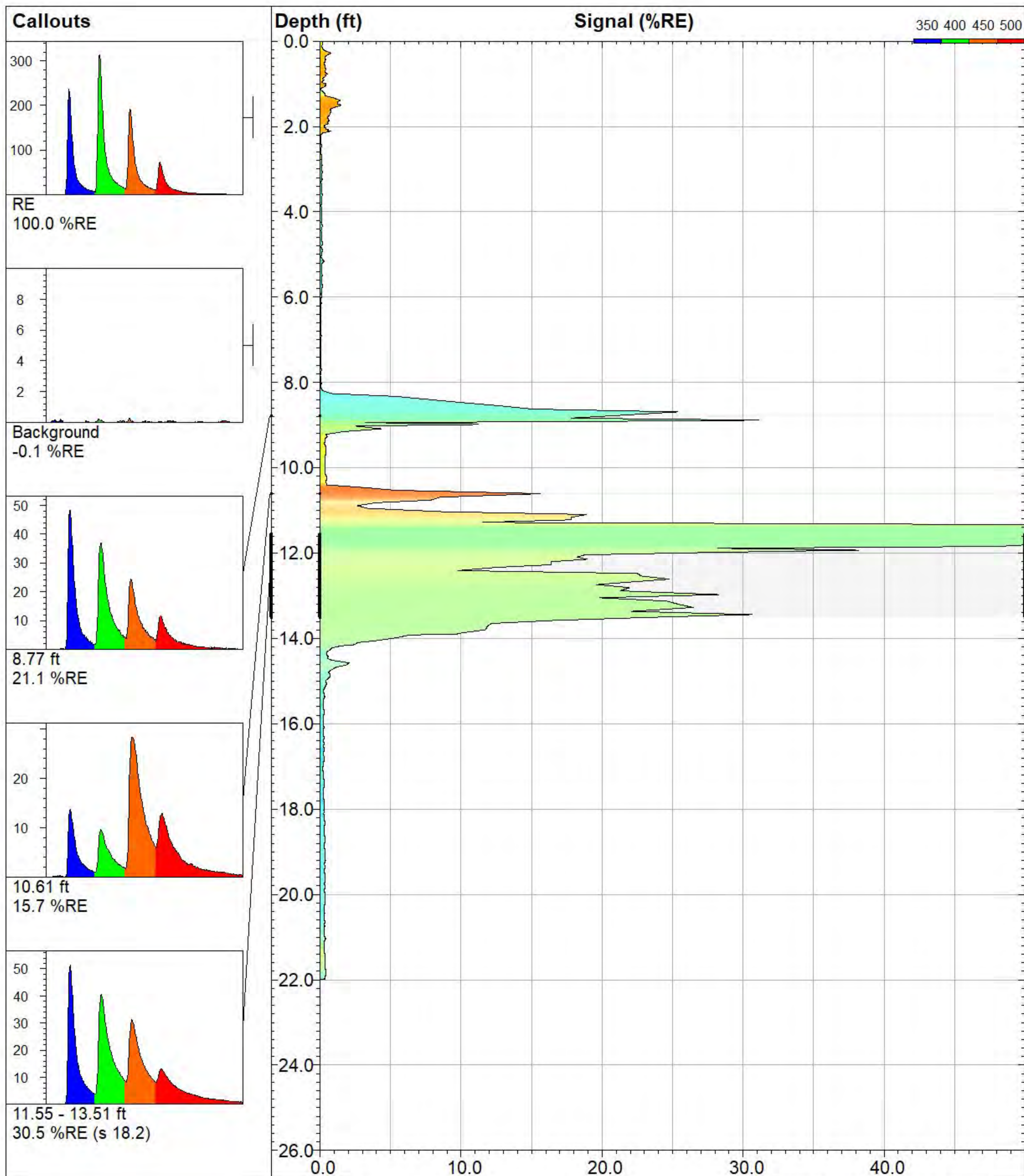
Max signal:
380.8 %RE @ 13.12 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-28 16:03 PDT





A2-09

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.00 ft

Client / Job:
Shannon & Wilson / 3738-

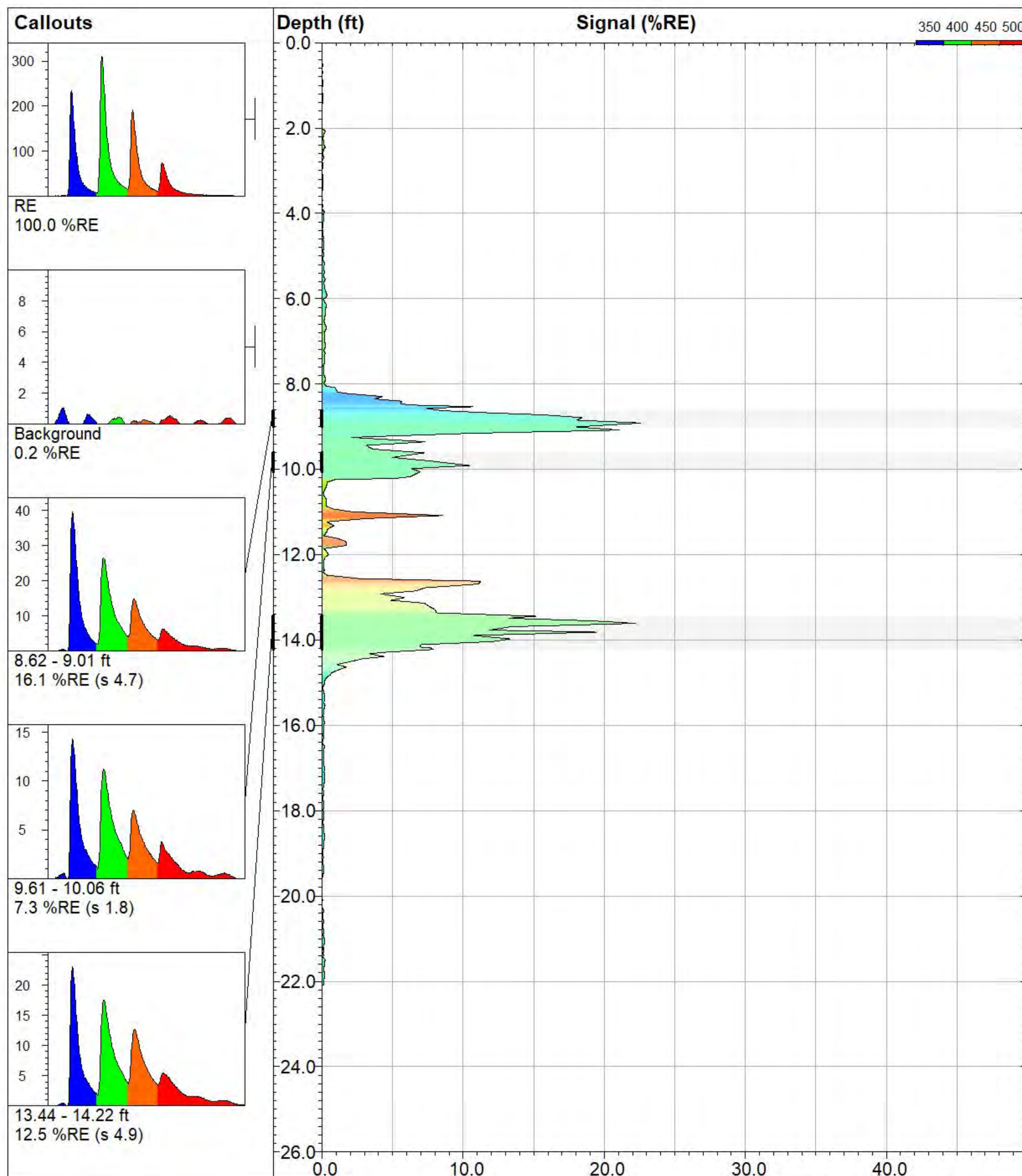
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
76.4 %RE @ 11.60 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-27 16:31 PDT



A2-10

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.08 ft

Client / Job:
Shannon & Wilson / 3738-

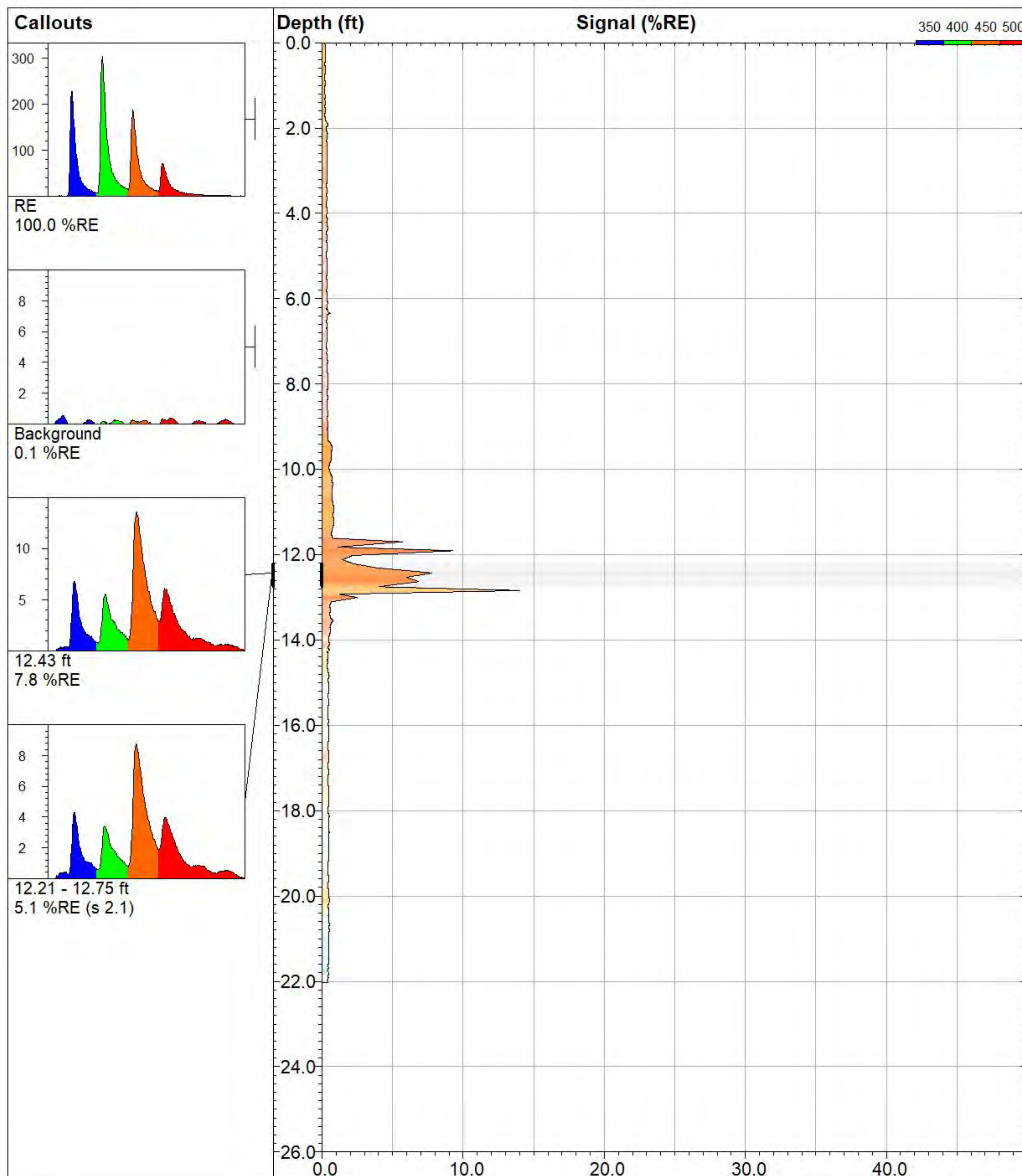
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
22.6 %RE @ 8.91 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-28 15:13 PDT



A2-11

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.02 ft

Client / Job:
Shannon & Wilson / 3738-

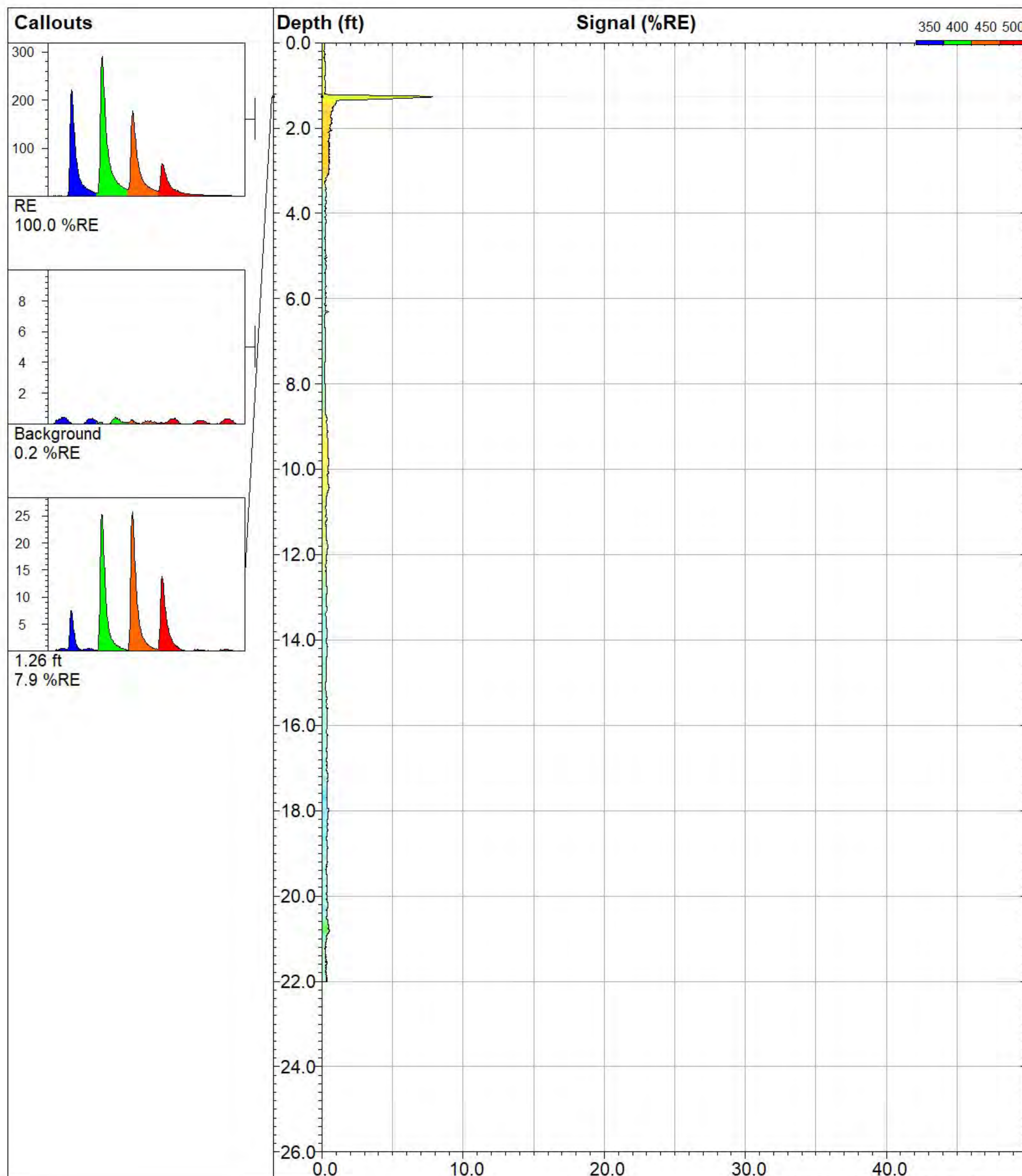
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
14.1 %RE @ 12.84 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-29 11:04 PDT



A2-12

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord. (Lat-N) / System:
Unavailable / NA

Final depth:
22.01 ft

Client / Job:
Shannon & Wilson / 3738-

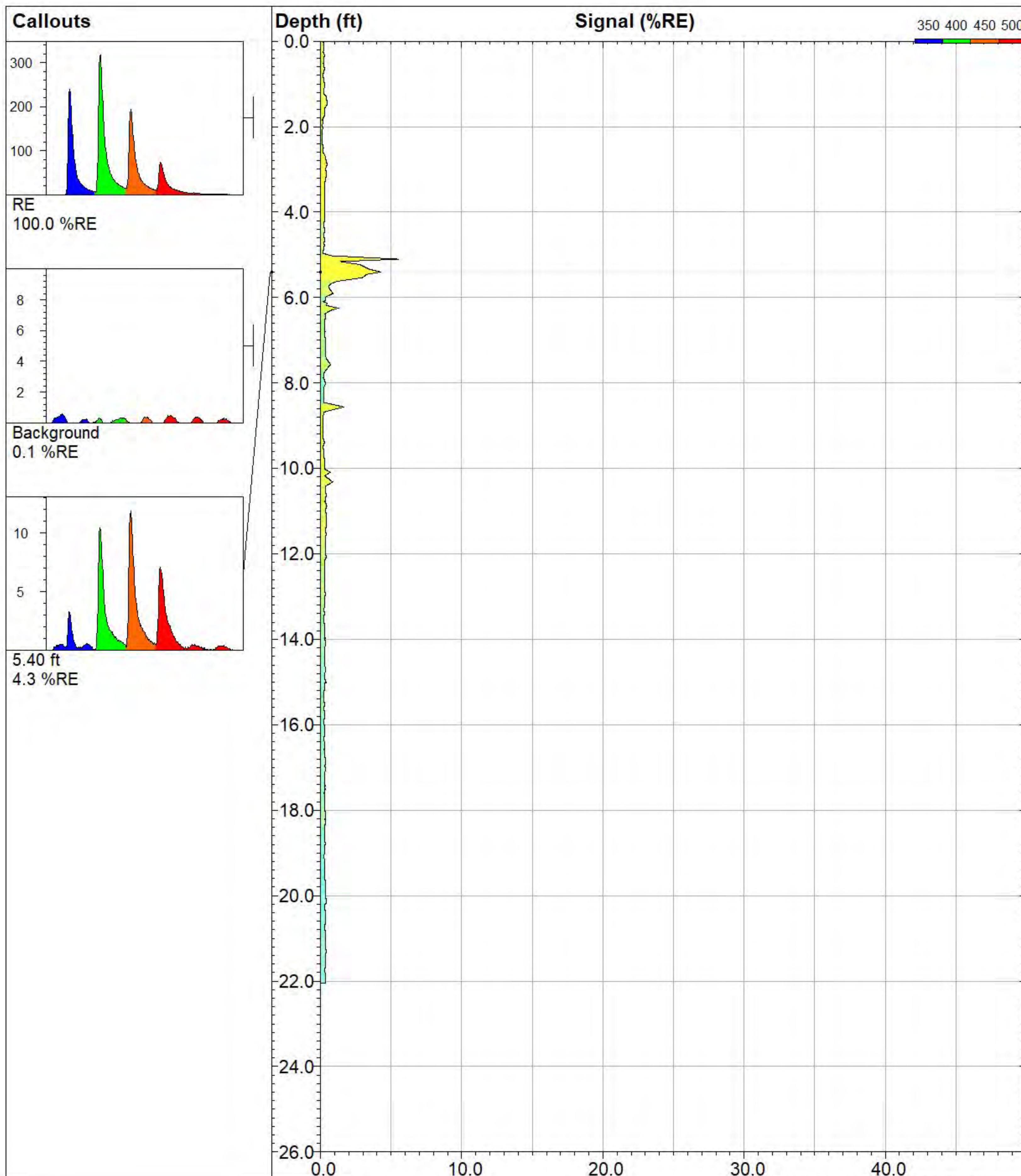
X Coord. (Lng-E) / Fix:
Unavailable / NA

Max signal:
7.9 %RE @ 1.26 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

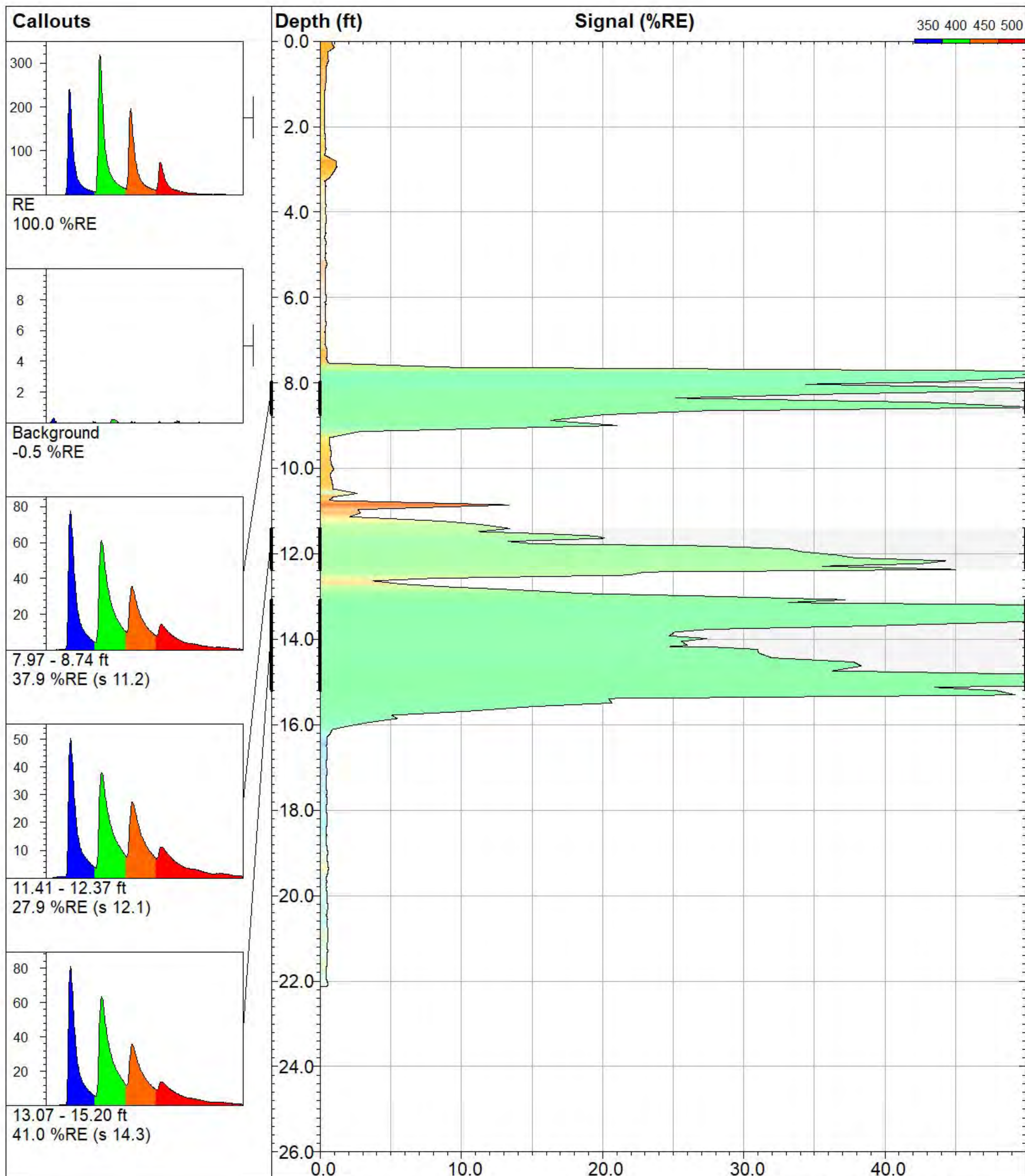
Date & Time:
2020-10-29 13:53 PDT



A2-13

UVOST® By Dakota
www.DakotaTechnologies.com

<i>Site:</i> Jorgensen Forge	<i>Y Coord.(Lat-N) / System:</i> Unavailable / NA	<i>Final depth:</i> 22.06 ft
<i>Client / Job:</i> Shannon & Wilson / 3738-	<i>X Coord.(Lng-E) / Fix:</i> Unavailable / NA	<i>Max signal:</i> 5.6 %RE @ 5.10 ft
<i>Operator / Unit:</i> RSP / UVOST1005	<i>Elevation:</i> Unavailable	<i>Date & Time:</i> 2020-10-29 15:49 PDT



A2-14

UVOST® By Dakota

www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.12 ft

Client / Job:
Shannon & Wilson / 3738-

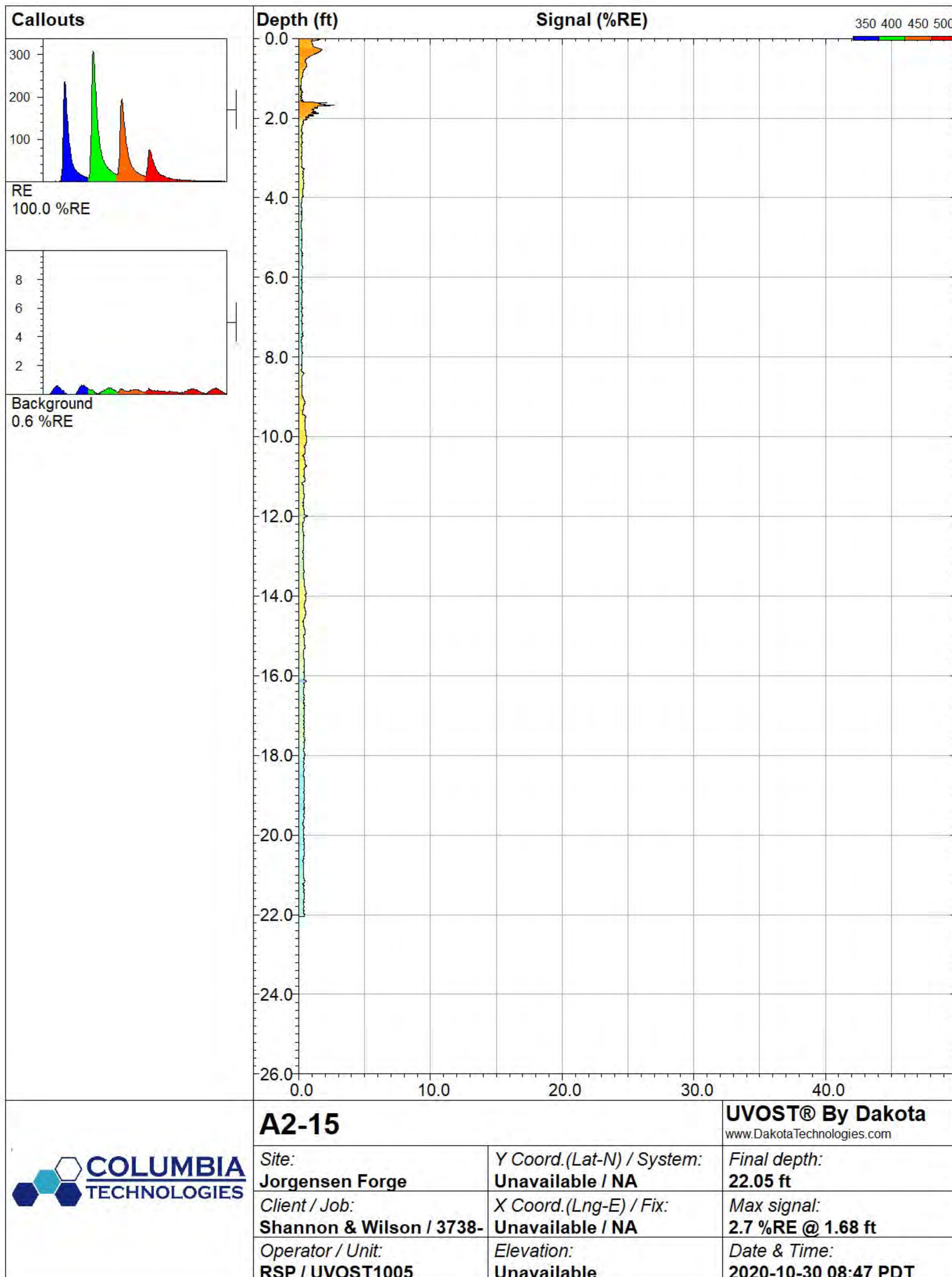
X Coord.(Lng-E) / Fix:
Unavailable / NA

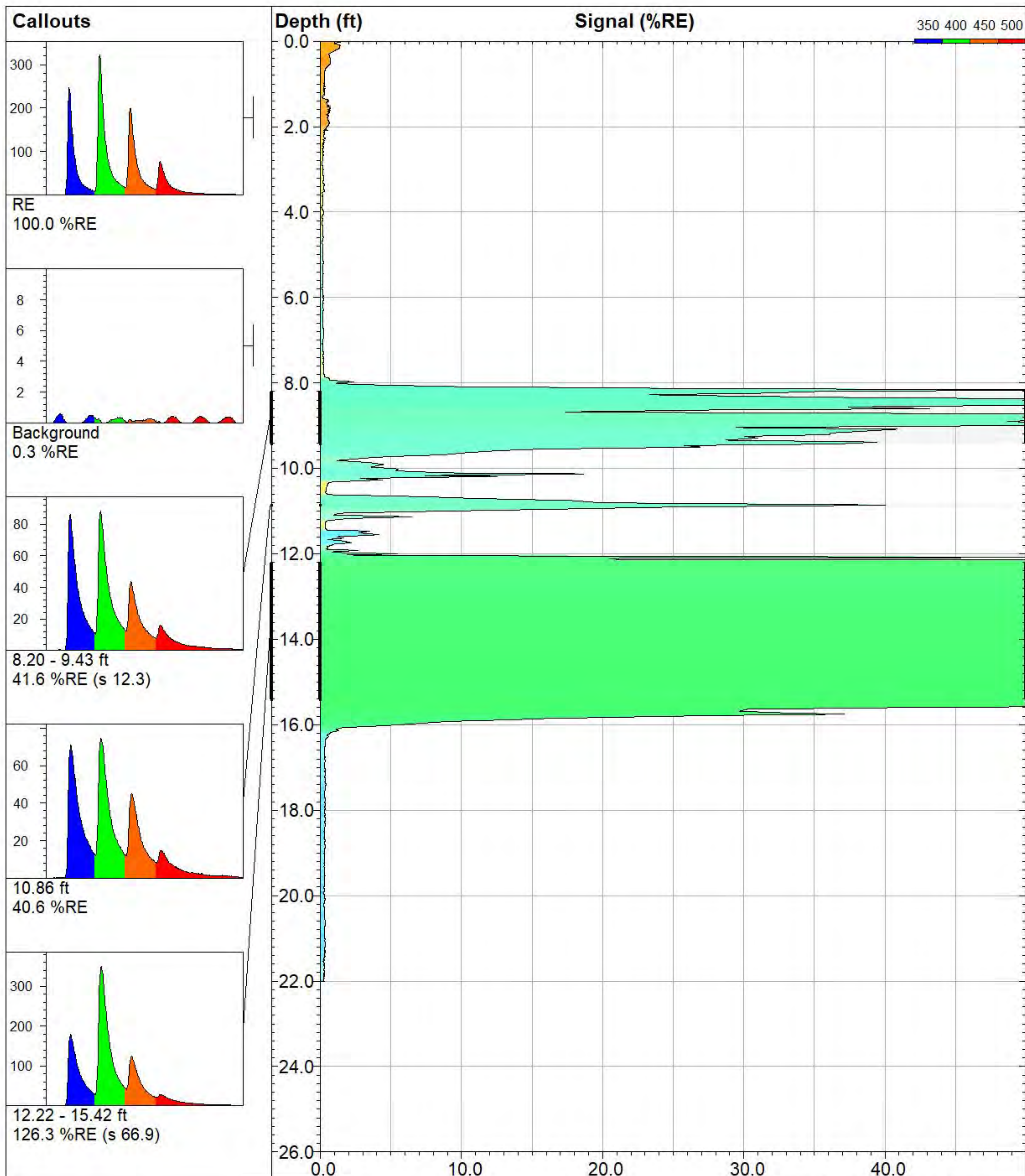
Max signal:
67.8 %RE @ 15.01 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-29 16:23 PDT

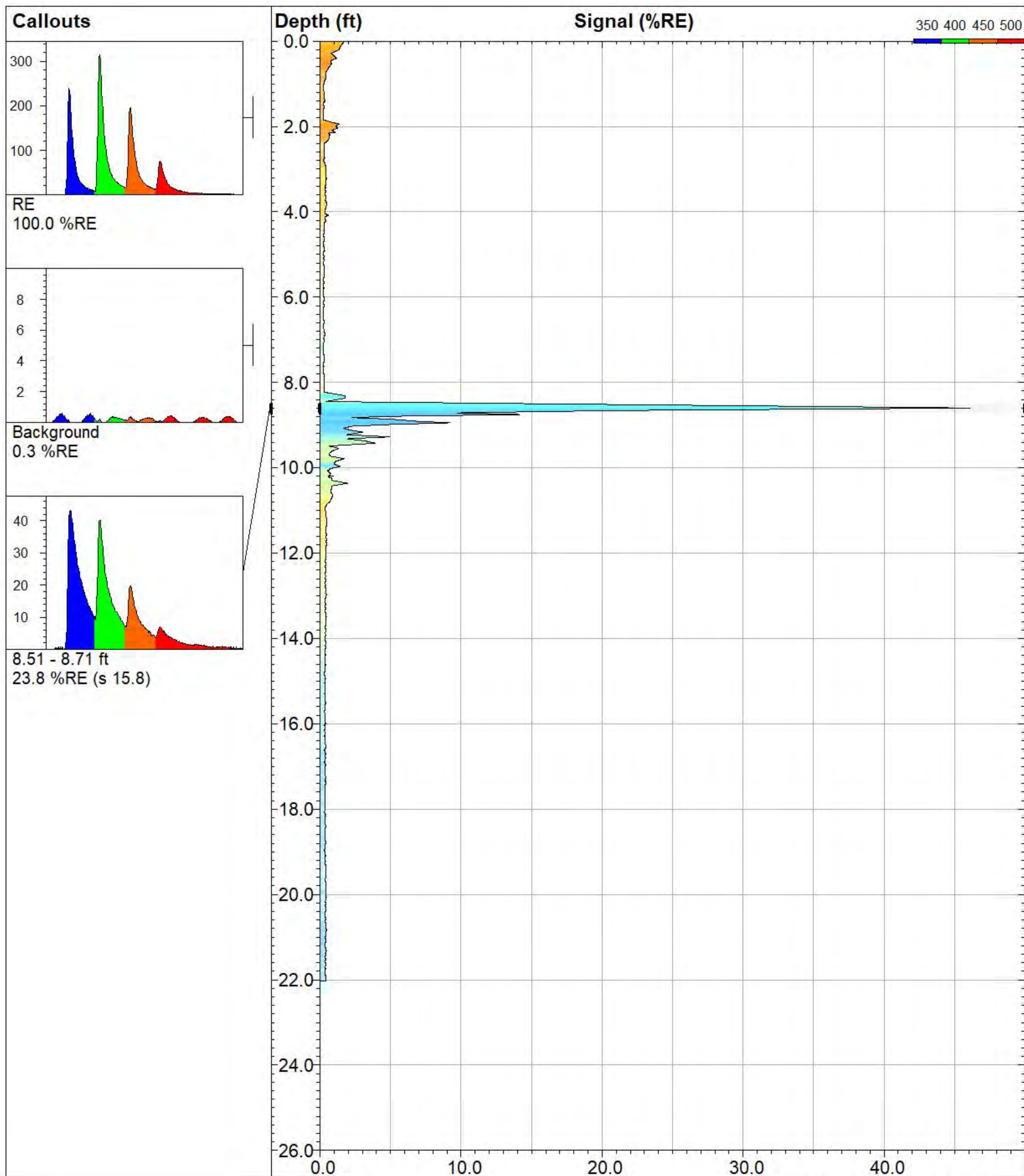




A2-16

UVOST® By Dakota
www.DakotaTechnologies.com

Site: Jorgensen Forge	Y Coord.(Lat-N) / System: Unavailable / NA	Final depth: 22.01 ft
Client / Job: Shannon & Wilson / 3738-	X Coord.(Lng-E) / Fix: Unavailable / NA	Max signal: 389.0 %RE @ 12.48 ft
Operator / Unit: RSP / UVOST1005	Elevation: Unavailable	Date & Time: 2020-10-30 09:31 PDT



A2-17

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.03 ft

Client / Job:
Shannon & Wilson / 3738-

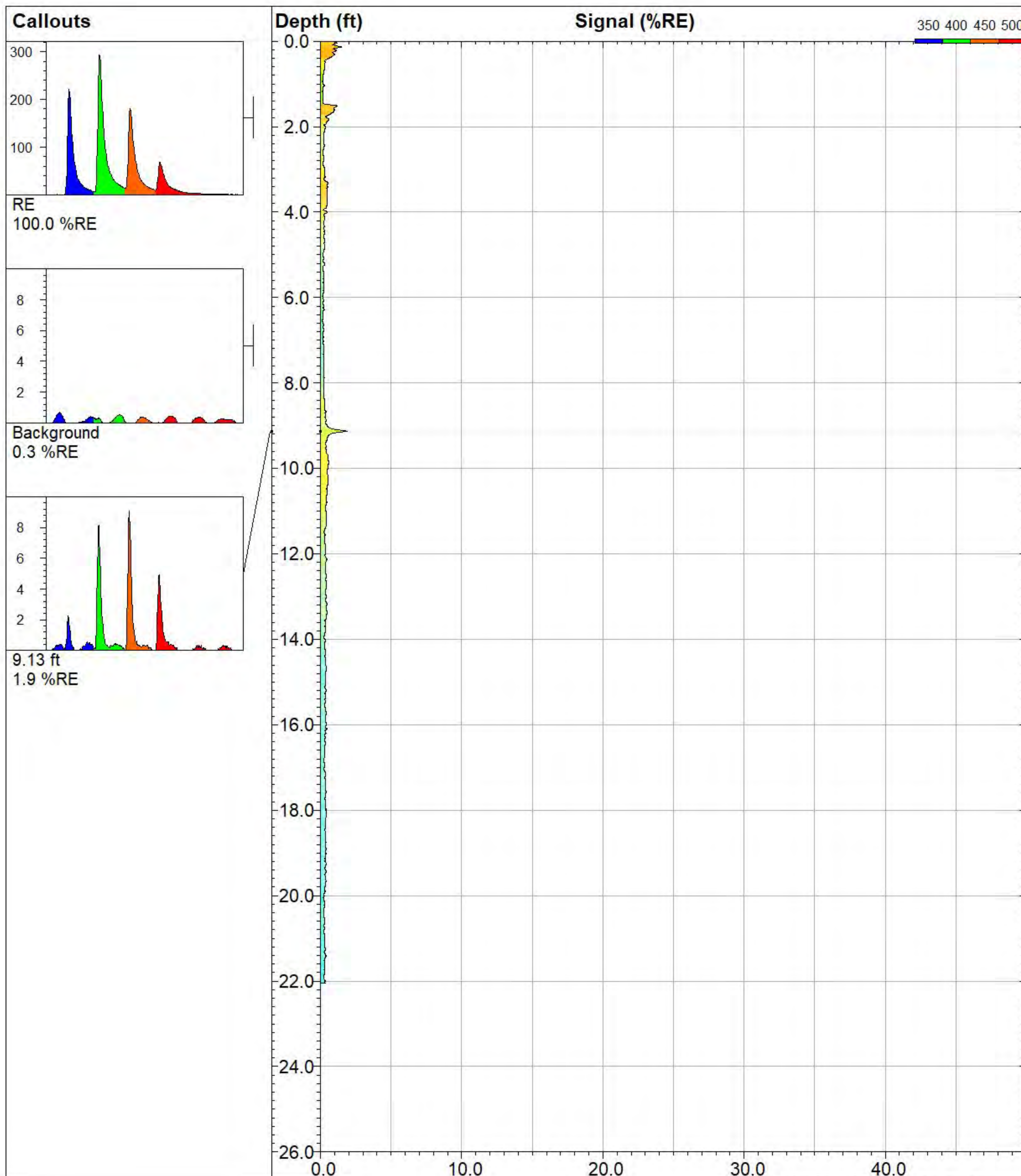
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
46.4 %RE @ 8.60 ft

Operator / Unit:
RSP / UVOST1005

Elevation:
Unavailable

Date & Time:
2020-10-30 10:14 PDT



A2-18

UVOST® By Dakota
www.DakotaTechnologies.com

Site:
Jorgensen Forge

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
22.04 ft

Client / Job:
Shannon & Wilson / 3738-

X Coord.(Lng-E) / Fix:
Unavailable / NA

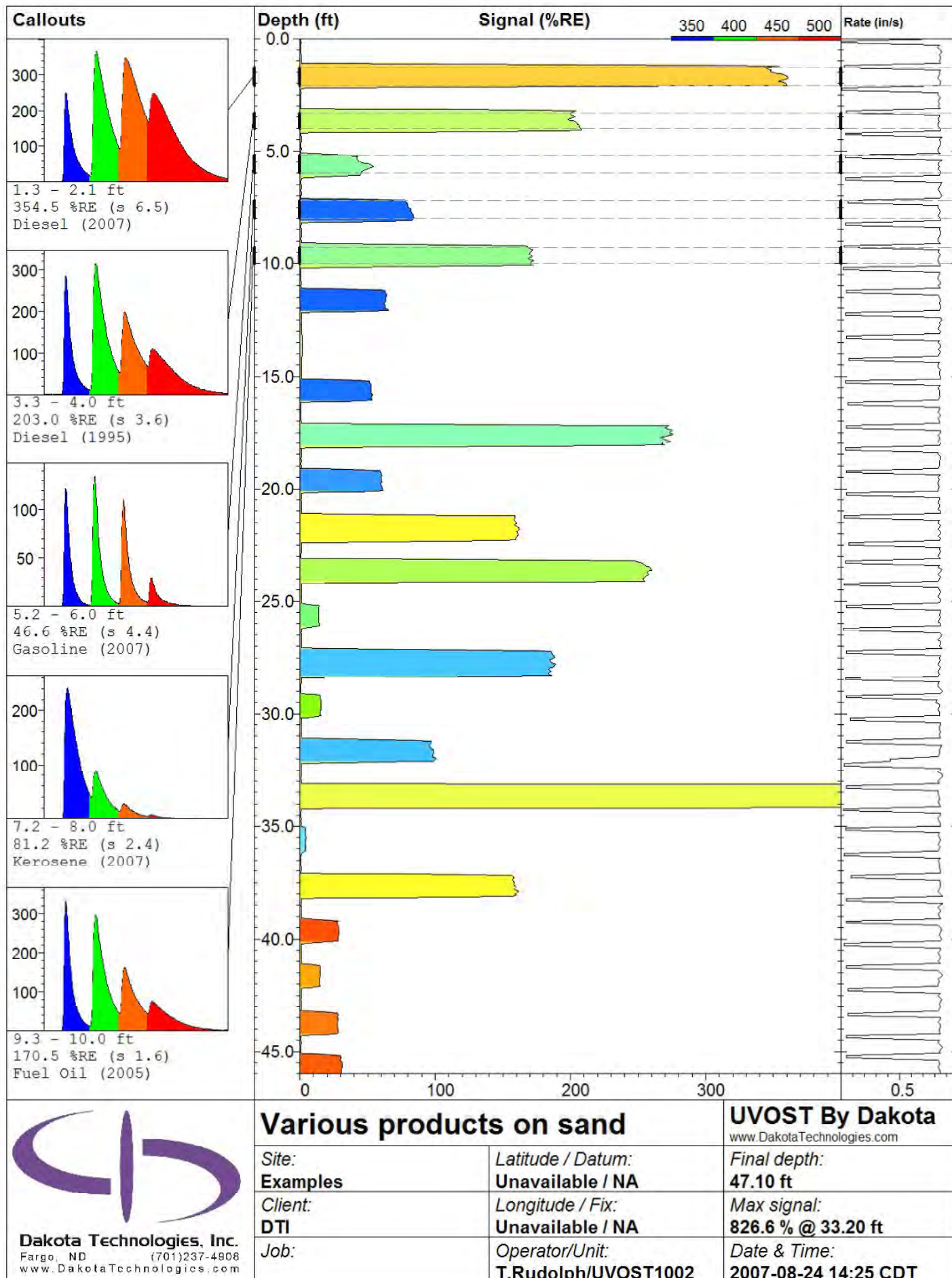
Max signal:
1.9 %RE @ 9.13 ft

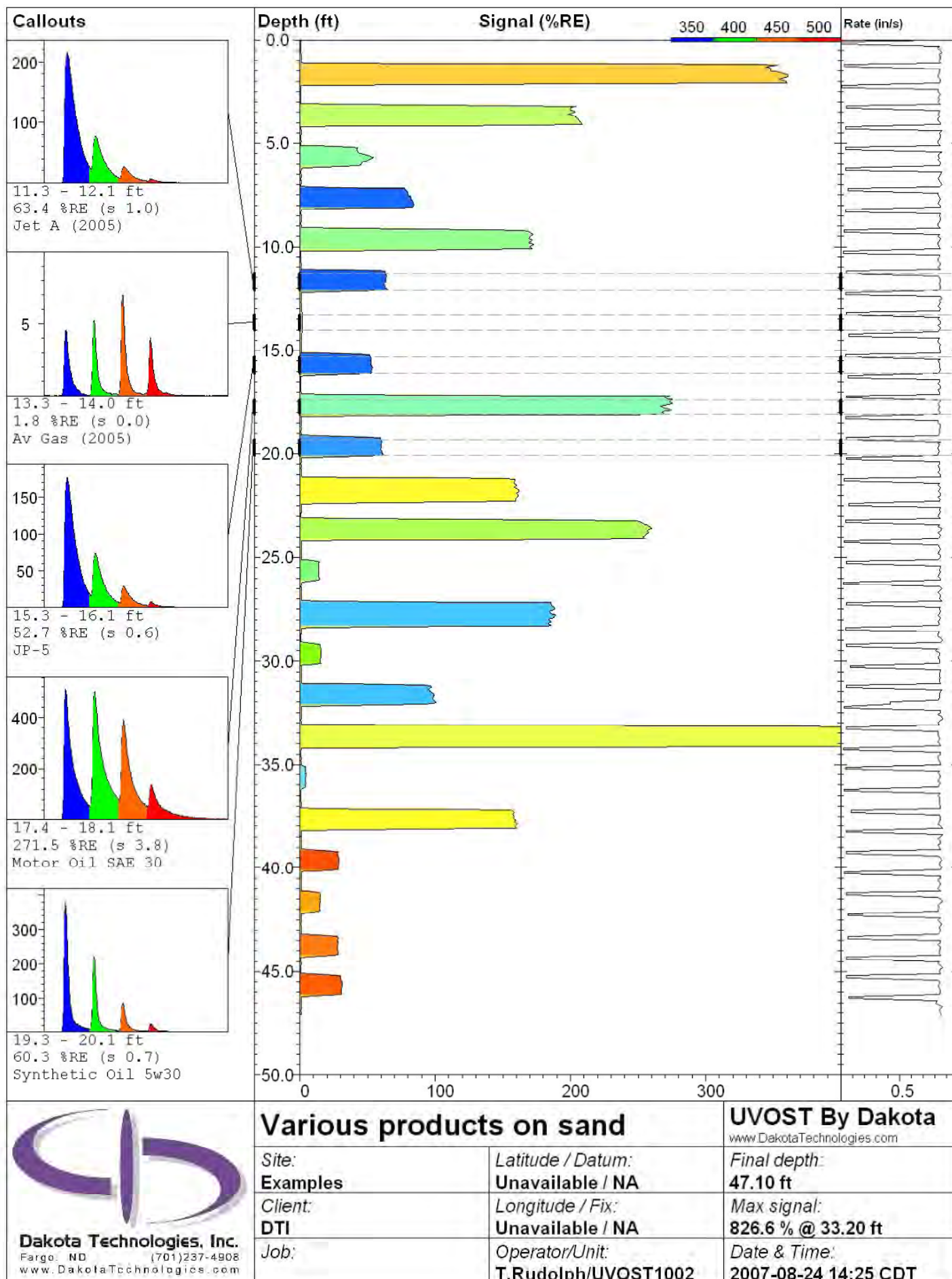
Operator / Unit:
RSP / UVOST1005

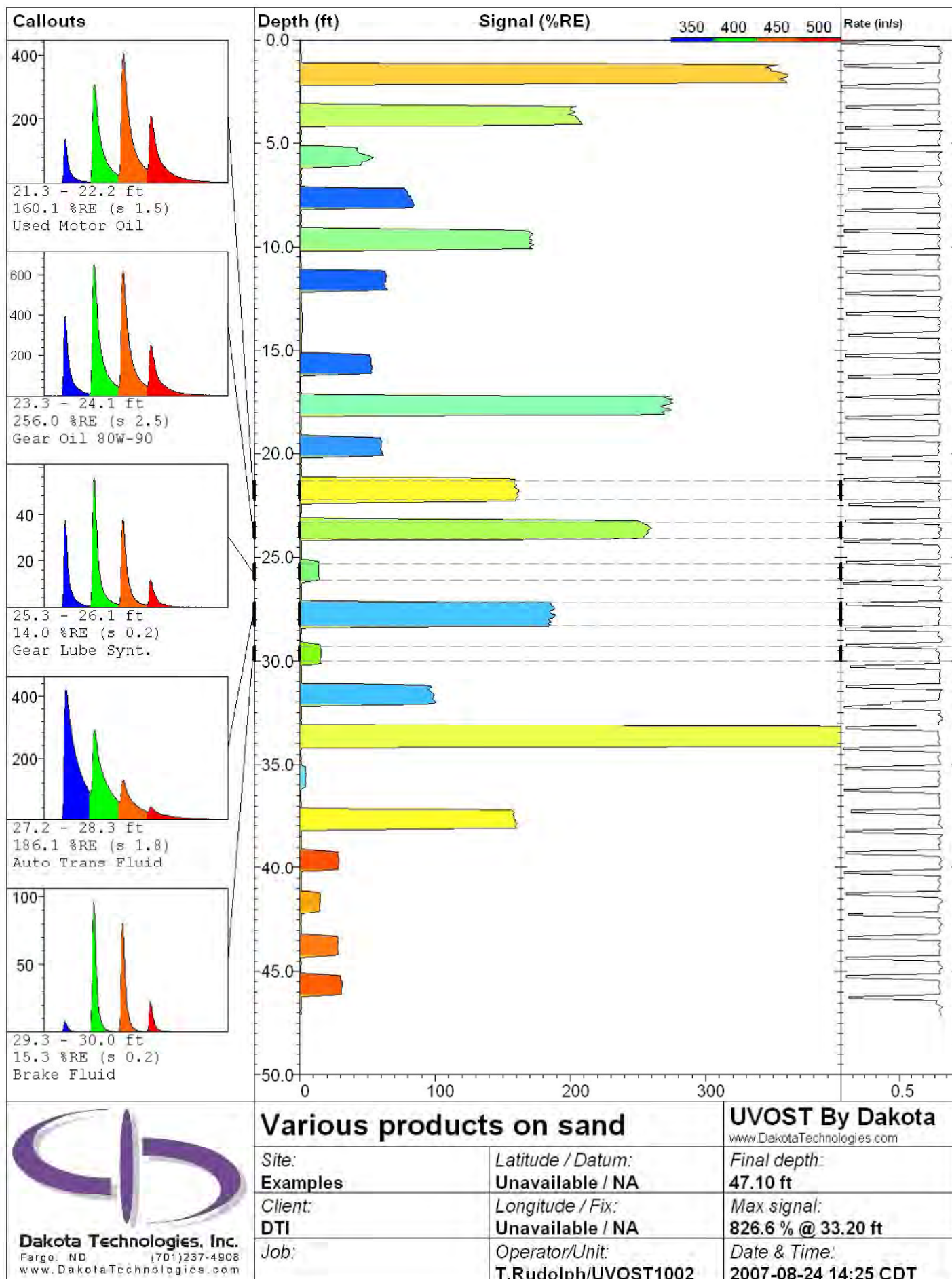
Elevation:
Unavailable

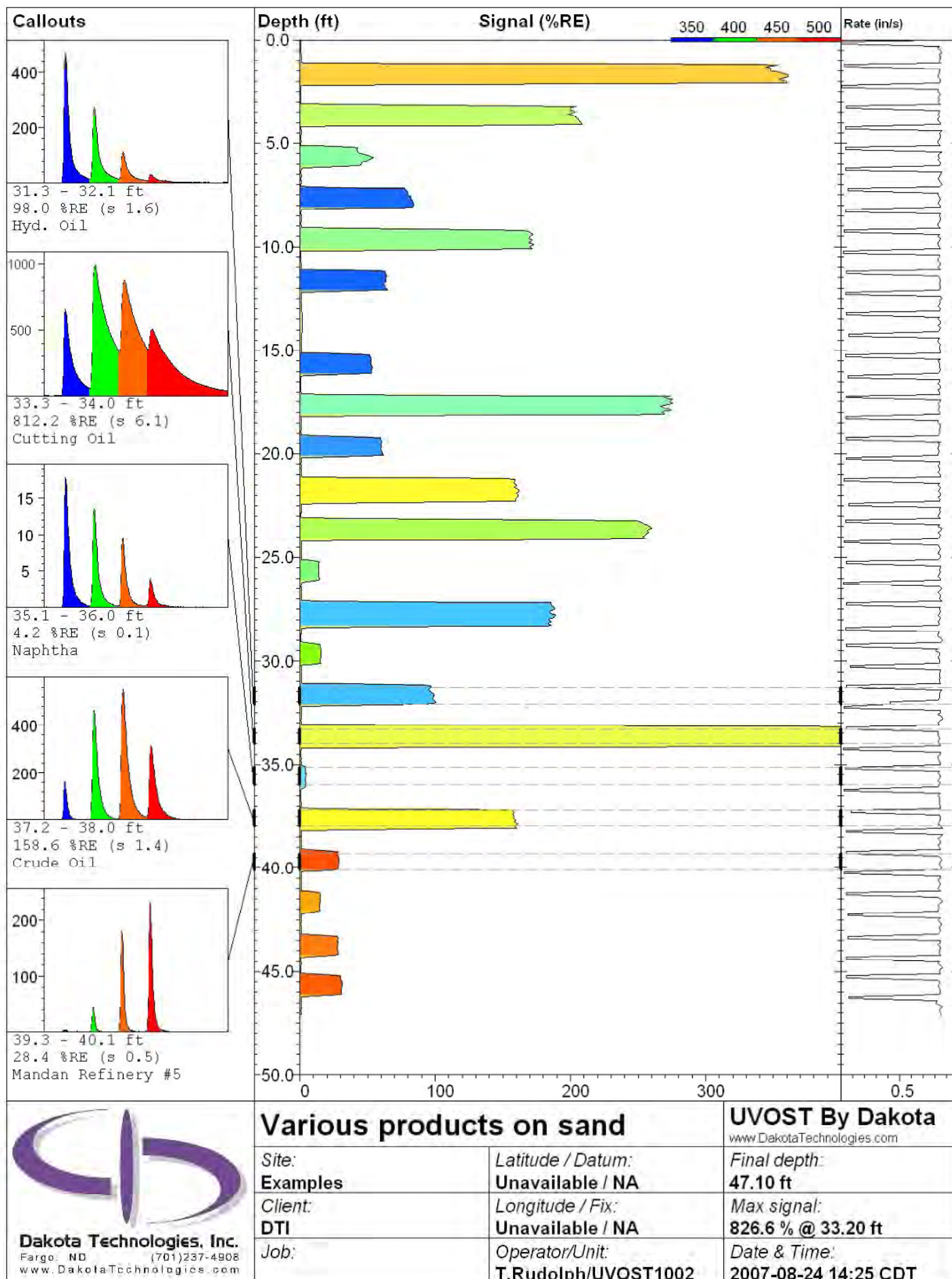
Date & Time:
2020-10-30 10:50 PDT

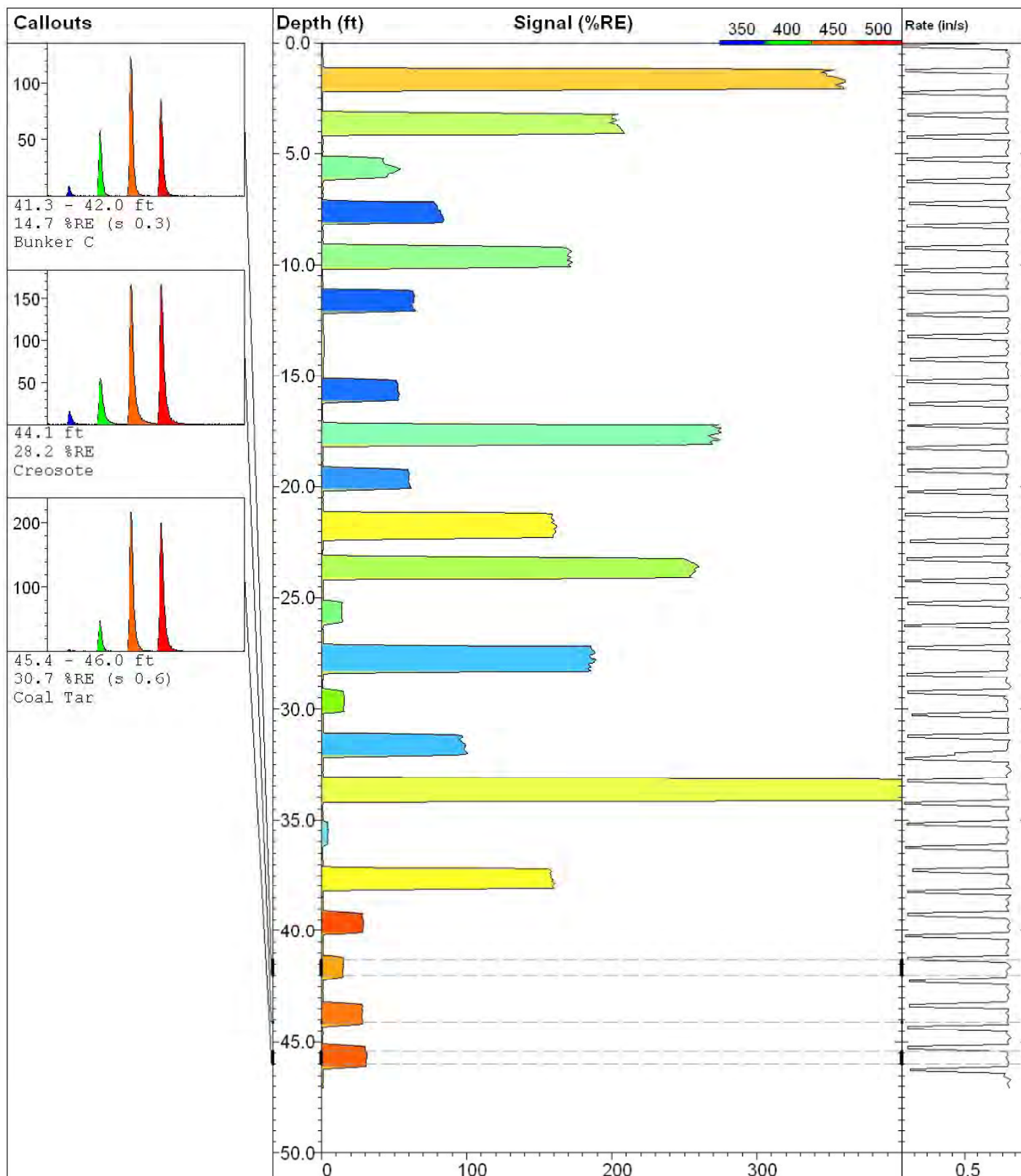
APPENDIX G – UVOST® Response to Various Saturated Products on Wet Sand











 Dakota Technologies, Inc. Fargo, ND (701)237-4908 www.DakotaTechnologies.com	Various products on sand		UVOST By Dakota www.DakotaTechnologies.com
	Site: Examples	Latitude / Datum: Unavailable / NA	Final depth: 47.10 ft
	Client: DTI	Longitude / Fix: Unavailable / NA	Max signal: 826.6 % @ 33.20 ft
	Job:	Operator/Unit: T.Rudolph/UVOST1002	Date & Time: 2007-08-24 14:25 CDT

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Appendix G

Terrestrial Ecological Evaluation Documentation

CONTENTS

- Table G-1: Species List – Terrestrial Flora and Fauna Observed During the December 6, 2021, Field Visit
- Figure G-1: TEE Evaluation Figure

Table G-1: Species List

Terrestrial Flora and Fauna Observed During the December 6, 2021, Field Visit	
Scientific Name	Common Name
Flora	
<i>Arctostaphylos uva-ursi</i>	Kinnikinnik
<i>Buddleia davidii</i> ¹	Butterfly bush
<i>Capsella bursa-pastoris</i>	Shepherd's purse
<i>Cupressaceae</i> spp.	Juniper
<i>Holcus lanatus</i>	Common velvet-grass
<i>Hypericum perforatum</i> ¹	Common St. John's Wort
<i>Pinus</i> spp.	Ornamental Pines
<i>Poa</i> spp.	Bluegrass
<i>Populus balsamifera</i>	Black cottonwood
<i>Prunus lusitanica</i>	Portuguese laurel
<i>Rubus armeniacus</i>	Himalayan blackberry
<i>Rumex acetosella</i>	Sheep sorrel
<i>Rumex crispus</i>	Curled dock
<i>Senecio jacobaea</i>	Tansy ragwort
Fauna	
<i>Columba livia</i>	Rock Pigeon
<i>Corvus brachyrhynchos</i>	American Crow
<i>Junco hyemalis</i>	Dark-eyed junco
Family Laridae	Gulls
<i>Melospiza melodia</i>	Song Sparrow
Family Rodentia ²	Rodents

NOTES:

1 Classified as a Non-regulated Class B and Class C Noxious Weed in King County. Control not required.

2 Only heard, not seen, during site visit.



Notes:

1. "Undeveloped Areas" as defined in Washington Administration Code (WAC) 173-340-7491(1)(c)(iii).
2. Undeveloped Area used in MTCA Table 749-1.

Appendix H

PFAS Investigation Report