

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

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TestAmerica Job ID: 580-80756-2

Client Project/Site: Portland Harbor Pre-Remedial Design

For:
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Authorized for release by:
10/15/2018 2:39:11 PM

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

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Case Narrative

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Job ID: 580-80756-2

Laboratory: TestAmerica Seattle

Narrative

CASE NARRATIVE

Client: AECOM

Project: Portland Harbor Pre-Remedial Design

Report Number: 580-80756-2

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

It should be noted that samples with elevated Reporting Limits (RLs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the RLs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT

Two samples were received on 9/26/2018 12:55 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was -11.0° C.

A sample container was provided to be archived frozen at the TestAmerica Sacramento laboratory pending potential additional analyses.

This report contains results for 1613B Dioxins / Furans, performed at TestAmerica Sacramento.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

DIOXIN/ FURAN

Samples PDI-SG-B258-BL1 (580-80756-1) and PDI-SG-B258-BL1-D (580-80756-2) were analyzed for Dioxin/ Furan in accordance with 1613B. The samples were prepared on 10/05/2018 and analyzed on 10/10/2018.

Several analytes were detected in method blank MB 320-250114/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates, and have been flagged. If the associated sample reported a result above the MDL and/or RL, the result has been flagged.

EPA Method 1613B specifies a +/- 15 second retention time difference between the recovery standard in the initial calibration (ICAL) and the continuing calibration verification (CCV). The 13C-1,2,3,4-TCDD and 13C-1,2,3,7,8,9-HxCDD associated with the following samples run on instrument 10D5 exceeded this criteria: PDI-SG-B258-BL1 (580-80756-1), PDI-SG-B258-BL1-D (580-80756-2), (CCV 320-250803/39), (LCS 320-250114/2-A), (LCSD 320-250114/3-A) and (MB 320-250114/1-A). This retention time shift is due to normal and reasonable column maintenance and does not affect the instrument chromatography resolution, sensitivity, or identification of target analytes. System retention times have been updated for proper analyte identification.

Due to the matrix, the initial volumes used for the following samples deviated from the standard procedure: PDI-SG-B258-BL1 (580-80756-1) and PDI-SG-B258-BL1-D (580-80756-2). The reporting limits (RLs) have been adjusted proportionately.

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

Definitions/Glossary

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Qualifiers

Dioxin

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
q	The reported result is the estimated maximum possible concentration of this analyte, quantitated using the theoretical ion ratio. The measured ion ratio does not meet qualitative identification criteria and indicates a possible interference.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation

These commonly used abbreviations may or may not be present in this report.

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

Client Sample Results

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Client Sample ID: PDI-SG-B258-BL1

Date Collected: 07/20/18 16:50

Date Received: 09/26/18 12:55

Lab Sample ID: 580-80756-1

Matrix: Solid

Percent Solids: 60.8

Method: 1613B - Dioxins and Furans (HRGC/HRMS)

Analyte	Result	Qualifier	RL	EDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,3,4,6,7,8-HpCDD	0.030	B	0.0041	0.00017	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,4,6,7,8-HpCDF	0.0054	q B	0.0041	0.00011	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,4,7,8,9-HpCDF	0.0015	J B	0.0041	0.00012	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,4,7,8-HxCDD	0.00046	J B	0.0041	0.000039	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,4,7,8-HxCDF	0.00070	J B	0.0041	0.000081	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,6,7,8-HxCDD	0.0014	J B	0.0041	0.000038	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,6,7,8-HxCDF	0.00045	J B	0.0041	0.000074	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,7,8,9-HxCDD	0.0011	J	0.0041	0.000036	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,7,8,9-HxCDF	0.0015	J B	0.0041	0.000046	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,7,8-PeCDD	0.00027	J B	0.0041	0.000031	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
1,2,3,7,8-PeCDF	0.00030	J B	0.0041	0.000045	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
2,3,4,6,7,8-HxCDF	0.00022	J	0.0041	0.000051	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
2,3,4,7,8-PeCDF	ND		0.0041	0.000049	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
2,3,7,8-TCDD	0.00016	J q	0.00082	0.000028	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
2,3,7,8-TCDF	0.00040	J B	0.00082	0.000031	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
OCDD	0.30	B	0.0082	0.00015	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
OCDF	0.018	B	0.0082	0.000047	ug/Kg	✉	10/05/18 16:22	10/10/18 01:27	1
Isotope Dilution	%Recovery	Qualifier		Limits			Prepared	Analyzed	Dil Fac
13C-1,2,3,4,6,7,8-HpCDD	46			23 - 140			10/05/18 16:22	10/10/18 01:27	1
13C-1,2,3,4,6,7,8-HpCDF	37			28 - 143			10/05/18 16:22	10/10/18 01:27	1
13C-1,2,3,4,7,8,9-HpCDF	47			26 - 138			10/05/18 16:22	10/10/18 01:27	1
13C-1,2,3,4,7,8-HxCDD	45			32 - 141			10/05/18 16:22	10/10/18 01:27	1
13C-1,2,3,4,7,8-HxCDF	43			26 - 152			10/05/18 16:22	10/10/18 01:27	1
13C-1,2,3,6,7,8-HxCDD	44			28 - 130			10/05/18 16:22	10/10/18 01:27	1
13C-1,2,3,6,7,8-HxCDF	42			26 - 123			10/05/18 16:22	10/10/18 01:27	1
13C-1,2,3,7,8,9-HxCDF	52			29 - 147			10/05/18 16:22	10/10/18 01:27	1
13C-1,2,3,7,8-PeCDD	51			25 - 181			10/05/18 16:22	10/10/18 01:27	1
13C-1,2,3,7,8-PeCDF	51			24 - 185			10/05/18 16:22	10/10/18 01:27	1
13C-2,3,4,6,7,8-HxCDF	46			28 - 136			10/05/18 16:22	10/10/18 01:27	1
13C-2,3,4,7,8-PeCDF	52			21 - 178			10/05/18 16:22	10/10/18 01:27	1
13C-2,3,7,8-TCDD	56			25 - 164			10/05/18 16:22	10/10/18 01:27	1
13C-2,3,7,8-TCDF	60			24 - 169			10/05/18 16:22	10/10/18 01:27	1
13C-OCDD	41			17 - 157			10/05/18 16:22	10/10/18 01:27	1
Surrogate	%Recovery	Qualifier		Limits			Prepared	Analyzed	Dil Fac
37Cl4-2,3,7,8-TCDD	95			35 - 197			10/05/18 16:22	10/10/18 01:27	1

TestAmerica Seattle

Client Sample Results

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Client Sample ID: PDI-SG-B258-BL1-D

Date Collected: 07/20/18 16:50

Date Received: 09/26/18 12:55

Lab Sample ID: 580-80756-2

Matrix: Solid

Percent Solids: 59.9

Method: 1613B - Dioxins and Furans (HRGC/HRMS)

Analyte	Result	Qualifier	RL	EDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,3,4,6,7,8-HxCDD	0.042	B	0.0041	0.00020	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,4,6,7,8-HxCDF	0.0071	B q	0.0041	0.00013	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,4,7,8,9-HxCDF	0.0016	J B	0.0041	0.00012	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,4,7,8-HxCDD	0.00063	J B	0.0041	0.000046	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,4,7,8-HxCDF	0.00070	J B	0.0041	0.000081	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,6,7,8-HxCDD	0.0021	J B	0.0041	0.000044	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,6,7,8-HxCDF	0.00049	J B	0.0041	0.000073	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,7,8,9-HxCDD	0.0014	J	0.0041	0.000042	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,7,8,9-HxCDF	0.0016	J B	0.0041	0.000048	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,7,8-PeCDD	0.00038	J B	0.0041	0.000043	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
1,2,3,7,8-PeCDF	0.00032	J B	0.0041	0.000037	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
2,3,4,6,7,8-HxCDF	0.00025	J	0.0041	0.000052	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
2,3,4,7,8-PeCDF	0.00021	J B q	0.0041	0.000038	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
2,3,7,8-TCDD	0.00024	J q	0.00082	0.000028	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
2,3,7,8-TCDF	0.00050	J B	0.00082	0.000034	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
OCDD	0.39	B	0.0082	0.00016	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
OCDF	0.025	B	0.0082	0.000040	ug/Kg	✉	10/05/18 16:22	10/10/18 02:13	1
Isotope Dilution	%Recovery	Qualifier		Limits			Prepared	Analyzed	Dil Fac
13C-1,2,3,4,6,7,8-HxCDD	51			23 - 140			10/05/18 16:22	10/10/18 02:13	1
13C-1,2,3,4,6,7,8-HxCDF	40			28 - 143			10/05/18 16:22	10/10/18 02:13	1
13C-1,2,3,4,7,8,9-HxCDF	52			26 - 138			10/05/18 16:22	10/10/18 02:13	1
13C-1,2,3,4,7,8-HxCDD	52			32 - 141			10/05/18 16:22	10/10/18 02:13	1
13C-1,2,3,4,7,8-HxCDF	49			26 - 152			10/05/18 16:22	10/10/18 02:13	1
13C-1,2,3,6,7,8-HxCDD	51			28 - 130			10/05/18 16:22	10/10/18 02:13	1
13C-1,2,3,6,7,8-HxCDF	47			26 - 123			10/05/18 16:22	10/10/18 02:13	1
13C-1,2,3,7,8,9-HxCDF	57			29 - 147			10/05/18 16:22	10/10/18 02:13	1
13C-1,2,3,7,8-PeCDD	55			25 - 181			10/05/18 16:22	10/10/18 02:13	1
13C-1,2,3,7,8-PeCDF	55			24 - 185			10/05/18 16:22	10/10/18 02:13	1
13C-2,3,4,6,7,8-HxCDF	50			28 - 136			10/05/18 16:22	10/10/18 02:13	1
13C-2,3,4,7,8-PeCDF	57			21 - 178			10/05/18 16:22	10/10/18 02:13	1
13C-2,3,7,8-TCDD	60			25 - 164			10/05/18 16:22	10/10/18 02:13	1
13C-2,3,7,8-TCDF	63			24 - 169			10/05/18 16:22	10/10/18 02:13	1
13C-OCDD	49			17 - 157			10/05/18 16:22	10/10/18 02:13	1
Surrogate	%Recovery	Qualifier		Limits			Prepared	Analyzed	Dil Fac
37Cl4-2,3,7,8-TCDD	95			35 - 197			10/05/18 16:22	10/10/18 02:13	1

TestAmerica Seattle

QC Sample Results

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Method: 1613B - Dioxins and Furans (HRGC/HRMS)

Lab Sample ID: MB 320-250114/1-A

Matrix: Solid

Analysis Batch: 250803

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 250114

Analyte	MB	MB	RL	EDL	Unit	D	Prepared	Analyzed	Dil Fac	
	Result	Qualifier								
1,2,3,4,6,7,8-HpCDD	0.000189	J q	0.0050	0.000016	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,4,6,7,8-HpCDF	0.000205	J	0.0050	0.000026	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,4,7,8,9-HpCDF	0.000724	J	0.0050	0.000035	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,4,7,8-HxCDD	0.000148	J	0.0050	0.000018	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,4,7,8-HxCDF	0.0000995	J q	0.0050	0.000043	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,6,7,8-HxCDD	0.0000589	J	0.0050	0.000017	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,6,7,8-HxCDF	0.0000847	J	0.0050	0.000040	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,7,8,9-HxCDD	ND		0.0050	0.000016	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,7,8,9-HxCDF	0.00105	J	0.0050	0.000029	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,7,8-PeCDD	0.0000395	J q	0.0050	0.000020	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
1,2,3,7,8-PeCDF	0.000128	J	0.0050	0.000021	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
2,3,4,6,7,8-HxCDF	ND		0.0050	0.000029	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
2,3,4,7,8-PeCDF	0.0000504	J	0.0050	0.000024	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
2,3,7,8-TCDD	ND		0.0010	0.000024	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
2,3,7,8-TCDF	0.0000589	J	0.0010	0.000011	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
OCDD	0.00169	J	0.010	0.000027	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
OCDF	0.000394	J	0.010	0.000027	ug/Kg	10/05/18 16:22	10/09/18 21:37		1	
MB MB		MB MB		MB MB		MB MB		MB MB		
Isotope Dilution	%Recovery	Qualifier	Limits					Prepared	Analyzed	Dil Fac
13C-1,2,3,4,6,7,8-HpCDD	79		23 - 140					10/05/18 16:22	10/09/18 21:37	1
13C-1,2,3,4,6,7,8-HpCDF	76		28 - 143					10/05/18 16:22	10/09/18 21:37	1
13C-1,2,3,4,7,8,9-HpCDF	77		26 - 138					10/05/18 16:22	10/09/18 21:37	1
13C-1,2,3,4,7,8-HxCDD	74		32 - 141					10/05/18 16:22	10/09/18 21:37	1
13C-1,2,3,4,7,8-HxCDF	69		26 - 152					10/05/18 16:22	10/09/18 21:37	1
13C-1,2,3,6,7,8-HxCDD	73		28 - 130					10/05/18 16:22	10/09/18 21:37	1
13C-1,2,3,6,7,8-HxCDF	69		26 - 123					10/05/18 16:22	10/09/18 21:37	1
13C-1,2,3,7,8,9-HxCDF	76		29 - 147					10/05/18 16:22	10/09/18 21:37	1
13C-1,2,3,7,8-PeCDD	73		25 - 181					10/05/18 16:22	10/09/18 21:37	1
13C-1,2,3,7,8-PeCDF	73		24 - 185					10/05/18 16:22	10/09/18 21:37	1
13C-2,3,4,6,7,8-HxCDF	69		28 - 136					10/05/18 16:22	10/09/18 21:37	1
13C-2,3,4,7,8-PeCDF	72		21 - 178					10/05/18 16:22	10/09/18 21:37	1
13C-2,3,7,8-TCDD	75		25 - 164					10/05/18 16:22	10/09/18 21:37	1
13C-2,3,7,8-TCDF	71		24 - 169					10/05/18 16:22	10/09/18 21:37	1
13C-OCDD	80		17 - 157					10/05/18 16:22	10/09/18 21:37	1
MB MB		MB MB		MB MB		MB MB		MB MB		
Surrogate	%Recovery	Qualifier	Limits					Prepared	Analyzed	Dil Fac
37Cl4-2,3,7,8-TCDD	96		35 - 197					10/05/18 16:22	10/09/18 21:37	1

Lab Sample ID: LCS 320-250114/2-A

Matrix: Solid

Analysis Batch: 250803

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 250114

Analyte	Spike	LCS	LCS	Unit	D	%Rec	Limits
	Added	Result	Qualifier				
1,2,3,4,6,7,8-HpCDD	0.100	0.104		ug/Kg	104	70 - 140	
1,2,3,4,6,7,8-HpCDF	0.100	0.106		ug/Kg	106	82 - 122	
1,2,3,4,7,8,9-HpCDF	0.100	0.106		ug/Kg	106	78 - 138	
1,2,3,4,7,8-HxCDD	0.100	0.103		ug/Kg	103	70 - 164	
1,2,3,4,7,8-HxCDF	0.100	0.103		ug/Kg	103	72 - 134	

TestAmerica Seattle

QC Sample Results

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Method: 1613B - Dioxins and Furans (HRGC/HRMS) (Continued)

Lab Sample ID: LCS 320-250114/2-A

Matrix: Solid

Analysis Batch: 250803

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 250114

%Rec.

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
1,2,3,6,7,8-HxCDD	0.100	0.104		ug/Kg		104	76 - 134
1,2,3,6,7,8-HxCDF	0.100	0.103		ug/Kg		103	84 - 130
1,2,3,7,8,9-HxCDD	0.100	0.108		ug/Kg		108	64 - 162
1,2,3,7,8,9-HxCDF	0.100	0.109		ug/Kg		109	78 - 130
1,2,3,7,8-PeCDD	0.100	0.105		ug/Kg		105	70 - 142
1,2,3,7,8-PeCDF	0.100	0.105		ug/Kg		105	80 - 134
2,3,4,6,7,8-HxCDF	0.100	0.102		ug/Kg		102	70 - 156
2,3,4,7,8-PeCDF	0.100	0.103		ug/Kg		103	68 - 160
2,3,7,8-TCDD	0.0200	0.0202		ug/Kg		101	67 - 158
2,3,7,8-TCDF	0.0200	0.0203		ug/Kg		101	75 - 158
OCDD	0.200	0.207		ug/Kg		103	78 - 144
OCDF	0.200	0.200		ug/Kg		100	63 - 170

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C-1,2,3,4,6,7,8-HpCDD	71		26 - 166
13C-1,2,3,4,6,7,8-HpCDF	68		21 - 158
13C-1,2,3,4,7,8,9-HpCDF	69		20 - 186
13C-1,2,3,4,7,8-HxCDD	66		21 - 193
13C-1,2,3,4,7,8-HxCDF	63		19 - 202
13C-1,2,3,6,7,8-HxCDD	66		25 - 163
13C-1,2,3,6,7,8-HxCDF	63		21 - 159
13C-1,2,3,7,8,9-HxCDF	69		17 - 205
13C-1,2,3,7,8-PeCDD	66		21 - 227
13C-1,2,3,7,8-PeCDF	65		21 - 192
13C-2,3,4,6,7,8-HxCDF	62		22 - 176
13C-2,3,4,7,8-PeCDF	65		13 - 328
13C-2,3,7,8-TCDD	68		20 - 175
13C-2,3,7,8-TCDF	66		22 - 152
13C-OCDD	72		13 - 199

Surrogate	LCS %Recovery	LCS Qualifier	Limits
37Cl4-2,3,7,8-TCDD	96		31 - 191

Lab Sample ID: LCSD 320-250114/3-A

Matrix: Solid

Analysis Batch: 250803

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 250114

%Rec.

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
1,2,3,4,6,7,8-HpCDD	0.100	0.104		ug/Kg		104	70 - 140	0	50
1,2,3,4,6,7,8-HpCDF	0.100	0.105		ug/Kg		105	82 - 122	0	50
1,2,3,4,7,8,9-HpCDF	0.100	0.105		ug/Kg		105	78 - 138	1	50
1,2,3,4,7,8-HxCDD	0.100	0.102		ug/Kg		102	70 - 164	1	50
1,2,3,4,7,8-HxCDF	0.100	0.103		ug/Kg		103	72 - 134	1	50
1,2,3,6,7,8-HxCDD	0.100	0.105		ug/Kg		105	76 - 134	0	50
1,2,3,6,7,8-HxCDF	0.100	0.104		ug/Kg		104	84 - 130	2	50
1,2,3,7,8,9-HxCDD	0.100	0.106		ug/Kg		106	64 - 162	1	50
1,2,3,7,8,9-HxCDF	0.100	0.108		ug/Kg		108	78 - 130	1	50
1,2,3,7,8-PeCDD	0.100	0.104		ug/Kg		104	70 - 142	1	50

TestAmerica Seattle

QC Sample Results

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Method: 1613B - Dioxins and Furans (HRGC/HRMS) (Continued)

Lab Sample ID: LCSD 320-250114/3-A

Matrix: Solid

Analysis Batch: 250803

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 250114

Analyte	Spike	LCSD	LCSD	Unit	D	%Rec	Limits	RPD	Limit
	Added	Result	Qualifier						
1,2,3,7,8-PeCDF	0.100	0.104		ug/Kg		104	80 - 134	1	50
2,3,4,6,7,8-HxCDF	0.100	0.101		ug/Kg		101	70 - 156	1	50
2,3,4,7,8-PeCDF	0.100	0.104		ug/Kg		104	68 - 160	1	50
2,3,7,8-TCDD	0.0200	0.0203		ug/Kg		101	67 - 158	0	50
2,3,7,8-TCDF	0.0200	0.0206		ug/Kg		103	75 - 158	2	50
OCDD	0.200	0.208		ug/Kg		104	78 - 144	1	50
OCDF	0.200	0.203		ug/Kg		101	63 - 170	1	50
<hr/>									
Isotope Dilution	LCSD	LCSD	Limits						
	%Recovery	Qualifier							
13C-1,2,3,4,6,7,8-HpCDD	78		26 - 166						
13C-1,2,3,4,6,7,8-HpCDF	74		21 - 158						
13C-1,2,3,4,7,8,9-HpCDF	76		20 - 186						
13C-1,2,3,4,7,8-HxCDD	71		21 - 193						
13C-1,2,3,4,7,8-HxCDF	69		19 - 202						
13C-1,2,3,6,7,8-HxCDD	72		25 - 163						
13C-1,2,3,6,7,8-HxCDF	66		21 - 159						
13C-1,2,3,7,8,9-HxCDF	75		17 - 205						
13C-1,2,3,7,8-PeCDD	72		21 - 227						
13C-1,2,3,7,8-PeCDF	72		21 - 192						
13C-2,3,4,6,7,8-HxCDF	69		22 - 176						
13C-2,3,4,7,8-PeCDF	71		13 - 328						
13C-2,3,7,8-TCDD	73		20 - 175						
13C-2,3,7,8-TCDF	71		22 - 152						
13C-OCDD	78		13 - 199						
<hr/>									
Surrogate	LCSD	LCSD	Limits						
	%Recovery	Qualifier							
37Cl-2,3,7,8-TCDD	98		31 - 191						

TestAmerica Seattle

Lab Chronicle

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Client Sample ID: PDI-SG-B258-BL1

Date Collected: 07/20/18 16:50

Date Received: 09/26/18 12:55

Lab Sample ID: 580-80756-1

Matrix: Solid

Percent Solids: 60.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	HRMS-Sox			250114	10/05/18 16:22	SR1	TAL SAC
Total/NA	Analysis	1613B		1	250803	10/10/18 01:27	AS	TAL SAC

Client Sample ID: PDI-SG-B258-BL1-D

Date Collected: 07/20/18 16:50

Date Received: 09/26/18 12:55

Lab Sample ID: 580-80756-2

Matrix: Solid

Percent Solids: 59.9

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	HRMS-Sox			250114	10/05/18 16:22	SR1	TAL SAC
Total/NA	Analysis	1613B		1	250803	10/10/18 02:13	AS	TAL SAC

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

TestAmerica Seattle

Accreditation/Certification Summary

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Laboratory: TestAmerica Seattle

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	17-024	01-19-19
ANAB	DoD ELAP		L2236	01-19-19
ANAB	ISO/IEC 17025		L2236	01-19-19
California	State Program	9	2901	11-05-18
Montana (UST)	State Program	8	N/A	04-30-20
Nevada	State Program	9	WA000502019-1	07-31-19
Oregon	NELAP	10	WA100007	11-05-18
US Fish & Wildlife	Federal		LE058448-0	07-31-19
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-19

Laboratory: TestAmerica Sacramento

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	17-020	01-20-21
ANAB	DoD ELAP		L2468	01-20-21
Arizona	State Program	9	AZ0708	08-11-19
Arkansas DEQ	State Program	6	88-0691	06-17-19
California	State Program	9	2897	01-31-19
Colorado	State Program	8	CA00044	08-31-19
Connecticut	State Program	1	PH-0691	06-30-19
Florida	NELAP	4	E87570	06-30-19
Georgia	State Program	4	N/A	01-28-19
Hawaii	State Program	9	N/A	01-29-19
Illinois	NELAP	5	200060	03-17-19
Kansas	NELAP	7	E-10375	10-31-18 *
Louisiana	NELAP	6	30612	06-30-19
Maine	State Program	1	CA0004	04-14-20
Michigan	State Program	5	9947	01-31-20
Nevada	State Program	9	CA00044	07-31-19
New Hampshire	NELAP	1	2997	04-18-19
New Jersey	NELAP	2	CA005	06-30-19
New York	NELAP	2	11666	03-31-19
Oregon	NELAP	10	4040	01-29-19
Pennsylvania	NELAP	3	68-01272	03-31-19
Texas	NELAP	6	T104704399	05-31-19
US Fish & Wildlife	Federal		LE148388-0	07-31-19
USDA	Federal		P330-18-00239	01-17-21
USEPA UCMR	Federal	1	CA00044	12-31-20
Utah	NELAP	8	CA00044	02-28-19
Vermont	State Program	1	VT-4040	04-30-19
Virginia	NELAP	3	460278	03-14-19
Washington	State Program	10	C581	05-05-19
West Virginia (DW)	State Program	3	9930C	12-31-18
Wyoming	State Program	8	8TMS-L	01-28-19

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

TestAmerica Seattle

Sample Summary

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-80756-1	PDI-SG-B258-BL1	Solid	07/20/18 16:50	09/26/18 12:55
580-80756-2	PDI-SG-B258-BL1-D	Solid	07/20/18 16:50	09/26/18 12:55

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12

13

1 2 3 4 5 6 7 8 9 10 11 12 13

TestAmerica-Seattle		SURFACE SEDIMENT CHAIN OF CUSTODY													
5155 8th Street-East Tacoma, WA 98424-1317	Ph: 253-922-2310 Fax: 253-922-5047	Client Contact		Project Contact: Amy Dahl / Chelsey Cook Tel: (206) 438-2261 / (206) 438-2010		Site Contact: Jennifer Ray Laboratory Contact: Elaine Walker		Carrier: Courier		9/26/2018 COC No: 3		1 of 1 COCs			
1111 3rd Ave Suite 1600 Seattle, WA 98101	Phone: (206) 438-2700 Fax: 1-(866) 495-52888	Analysis Turnaround Time		Calendar (C) or Work Days (W)											
Project Name: Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling Portland, OR	Project #: 60566335 Study: Surface Sediment	<input checked="" type="checkbox"/> 21 days	<input type="checkbox"/> Other _____												
Sample Type: SRS															
Sample Identification		Sample Date	Sample Time	Matrix	QC Sample	Sampler's Initials	Total No. of Cont.	Fraction	PCB Concentrators 1668A	PCB Diesel Metrics, Mercury MWTPh-DAs, Total organic carbon, Total solids 9060	PCB, T471A, 6926B, 7471A, 104C & 70C	Arcticive Archive -20 C PAHs, BEHP, Tributyltin, 8270-SIM, 8270-LI, Keton/Lnager	Sample Specific Notes: <i>Sample S Frozen 7/24/18 2955</i>		
PDI-SG-B258-BL1	7/20/18 7/20/2018	1650	SS	MAT	JT										
PDI-SG-B258-BL1-D	7/20/18 7/20/2018	1650	SS	MAT	6										
580-80756 Chain of Custody															
Container Type: WMG=Wide Mouth Glass Jar, P=HDPE, PP=Polypropylene, AG=Amber glass, G=glass, RC=Resin Column Preservative: HCl = Hydrochloric Acid, H3PO4 = Phosphoric Acid, HNO3 = Nitric Acid Fraction: D = Dissolved, PRT = Particulate, T = Total (unfiltered)															
Special Instructions/QC Requirements & Comments: Separate reports for each lab. <i>44 3.3 -11.0</i>															
Relinquished by: <i>J. M. E.</i>		Company: AECOM		Date/Time: 9/26/18 11215		Received by: <i>America Inc</i>		Company: M-E.		Date/Time: 9/26/18 1215					
Relinquished by: <i>J. M. E.</i>		Company: AECOM		Date/Time: 9/26/18 1255		Received by: <i>America Inc</i>		Company: M-E.		Date/Time: 9/26/18 1255					
Relinquished by: <i>J. M. E.</i>		Company: AECOM		Date/Time: 9/26/18 1255		Received by: <i>America Inc</i>		Company: M-E.		Date/Time: 9/26/18 1255					
<input type="checkbox"/> Return To Client		<input checked="" type="checkbox"/> Isolate By Lab		<input checked="" type="checkbox"/> Archive For 12 Months											

TestAmerica-Seattle
5755-8th-Street-East
Tacoma, WA 98424-1317
Ph: 253-922-2310 Fax: 253-922-5047

Client Contact
AECOM
1111 3rd Ave Suite 1600
Seattle, WA 98101
Phone (206) 438-2700 Fax: 1-(866) 495-5288
Project Name: Portland Harbor Pre-Remedial Design
Investigation and Baseline Sampling
Portland, OR
Project #: 60566335 Study: Surface Sediment
Sample Type: SRS

SURFACE SEDIMENT CHAIN OF CUSTODY

Client Contact		Project Contact: Amy Dahl / Chelsey Cook		Site Contact: Jennifer Ray		9/26/2018 COC No. 3									
		Tel: (206) 438-2261 / (206) 438-2010		Laboratory Contact: Elaine-Walker		Carrier: Courier									
		Analysis Turnaround Time													
		Calendar (C) or Work Days (W)													
		<input checked="" type="checkbox"/> 21 days													
		<input type="checkbox"/> Other _____													
Sample Identification		Sample Date	Sample Time	Matrix	QC Sample	Sampler's Initials	Total No. of Cont.	Function	PCB Congener 1668A	PCDD/Fs 1613B	DPH Diesel, Methyl, Mercury, NW/TPH, Dn, 6020B, 7471A	Grain size ASTM D7928/D6913	Total organic carbon, Total solids 9060 (104C & 70C)	Archive Archive -20 C	PAHs, BzHP, Tributyltin, 8270-SIM, 8270-LI, Kovat's finger
PDI-SG-B258-BL1		7/26/18 7/26/2018	1650	SS		MT	17	x	x	x	x	x	x	x	
PDI-SG-B258-BL1-D		7/26/18	1650	SS		MT	6	x	x	x	x	x	x	x	
Sample Specific Notes: SAMPLES FROZEN 7/24 C 0955															
 580-80756 Chain of Custody															
Container Type: WMG=Wide Mouth Glass Jar, P=HDPE, PP=Polypropylene, AG=amber glass, G=glass, RC=Resin Column Preservative: HCl = Hydrochloric Acid, H3PO4 = Phosphoric Acid, HNO3 = Nitric Acid Fraction: D = Dissolved, PRT = Particulate, T = Total (unfiltered)															
<input type="checkbox"/> Return To Client <input checked="" type="checkbox"/> Disposal By Lab <input checked="" type="checkbox"/> Archive For 12 Months															
Special Instructions/QC Requirements & Comments: Separate reports for each lab. KEEP SAMPLES FROZEN UPON RECEIPT															

Relinquished by:	Company: AECOM	Date/Time: 9/26/18 1215	Received by: Jennifer Ray	Company: M.E.	Date/Time: 9/26/18 1215
Relinquished by:	Company: M.E.	Date/Time: 9/26/18 1255	Received by: <i>J. Ray</i>	Company: DR PDR	Date/Time: 9/26/18 1255
Relinquished by:	Company: TAPEX	Date/Time: 10/3/18 1630	Received by: <i>J. Ray</i>	Company: TASEA	Date/Time: 10/4/18 0900

JR 4-24-24



Chain of Custody Record

5755 8th Street East

5755 8th Street East

Phone (253) 922-2310 Fax (253) 922-5047

Possible Hazard Identification

Unconfirmed

Deliverable Re-

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Central Kit Delhi

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Custody Settlement

A Yes

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-80756-2

Login Number: 80756

List Source: TestAmerica Seattle

List Number: 1

Creator: O'Connell, Jason I

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-80756-2

Login Number: 80756

List Source: TestAmerica Sacramento

List Number: 2

List Creation: 10/04/18 02:33 PM

Creator: Her, David A

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
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	-2.4c
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?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Sacramento Sample Receiving Notes



580-80756 Field Sheet

Job:

Tracking # 41411 5670 2500

SO / PO / FO / 2-Day / SAT / Ground / UPS / Courier /

Drop Off / GSO / OnTrac / Goldstreak / USPS / Other

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC.

Notes: Samples required
to be frozen

MGR 10-4-18

Therm. ID: AK-2 / AK-3 / AK-5 / AK-6 / HACCP / Other
(+0.7°C)

Ice Wet Gel Other

Cooler Custody Seal:

Sample Custody Seal:

Cooler ID:

Temp: Observed -2.4 Corrected -2.4

From: Temp Blank Sample

NCM Filed: Yes No

Yes No NA

Perchlorate has headspace?

Alkalinity has no headspace?

CoC is complete w/o discrepancies?

Samples received within holding time?

Sample preservatives verified?

Cooler compromised/tampered with?

Samples compromised/tampered with?

Samples w/o discrepancies?

Sample containers have legible labels?

Containers are not broken or leaking?

Sample date/times are provided.

Appropriate containers are used?

Sample bottles are completely filled?

Zero headspace?*

Multiphasic samples are not present?

Sample temp OK?

Sample out of temp?

Initials: MGR Date: 10-4-18

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

F81 @ 1437

Isotope Dilution Summary

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

Method: 1613B - Dioxins and Furans (HRGC/HRMS)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Isotope Dilution Recovery (Acceptance Limits)							
		HpCDD (23-140)	HpCDF (28-143)	HpCDF2 (26-138)	HxCDD (32-141)	HxCDF (26-152)	HxDD (28-130)	HxDF (26-123)	HxCF (29-147)
580-80756-1	PDI-SG-B258-BL1	46	37	47	45	43	44	42	52
580-80756-2	PDI-SG-B258-BL1-D	51	40	52	52	49	51	47	57
MB 320-250114/1-A	Method Blank	79	76	77	74	69	73	69	76
Lab Sample ID	Client Sample ID	Percent Isotope Dilution Recovery (Acceptance Limits)							
		PeCDD (25-181)	PeCDF (24-185)	13CHxCF (28-136)	PeCF (21-178)	TCDD (25-164)	TCDF (24-169)	OCDD (17-157)	
580-80756-1	PDI-SG-B258-BL1	51	51	46	52	56	60	41	
580-80756-2	PDI-SG-B258-BL1-D	55	55	50	57	60	63	49	
MB 320-250114/1-A	Method Blank	73	73	69	72	75	71	80	

Surrogate Legend

HpCDD = 13C-1,2,3,4,6,7,8-HpCDD

HpCDF = 13C-1,2,3,4,6,7,8-HpCDF

HpCDF2 = 13C-1,2,3,4,7,8,9-HpCDF2

HxCDD = 13C-1,2,3,4,7,8-HxCDD

HxCDF = 13C-1,2,3,4,7,8-HxCDF

HxDD = 13C-1,2,3,6,7,8-HxDD

HxDF = 13C-1,2,3,6,7,8-HxDF

HxCF = 13C-1,2,3,7,8,9-HxCF

PeCDD = 13C-1,2,3,7,8-PeCDD

PeCDF = 13C-1,2,3,7,8-PeCDF

13CHxCF = 13C-2,3,4,6,7,8-HxCDF

PeCF = 13C-2,3,4,7,8-PeCF

TCDD = 13C-2,3,7,8-TCDD

TCDF = 13C-2,3,7,8-TCDF

OCDD = 13C-OCDD

Method: 1613B - Dioxins and Furans (HRGC/HRMS)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Isotope Dilution Recovery (Acceptance Limits)							
		HpCDD (26-166)	HpCDF (21-158)	HpCDF2 (20-186)	HxCDD (21-193)	HxCDF (19-202)	HxDD (25-163)	HxDF (21-159)	HxCF (17-205)
LCS 320-250114/2-A	Lab Control Sample	71	68	69	66	63	66	63	69
LCSD 320-250114/3-A	Lab Control Sample Dup	78	74	76	71	69	72	66	75
Lab Sample ID	Client Sample ID	Percent Isotope Dilution Recovery (Acceptance Limits)							
		PeCDD (21-227)	PeCDF (21-192)	13CHxCF (22-176)	PeCF (13-328)	TCDD (20-175)	TCDF (22-152)	OCDD (13-199)	
LCS 320-250114/2-A	Lab Control Sample	66	65	62	65	68	66	72	
LCSD 320-250114/3-A	Lab Control Sample Dup	72	72	69	71	73	71	78	

Surrogate Legend

HpCDD = 13C-1,2,3,4,6,7,8-HpCDD

HpCDF = 13C-1,2,3,4,6,7,8-HpCDF

HpCDF2 = 13C-1,2,3,4,7,8,9-HpCDF2

HxCDD = 13C-1,2,3,4,7,8-HxCDD

HxCDF = 13C-1,2,3,4,7,8-HxCDF

HxDD = 13C-1,2,3,6,7,8-HxDD

HxDF = 13C-1,2,3,6,7,8-HxDF

TestAmerica Seattle

Isotope Dilution Summary

Client: AECOM

Project/Site: Portland Harbor Pre-Remedial Design

TestAmerica Job ID: 580-80756-2

HxCDF = 13C-1,2,3,7,8,9-HxCDF

PeCDD = 13C-1,2,3,7,8-PeCDD

PeCDF = 13C-1,2,3,7,8-PeCDF

13CHxCDF = 13C-2,3,4,6,7,8-HxCDF

PeCF = 13C-2,3,4,7,8-PeCDF

TCDD = 13C-2,3,7,8-TCDD

TCDF = 13C-2,3,7,8-TCDF

OCDD = 13C-OCDD

1

2

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13