2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Windward Environmental, LLC 200 West Mercer Street, Suite 401 Seattle, WA 98119 ATTN: Amara Vandervort amarav@windwardenv.com

September 2, 2020

SUBJECT: Revised Duwamish AOC4, Data Validation

Dear Ms. Vandervort,

Enclosed are the revised validation reports for the fractions listed below. These SDGs were received on August 3, 2020. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #48785_RV1:

SDG #	<u>Fraction</u>
20F0114, 20F0118, 20F0339 20F0352, 20F0359, 20F0392 20F0407, 20F0437, 20F0438	Semivolatiles, Hexachlorobenzene, Polychlorinated Biphenyls, Metals, Wet Chemistry, Polychlorinated Dioxins/Dibenzofurans

The data validation was performed under Stage 2B guidelines. The analyses were validated using the following documents, as applicable to each method:

- Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation; May 2020
- USEPA National Functional Guidelines for Organic Superfund Methods Data Review;
 January 2017
- USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review;
 January 2017
- USEPA National Functional Guidelines for High Resolution Superfund Methods Data Review; April 2016
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Pei Geng

pgeng@lab-data.com

Project Manager/Senior Chemist

32,981 pages-ADV Attachment 1

5	Stage 2B/4 (client Select) EDD LDC #48785 (Windward Environmental, LLC - Seattle WA / Duwamish AOC4)																																		
LDO	SDG#	DATE REC'D	(3) DATE DUE		OA 70E)	(82	Hs 70E M)	Pε	1) est 31B)		:Bs 32A)		tals 20A)		tals 20A- KED)	H (747	lg 71B)		kins 3B)	TC (906	DC 50A)	Sol	tal lids l0G)												
Ma	trix: Water/Sediment			W	S	W	S	W	S	W	S	W	S	W	s	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
Α	20F0114	08/03/20	08/24/20	0	6	0	6	0	6	0	11	0	6	0	10	0	6	0	4	0	11	0	11												
В	20F0118	08/03/20	08/24/20	0	12	0	12	0	11	0	11	0	11	0	11	0	11	0	3	0	11	0	11			Đ									
С	20F0339	08/03/20	08/24/20	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	2	0	10	0	10												
D	20F0352	08/03/20	08/24/20	0	11	0	10	0	10	0	10	0	10	0	10	0	10	0	1	0	10	0	10												
Ε	20F0359	08/03/20	08/24/20	0	16	0	16	0	16	0	16	0	16	0	16	0	16	0	2	0	16	0	16												
F	20F0392	08/03/20	08/24/20	0	1	0	1	0	1	0	19	0	1	0	13	0	1	0	4	0	13	0	13												
G	20F0407	08/03/20	08/24/20	0	5	0	5	0	5	0	6	0	5	0	5	0	5	0	1	0	5	0	5												
Н	20F0437	08/03/20	08/24/20	_		-	-	-	-	0	1	_	-	-	_	-	-	_		0	1	0	1												
I	20F0438	08/03/20	08/24/20	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0	1	0	6	0	6												
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Semivolatiles

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0114

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SC322	20F0114-07	Sediment	06/05/20
LDW20-SC336	20F0114-08	Sediment	06/05/20
LDW20-SC336FD	20F0114-09	Sediment	06/05/20
LDW20-IT365	20F0114-10	Sediment	06/05/20
LDW20-IT365FD	20F0114-11	Sediment	06/05/20
LDW20-IT361	20F0114-12	Sediment	06/05/20
LDW20-SC322MS	20F0114-07MS	Sediment	06/05/20
LDW20-SC322MSD	20F0114-07MSD	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits with the following exceptions:

SRM ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
BIF0484-SRM1	Anthracene	52.2 (57-143)	All samples in SDG 20F0114	J (all detects) UJ (all non-detects)	Р

X. Field Duplicates

Samples LDW20-SC336 and LDW20-SC336FD and samples LDW20-IT365 and LDW20-IT365FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentra	ition (ug/Kg)	
Compound	LDW20-SC336	LDW20-SC336FD	RPD
Naphthalene	31.5U	19.4	Not calculable
2-Methylnaphthalene	31.5U	12.4	Not calculable
Phenanthrene	85.9	109	24
Anthracene	15.9	12.8	22
Fluoranthene	208	177	16
Pyrene	202	182	10
Butylbenzylphthalate	2.8	14.7	136

	Concentra	ition (ug/Kg)	
Compound	LDW20-SC336	LDW20-SC336FD	RPD
Benzo(a)anthracene	70.9	59.5	17
Chrysene	107	99.6	7
Bis(2-ethylhexyl)phthalate	113	104	8
Benzofluoranthenes, total	219	191	14
Benzo(a)pyrene	85.6	75.4	13
Indeno(1,2,3-cd)pyrene	64.5	55.4	15
Dibenzo(a,h)anthracene	18.0	14.0	25
Benzo(g,h,i)perylene	78.4	61.6	24

	Concentra	tion (ug/Kg)	
Compound	LDW20-IT365	LDW20-IT365FD	RPD
Phenanthrene	13.0	15.7	19
Fluoranthene	33.8	32.8	3
Pyrene	34.9	33.7	3
Benzo(a)anthracene	12.5	13.2	5
Chrysene	18.3	17.8	3
Bis(2-ethylhexyl)phthalate	49.8U	32.8	Not calculable
Benzofluoranthenes, total	36.6	35.1	4
Benzo(a)pyrene	15.5	14.6	6
Indeno(1,2,3-cd)pyrene	11.2	10.7	5
Benzo(g,h,i)perylene	13.3	12.4	7

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to SRM %R, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles - Data Qualification Summary - SDG 20F0114

Sample	Compound	Flag	A or P	Reason
LDW20-SC322 LDW20-SC336 LDW20-SC336FD LDW20-IT365 LDW20-IT365FD LDW20-IT361	Anthracene	J (all detects) UJ (all non-detects)	Р	Standard reference materials (%R)

Duwamish AOC4

Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

Duwamish AOC4

Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

SDG a	t: 48785A2a VALIDATIO #: 20F0114 atory: Analytical Resources, Inc. HOD: GC/MS Semivolatiles (EPA SW 846	S	tage 2B	S WORKSHEE	ïΤ	Date Page Reviewer 2nd Reviewer	e: 08/4/2 :1 of 1 r: 14
	·		·				
	amples listed below were reviewed for eation findings worksheets.	ach of the f	ollowing valida	ation areas. Valida	ation finding	is are noted in	attached
	Validation Area			Com	ments	(Insufficient	t line to
ı.	Sample receipt/Technical holding times	SW / A	Cooker ten	PS = 18.8°C, 10	0,2°C, 12,6	°C;15.5°C, 9	1.10
11.	GC/MS Instrument performance check	A		14.3%	4.76, 1	0.24; 11.8%	
111.	Initial calibration/ICV	AIA	10AL S	. 102		165363	
IV.	Continuing calibration	A		20%			
V.	Laboratory Blanks	Á					
VI.	Field blanks	7					
VII.	Surrogate spikes	A					
VIII.	Matrix spike/Matrix spike duplicates	A					
IX.	Laboratory control samples	SW	SF	² Μ		(no les	2
X.	Field duplicates	SW		P= 2/3	4/5	(
XI.	Internal standards	A					
XII.	Compound quantitation RL/LOQ/LODs	N					
XIII.	Target compound identification	N					
XIV.	System performance	N					
XV.	Overall assessment of data	Á					
Note:	N = Not provided/applicable R = Ri		detected D = Du	plicate TB = Trip blank EB = Equipment bla		blank THER:	
	Client ID			Lab ID	Matrix	Date	
1	LDW20-SC322			20F0114-07	Sedime	ent 06/05	v/20
2	LDW20-SC336 D 1			20F0114-08	Sedime	ent 06/05	V20
3	LDW20-SC336FD D,			20F0114-09	Sedime	ent 06/05	/20
4 1	LDW20-IT365			20F0114-10	Sedime	ent 06/05	/20
5	LDW20-IT365FD D_{γ}			20F0114-11	Sedime	ent 06/05	/20
6 1	LDW20-IT361			20F0114-12	Sedime	ent 06/05	/20
7	LDW20-SC322MS			20F0114-07MS	Sedime	ent 06/05	v20

10											
Notes	otes:										
	BIF0484- BULL										
	1										

20F0114-07MS

20F0114-07MSD

Sediment

06/05/20

LDW20-SC322MS

LDW20-SC322MSD

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

TIME THE DE CONTROL OF CONTROL				
A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ: N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachiorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

A2. Benzofluoranthenes, Total

LDC #: 48785 AZA

VALIDATION FINDINGS WORKSHEET <u>Laboratory Control Samples (LCS)</u>

Page:	t_of	
Reviewer:	JVG	
2nd Reviewer:	4	_
· ·		

METHOD: GC/MS BNA (EPA SW 846 Method 8270¢)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N/A Was a LCS required?

YNN/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)		CSD Limits)	RPD (Limits)		Associated Samples	Qualifications
	BIF0484- SRM	· VV	52.2 (57-143)	()	()	All (ND+Det)	J/45/P
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LDC#: 48785A2a

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: 1 of 1 Reviewer: JVG 2nd Reviewer:

METHOD: GCMS SVOA (EPA SW 846 Method 8270E)

YN NA YN NA

Were field duplicate pairs identified in this SDG? Were target analytes detected in the field duplicate pairs?

	Concentra		
Compound	2	3	RPD
s	31.5U	19.4	NC
w	31.5U	12.4	NC
UU	85.9	109	24
w	15.9	12.8	22
YY	208	177	16
ZZ	202	182	10
AAA	2.8	14.7	136
ccc	70.9	59.5	17
DDD	107	99.6	7
EEE	113	104	8
A2	219	191	14
#	85.6	75.4	13
JJJ	64.5	55.4	15
ккк	18.0	14.0	25
LLL	78.4	61.6	24

	Concentrat		
Compound	4	5	RPD
υυ	13.0	15.7	19
YY	33.8	32.8	3
ZZ	34.9	33.7	3
ccc	12.5	13.2	5
DDD	18.3	17.8	3
EEE	49.8U	32.8	NC
A2	36.6	35.1	4
	15.5	14.6	6
JJJ	11.2	10.7	5
LLL	13.3	12.4	7

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Semivolatiles

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0114

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SC322	20F0114-07	Sediment	06/05/20
LDW20-SC336	20F0114-08	Sediment	06/05/20
LDW20-SC336FD	20F0114-09	Sediment	06/05/20
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LDW20-IT365FD	20F0114-11	Sediment	06/05/20
LDW20-IT361	20F0114-12	Sediment	06/05/20
LDW20-SC322MS	20F0114-07MS	Sediment	06/05/20
LDW20-SC322MSD	20F0114-07MSD	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
02/28/20	N-Nitrosodiphenylamine	34.4	All samples in SDG 20F0114	J (all detects) UJ (all non-detects)	А

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/24/20	Benzoic acid	31.0	All samples in SDG 20F0114	J (all detects)	А

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

The laboratory has indicated that there were no laboratory control samples (LCS) analyses performed. No data were qualified since the standard reference materials (SRM) were reported.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

X. Field Duplicates

Samples LDW20-SC336 and LDW20-SC336FD and samples LDW20-IT365 and LDW20-IT365FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentration (ug/Kg)		
Compound	LDW20-SC336	LDW20-SC336FD	RPD
Benzyl alcohol	29.9	32.8	9
Benzoic acid	153	56.0	93
N-Nitrosodiphenylamine	7.9U	3.1	Not calculable

	Concentra		
Compound	LDW20-IT365	LDW20-IT365FD	RPD
1,4-Dichlorobenzene	5.0U	1.1	Not calculable
Benzoic acid	30.8	19.7	44

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D and continuing calibration %D, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles – Data Qualification Summary - SDG 20F0114

Sample	Compound	Flag	A or P	Reason
LDW20-SC322 LDW20-SC336 LDW20-SC336FD LDW20-IT365 LDW20-IT365FD LDW20-IT361	N-Nitrosodiphenylamine	J (all detects) UJ (all non-detects)	Α	Initial calibration verification (%D)
LDW20-SC322 LDW20-SC336 LDW20-SC336FD LDW20-IT365 LDW20-IT365FD LDW20-IT361	Benzoic acid	J (all detects)	А	Continuing calibration (%D)

Duwamish AOC4

Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

Duwamish AOC4

Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

LDC #	#: <u>48785A2b</u> VALIDATIO	N COMP	LETEN	IESS WORK	SHEET		Date: 08/14/
SDG	#: 20F0114		Stage 2E				Page: \ of \ \ eviewer: \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
_abor	ratory: Analytical Resources, Inc.					Re 2nd R	eviewer: } eviewer: 4
METH	S <i>Vo7</i> 4 H OD: GC/MS P olynuclear Aromatic Hydro	o carbons (I	EPA SW	846 Method 82	270E-SIM)	ZIIU IN	eviewei _
					ŕ		
	amples listed below were reviewed for ea tion findings worksheets.	ich of the to	ollowing v	/alidation areas	s. Validation	findings are n	oted in attached
741142							
	Validation Area				Comme	nts to	
1.	Sample receipt/Technical holding times	SAIA	Cooler	temp = 18.8	°C, 16,2°C	. 12.6°C. 15	11.8°C 9.1 °C,
II.	GC/MS Instrument performance check	A		14.3	16; 9.7°C	; 10,260;	11.8%
111.	Initial calibration/ICV	AISN		AL = 20?			14 30%
IV.	Continuing calibration	W W		W = 20 %			
V.	Laboratory Blanks	A					
VI.	Field blanks	N					
VII.	Surrogate spikes	T A					
VIII.	Matrix spike/Matrix spike duplicates	A					
IX.	Laboratory control samples	SW		no LCS	. S <i>I</i>	24	
X.	Field duplicates	SW		D = 2/3	4/9	5	
XI.	Internal standards	A					
XII.	Compound quantitation RL/LOQ/LODs	N					
XIII.	Target compound identification	N	-74				
XIV.	System performance	N					
XV.	Overall assessment of data	A					
lote:	N = Not provided/applicable R = Rins	lo compounds nsate ield blank	detected	D = Dupli TB = Trip EB = Equ		SB=Source OTHER:	e blank
	Client ID			Lab ID		Matrix	Date
1	LDW20-SC322			20F0114-0	7	Sediment	06/05/20
2	LDW20-SC336 D ₁			20F0114-0	8	Sediment	06/05/20
3 I	LDW20-SC336FD D,			20F0114-0	9	Sediment	06/05/20
4 I	LDW20-IT365			20F0114-1	0	Sediment	06/05/20
	LDW20-IT365FD D_{ν}			20F0114-1	1	Sediment	06/05/20
6 I	LDW20-IT361			20F0114-1	2	Sediment	06/05/20
7 l	LDW20-SC322MS			20F0114-0	7MS	Sediment	06/05/20
8 L	LDW20-SC322MSD			20F0114-0	7MSD	Sediment	06/05/20
9							
10							
otes:						-T-	
	RIFO484_BMV						

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	J.F. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

LDC #:	48785 426
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VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:	of	١
Reviewer:	:_JVG	•
2nd Reviewer:	9	

METHOD: GC/MS SVOA (EPA SW 846 Method 8270%)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". Y N N/A

Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Were all %D within the validation criteria of ≤20/30% %D?

#	Date	Standard ID	Compound	Finding %D (Limit: <2 0.0 %/30%) 34.4	Associated Samples All ND + Dat	Qualifications
	02/28/20	Standard ID SIC0029 - SCV1	RR	34.4	All (ND+Det)	Qualifications J/UJ/A
	· · · · · · · · · · · · · · · · · · ·					
]		
						·
	<u></u>			<u> </u>		

LDC #: 48785 A 26

Y(N) N/A

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Page:	of/
Reviewer:	JVG
2nd Reviewer:	0

METHOD: GC/MS BNA (EPA SW 846 Method 8270 SIM)
Please see qualifications below for all questions answered "M". Not applicable questions are identified as "N/A".

 (Ω) N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument? Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?

Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: <u>></u> 0.05)	Associated Samples	Qualifications
	06/24/20	hT100624035	PPP	31.0		A11 (Det)	A TN/T
						(*)	
				<u> </u>			
-							

LDC #: 48785 A26

VALIDATION FINDINGS WORKSHEET Laboratory Control Samples (LCS)

Page:	of
Reviewer:	_JVG_
2nd Reviewer:	2_

METHOD: GC/MS BNA (EPA SW 846 Method 8270 ₱-SIM)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A Was a LCS required?

Y(N) N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

LCS/LCSD ID	Compound	LCS %R (Limits)		LCSD %R (Limits)		RPD (Limits)		Associated Samples	Qualifications
No L	cs perfo	rmed (no	data	qualifi	ed	since.	2/	LM was reported	Text
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		(()		()		
		()	()		()		
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	-	()	()	_	()		
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		()	()	1	(<u>)</u>		
		()	()	ļ	()		
		()	()		()		
		LCS/LCSD ID Compound NO LCS per fo	LCS/LCSD ID Compound %R (Limits)	LCS/LCSD ID Compound KR (Limits)	LCS/LCSD D Compound Compound CS R (Limits) R (Limits)	LCS/LCSD ID Compound LCS MR (Limits) LCSD MR (Limits) MR (LCS/LCSD ID	No LCS performed (no bata ghalified since 9k () () () () () () () () () ()	No LCS performed (no blata ghalified since SRM was reported () () () () () () () () () () ()

LDC#: 48785A2b

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: 1_of_1_ Reviewer:__ 2nd Reviewer:

METHOD: GCMS SVOA (EPA SW 846 Method 8270E-SIM)

<u>Y)N,NA</u> Were field duplicate pairs identified in this SDG? VN NA

Were target analytes detected in the field duplicate pairs?

	Concentrat		
Compound	2	3	RPD
QQQ	29.9	32.8	9
PPP	153	56.0	93
QQ	7.9U	3.1	NC

	Concentra	555	
Compound	4	5	RPD
E	5.0U	1.1	NC
PPP	30.8	19.7	44

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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Hexachlorobenzene

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0114

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SC322	20F0114-07	Sediment	06/05/20
LDW20-SC336	20F0114-08	Sediment	06/05/20
LDW20-SC336FD	20F0114-09	Sediment	06/05/20
LDW20-IT365	20F0114-10	Sediment	06/05/20
LDW20-IT365FD	20F0114-11	Sediment	06/05/20
LDW20-IT361	20F0114-12	Sediment	06/05/20
LDW20-SC322MS	20F0114-07MS	Sediment	06/05/20
LDW20-SC322MSD	20F0114-07MSD	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Hexachlorobenzene by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples LDW20-SC336 and LDW20-SC336FD and samples LDW20-IT365 and LDW20-IT365FD were identified as field duplicates. No results were detected in any of the samples.

XI. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4

Hexachlorobenzene - Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Laboratory Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Field Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

SDG # Labora	#:48785A3a	S	tage 2	2B	S WORKSHEET	ĺ	Date: 08/14/2 Page: _of_/ Reviewer: \ Reviewer:
The sa	amples listed below were reviewed for e tion findings worksheets.				tion areas. Validation	on findings are	noted in attached
	Validation Area				Comn	nents (In	infficient time to cool
l.	Sample receipt/Technical holding times	SW/A	Cos	ler tem	p. = 18,8°C. 1	6,2°C; 12.6°; 9.7°C; 10.	C, 15.5°C. 9.18
II.	GC Instrument Performance Check	N			14.390	; 9.7 dc; 10.	,20€; 11.80€
III.	Initial calibration/ICV	AA		ICAL	£ 20%		WE 202
IV.	Continuing calibration	\ A'		CW	£ 20/s		
V.	Laboratory Blanks	A					
VI.	Field blanks	2.					
VII.	Surrogate spikes /15	A /A					
VIII.	Matrix spike/Matrix spike duplicates	A					
IX.	Laboratory control samples	LA		LC	s /b		
X.	Field duplicates	ND		b	= 2/3	9/5	
XI.	Compound quantitation/RL/LOQ/LODs	N			/		
XII.	Target compound identification	N					
XIII.	System Performance	N					
XIV	Overall assessment of data	A					
Note:	N = Not provided/applicable R = Ri	No compounds nsate Field blank	detecte	d	D = Duplicate TB = Trip blank EB = Equipment blar	OTHER:	rce blank
-	Client ID				Lab ID	Matrix	Date
1 L	_DW20-SC322				20F0114-07	Sediment	06/05/20
	_DW20-SC336 P,				20F0114-08	Sediment	06/05/20
3 L	_DW20-SC336FD),				20F0114-09	Sediment	06/05/20
4 L	DW20-IT365 P				20F0114-10	Sediment	06/05/20
5 L	DW20-IT365FD				20F0114-11	Sediment	06/05/20
	_DW20-IT361				20F0114-12	Sediment	06/05/20
	DW20-SC322MS				20F0114-07MS	Sediment	06/05/20
	DW20-SC322MSD				20F0114-07MSD	Sediment	06/05/20
9							
10							
11							
Votes:	6						
	BI 1=0497- BUK!						
1 1				1		1 1	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Polychlorinated Biphenyls

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0114

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SC169	20F0114-01	Sediment	06/05/20
LDW20-IT215	20F0114-03	Sediment	06/05/20
LDW20-IT240	20F0114-04	Sediment	06/05/20
LDW20-IT247	20F0114-05	Sediment	06/05/20
LDW20-IT310	20F0114-06	Sediment	06/05/20
LDW20-SC322	20F0114-07	Sediment	06/05/20
LDW20-SC336	20F0114-08	Sediment	06/05/20
LDW20-SC336FD	20F0114-09	Sediment	06/05/20
LDW20-IT365	20F0114-10	Sediment	06/05/20
LDW20-IT365FD	20F0114-11	Sediment	06/05/20
LDW20-IT361	20F0114-12	Sediment	06/05/20
LDW20-SC169MS	20F0114-01MS	Sediment	06/05/20
LDW20-SC169MSD	20F0114-01MSD	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	%D	Associated Samples	Flag	A or P
06/10/20	SIF0176-SCV1	2C	Aroclor-1260	21.0	All samples in SDG 20F0114	J (all detects)	А

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

Samples LDW20-SC336 and LDW20-SC336FD and samples LDW20-IT365 and LDW20-IT365FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentration (ug/Kg)		
Compound	LDW20-SC336	LDW20-SC336FD	RPD
Aroclor-1248	31.0	28.3	9
Aroclor-1254	37.0	38.0	3
Aroclor-1260	36.9	34.7	6

	Concentra		
Compound	LDW20-IT365	LDW20-IT365FD	RPD
Aroclor-1248	5.8	4.7	21
Aroclor-1254	5.2	6.0	14
Aroclor-1260	4.5	4.7	4

X. Compound Quantitation

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
LDW20-SC169	Aroclor-1248	61.3	J (all detects)	А
LDW20-IT247	Aroclor-1248	59.5	J (all detects)	А
LDW20-SC336FD	Aroclor-1248	41.7	J (all detects)	А
LDW20-IT365FD	Aroclor-1254	62.9	J (all detects)	А

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D and RPD between two columns, data were qualified as estimated in eleven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Biphenyls - Data Qualification Summary - SDG 20F0114

Sample	Compound	Flag	A or P	Reason
LDW20-SC169 LDW20-IT215 LDW20-IT240 LDW20-IT347 LDW20-IT310 LDW20-SC322 LDW20-SC336 LDW20-SC336FD LDW20-IT365 LDW20-IT365FD LDW20-IT365FD	Aroclor-1260	J (all detects)	А	Initial calibration verification (%D)
LDW20-SC169 LDW20-IT247 LDW20-SC336FD	Aroclor-1248	J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-IT365FD	Aroclor-1254	J (all detects)	Α	Compound quantitation (RPD between two columns)

Duwamish AOC4

Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

LDC #: 48785A3b VALIDATION COMPLETENESS WORKSHEET

SDG #: 20F0114

Stage 2B

Page:__l_of_ Reviewer:_____ 2nd Reviewer:

Laboratory: Analytical Resources, Inc.

METHOD: GC Polychlorinated Biphenyls (EPA SW846 Method 8082A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments (Insufficient)
1.	Sample receipt/Technical holding times	SW/A	Cooler temp. = 18.8°C, 16.2°C. 12.6°C. 15,5°C, 9.1°C
II.	Initial calibration/ICV	A ISW	ICAL = 20% 14.300; 9.700; 10.200; 11,800
111.	Continuing calibration	A	ou & Zolo
IV.	Laboratory Blanks	ÎÂ.	
V.	Field blanks	N	
VI.	Surrogate spikes //S	A/A	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	Ä	LCS/D SRM
IX.	Field duplicates	ŚN	D = 7/8 a/10
X.	Compound quantitation/RL/LOQ/LODs	SIM	ſ
XI.	Target compound identification	N	
XII	Overall assessment of data	A	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank
EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1_	LDW20-SC169	20F0114-01	Sediment	06/05/20
2	LDW20-IT215	20F0114-03	Sediment	06/05/20
3	LDW20-IT240	20F0114-04	Sediment	06/05/20
4	LDW20-IT247	20F0114-05	Sediment	06/05/20
5	LDW20-IT310	20F0114-06	Sediment	06/05/20
6	LDW20-SC322	20F0114-07	Sediment	06/05/20
7	LDW20-SC336 D ₁	20F0114-08	Sediment	06/05/20
8	LDW20-SC336FD D,	20F0114-09	Sediment	06/05/20
9	LDW20-IT365 D ₂	20F0114-10	Sediment	06/05/20
10	LDW20-IT365FD D 🗸	20F0114-11	Sediment	06/05/20
11	LDW20-IT361	20F0114-12	Sediment	06/05/20
12	LDW20-SC169MS	20F0114-01MS	Sediment	06/05/20
13	LDW20-SC169MSD	20F0114-01MSD	Sediment	06/05/20
14				
15				
16	,			
17	BIFO 979- BULL			

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPASW 846 Method 8081/8082)

A. alpha-BHC	K. Endrin	U. Toxaphene	EE. 2,4'-DDT	OO. trans-Heptachlor epoxide
B. beta-BHC	L. Endosulfan II	V. Aroclor-1016	FF. Hexachlorobenzene	PP. Mirex
C. delta-BHC	M. 4,4'-DDD	W. Aroclor-1221	GG. Chlordane	QQ çis-Chlordane
D. gamma-BHC	N. Endosulfan sulfate	X. Aroclor-1232	HH. Chlordane (Technical)	RR. trans-Chlordane
E. Heptachlor	O. 4,4'-DDT	Y. Aroclor-1242	II. Aroclor 1262	SS.
F. Aldrin	P. Methoxychlor	Z. Aroclor-1248	JJ. Aroclor 1268	тт.
G. Heptachlor epoxide	Q. Endrin ketone	AA. Aroclor-1254	KK. Oxychlordane	UU.
H. Endosulfan I	R. Endrin aldehyde	BB. Aroclor-1260	LL. trans-Nonachlor	vv
I. Dieldrin	S. alpha-Chlordane	CC. 2,4'-DDD	MM. cis-Nonachlor	WW.
J. 4,4'-DDE	T. gamma-Chlordane	DD. 2,4'-DDE	NN. cis-Heptachlor epoxide	XX.

Notes:_		 	 	-	 		 	 	
		 		 	 	 		 	

LDC #: 48785 A36

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	Lof
Reviewer:_	`J¼ <u>Ģ</u>
2nd Reviewer:	4

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

N) N/A

Did the initial calibration verification standards meet the %D / %R validation criteria of <20.0% / 80-120%?

<u> </u>	N) N/A Did the initial calibration verification standards meet the %D / %R validation criteria of <20.0% / 80-120%?						
#	Date	Standard ID	Detector/ Column	Compound	%D (Limit ≤ 20.0)	Associated Samples	Qualifications
	06/0/20	SIF0176-SCV	1 2C	BB	2).0	All (Det)	J/UJ/A
							(qual BB only)
							(* *))
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LDC#: 48785A3b

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: 1_of_1_ Reviewer: JVG 2nd Reviewer:

METHOD: GC PCB (EPA SW 846 Method 8082A)

YN NA YN NA

Were field duplicate pairs identified in this SDG?
Were target analytes detected in the field duplicate pairs?

	Concentration (ug/Kg)		200
Compound	7	8	RPD
Aroclor 1248	31.0	28.3	9
Aroclor 1254	37.0	38.0	3
Aroclor 1260	36.9	34.7	6

	Concentration (ug/Kg)		
Compound	9	10	RPD
Aroclor 1248	5.8	4.7	21
Aroclor 1254	5.2	6.0	14
Aroclor 1260	4.5	4.7	4

V:\Josephine\FIELD DUPLICATES\48785A3b windward duwamish.wpd

LDC #: 48785 A3b

VALIDATION FINDINGS WORKSHEET <u>Compound Quantitation and Reported CRQLs</u>

Page:		_
Reviewer: _	JVG	
2nd Reviewer:	1	_

METHOD: GC HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Level IV/D Only

AN N/A

Were CRQLs adjusted for sample dilutions, dry weight factors, etc.?

Y N N/A

Did the reported results for detected target compounds agree within 10.0% of the recalculated results?

Did the percent difference of detected compounds between two columns./detectors ≤40%?

If no, please see findings bellow.

#	Compound Name	Sample ID	%RPD/%D Between Two Columns/Detectors Limit (≤ 40%)	Qualifications
	Aroclor, 1248		61.3	Jats A
		4	59.5	
		8	41.7	
		,		
	Araclor 1254	10	42.9	V
 				
-				
\vdash				

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Metals

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0114

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-IT215	20F0114-03	Sediment	06/05/20
LDW20-IT240	20F0114-04	Sediment	06/05/20
LDW20-IT247	20F0114-05	Sediment	06/05/20
LDW20-IT310	20F0114-06	Sediment	06/05/20
LDW20-SC322	20F0114-07	Sediment	06/05/20
LDW20-SC336	20F0114-08	Sediment	06/05/20
LDW20-SC336FD	20F0114-09	Sediment	06/05/20
LDW20-IT365	20F0114-10	Sediment	06/05/20
LDW20-IT365FD	20F0114-11	Sediment	06/05/20
LDW20-IT361	20F0114-12	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Arsenic, Cadmium, Chromium, Copper, Lead, Silver, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A Mercury by EPA SW 846 Method 7471B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Cadmium	0.034 ug/L	LDW20-SC322 LDW20-SC336 LDW20-SC336FD LDW20-IT365 LDW20-IT365FD LDW20-IT361

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
LDW20-SC336FD	Cadmium	0.21 mg/Kg	0.21U mg/Kg
LDW20-IT365	Cadmium	0.11 mg/Kg	0.11U mg/Kg

Sample	Analyte	Reported Concentration	Modified Final Concentration
LDW20-IT365FD	Cadmium	0.11 mg/Kg	0.11U mg/Kg
LDW20-IT361	Cadmium	0.07 mg/Kg	0.07U mg/Kg

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

XI. Field Duplicates

Samples LDW20-SC336 and LDW20-SC336FD and samples LDW20-IT365 and LDW20-IT365FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentra		
Analyte	LDW20-SC336	LDW20-SC336FD	RPD
Arsenic	9.99	11.4	13
Cadmium	0.23	0.21	9

	Concentra	tion (mg/Kg)	
Analyte	LDW20-SC336	LDW20-SC336FD	RPD
Chromium	25.8	26.3	2
Copper	46.3	44.9	3
Lead	17.0	17.1	1
Mercury	0.141	0.118	18
Silver	0.16	0.17	6
Zinc	98.6	98.5	0

	Concentra	tion (mg/Kg)	
Analyte	LDW20-IT365	LDW20-IT365FD	RPD
Arsenic	4.53	4.39	3
Cadmium	0.11	0.11	0
Chromium	17.0	16.1	5
Copper	19.4	19.6	1
Lead	12.3	8.25	39
Mercury	0.0350	0.0425	19
Silver	0.08	0.09	12
Zinc	59.2	57.3	3

XII. Internal Standards (ICP-MS)

Raw data were not reviewed for Stage 2B validation.

XIII. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to laboratory blank contamination, data were qualified as not detected in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Metals - Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

Duwamish AOC4 Metals - Laboratory Blank Data Qualification Summary - SDG 20F0114

Sample	Analyte	Modified Final Concentration	A or P
LDW20-SC336FD	Cadmium	0.21U mg/Kg	Α
LDW20-IT365	Cadmium	0.11U mg/Kg	А
LDW20-IT365FD	Cadmium	0.11U mg/Kg	Α
LDW20-IT361	Cadmium	0.07U mg/Kg	А

Duwamish AOC4
Metals - Field Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

LDC #: 48785A4a VALIDATION COMPLETENESS WORKSHEET SDG #: 20F0114 Stage 2B

Laboratory: Analytical Resources, Inc.

METHOD: Metals (EPA SW 846 Method 6020A/7471B)

Date: 6/8/20
Page: of Reviewer: 2nd Reviewer:

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	AA	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	4	
IV.	ICP Interference Check Sample (ICS) Analysis	1	
V.	Laboratory Blanks	SW	
VI.	Field Blanks	\mathcal{N}_{\perp}	
VII.	Matrix Spike/Matrix Spike Duplicates	\mathcal{N}	
VIII.	Duplicate sample analysis	<i>N'</i>	
IX.	Serial Dilution	N	
X.	Laboratory control samples	A	LCS, SBM
XI.	Field Duplicates	SY	(6,7) (8,9)
XII.	Internal Standard (ICP-MS)	\mathcal{N}	not reviewed
XIII.	Sample Result Verification	N	,
XIV	Overall Assessment of Data	LA_	

Note: A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank EB = Equipment blank

ip blank OTHER:

SB=Source blank

Client ID Lab ID Matrix Date LDW20-IT215 20F0114-03 Sediment 06/05/20 2 LDW20-IT240 20F0114-04 Sediment 06/05/20 3 LDW20-IT247 20F0114-05 Sediment 06/05/20 Sediment LDW20-IT310 20F0114-06 06/05/20 5 LDW20-SC322 20F0114-07 Sediment 06/05/20 6 LDW20-SC336 20F0114-08 Sediment 06/05/20 Sediment 06/05/20 LDW20-SC336FD 20F0114-09 8 LDW20-IT365 20F0114-10 Sediment 06/05/20 Sediment 06/05/20 9 LDW20-IT365FD 20F0114-11 10 LDW20-IT361 20F0114-12 Sediment 06/05/20 11 12

Notes:	 	 	 	 	

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
5 to 10	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
1 to 4	As
and the second and th	
4 - 14-11	
	Analysis Method

ICP		
ICP-MS	As, Cd, Cr, Cu, Pb, Ag, Zn	
CVAA	Hg	

Page 1 of 1 Reviewer:CR

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Soil preparation factor applied (if applicable):

Sample Concentration, unless otherwise noted: mg/Kg Associated Samples: 5-10

				Sample Identification								
Analyte	PB (units)	Maximum ICB/CCB (ug/L)	Action Level	7	8	9	10					
Cd		0.034		0.21	0.11	0.11	0.07					
									ļ	<u> </u>	<u> </u>	
	\											

Comments: The listed analyte concentration is the highest ICB or CCB detected in the analysis. The action level, when applicable, is established at 5X the highest ICB, CCB, or PB concentration.

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page 1 of 1 Reviewer:CR

Method: Metals

	Concentrat	RPD	
Analyte	6	7	
Arsenic	9.99	11.4	13
Cadmium	0.23	0.21	9
Chromium	25.8	26.3	2
Copper	46.3	44.9	3
Lead	17.0	17.1	1
Mercury	0.141	0.118	18
Silver	0.16	0.17	6
Zinc	98.6	98.5	0

Analista	Concentrat	RPD	
Analyte	8	9	
Arsenic	4.53	4.39	3
Cadmium	0.11	0.11	0
Chromium	17.0	16.1	5
Copper	19.4	19.6	1
Lead	12.3	8.25	39
Mercury	0.0350	0.0425	19
Silver	0.08	0.09	12
Zinc	59.2	57.3	3

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Wet Chemistry

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0114

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SC169	20F0114-01	Sediment	06/05/20
LDW20-IT215	20F0114-03	Sediment	06/05/20
LDW20-IT240	20F0114-04	Sediment	06/05/20
LDW20-IT247	20F0114-05	Sediment	06/05/20
LDW20-IT310	20F0114-06	Sediment	06/05/20
LDW20-SC322	20F0114-07	Sediment	06/05/20
LDW20-SC336	20F0114-08	Sediment	06/05/20
LDW20-SC336FD	20F0114-09	Sediment	06/05/20
LDW20-IT365	20F0114-10	Sediment	06/05/20
LDW20-IT365FD	20F0114-11	Sediment	06/05/20
LDW20-IT361	20F0114-12	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

Total Solids by Standard Method 2540G

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples LDW20-SC336 and LDW20-SC336FD and samples LDW20-IT365 and LDW20-IT365FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concent		
Analyte	LDW20-SC336	LDW20-SC336FD	RPD
Total solids	45.69	46.44	2
Total organic carbon	2.38	2.29	4

	Concent		
Analyte	LDW20-IT365	LDW20-IT365FD	RPD
Total solids	70.53	69.99	1
Total organic carbon	0.66	0.65	2

X. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4
Wet Chemistry - Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Field Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785A6 SDG #: 20F0114

Laboratory: Analytical Resources, Inc.

Stage 2B

2nd Reviewer

METHOD: (Analyte) TOC (EPA SW846 Method 9060A), Total Solids (SM 2540G)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
1.	Sample receipt/Technical holding times	AA	
- 11	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	\mathcal{N}_{-}	
VI.	Matrix Spike/Matrix Spike Duplicates	\mathcal{N}	
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS, SRM
IX.	Field duplicates	SW	L7.8 Y(9,10)
X.	Sample result verification	, s	, , , , , , , , , , , , , , , , , , , ,
XI	Overall assessment of data	A	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1_	LDW20-SC169	20F0114-01	Sediment	06/05/20
2_	LDW20-IT215	20F0114-03	Sediment	06/05/20
3	LDW20-IT240	20F0114-04	Sediment	06/05/20
4	LDW20-IT247	20F0114-05	Sediment	06/05/20
5	LDW20-IT310	20F0114-06	Sediment	06/05/20
6	LDW20-SC322	20F0114-07	Sediment	06/05/20
7	LDW20-SC336	20F0114-08	Sediment	06/05/20
8	LDW20-SC336FD	20F0114-09	Sediment	06/05/20
9	LDW20-IT365	20F0114-10	Sediment	06/05/20
10	LDW20-IT365FD	20F0114-11	Sediment	06/05/20
11	LDW20-IT361	20F0114-12	Sediment	06/05/20
12				
13				
14				
15				

Note	es:		 	 	 	 	
				_	 		
		•	 	 			

LDC #: 48785A6

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page 1 of 1 Reviewer:CR

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List	
1 to 11	Total solids, TOC	
		-

LDC #: 48785A6

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page 1 of 1 Reviewer:CR

METHOD: Inorganics

	Concent	RPD	
Analyte	7	8	
Total solids	45.69	46.44	2
TOC	2.38	2.29	4

Amelida	Concentration (%)		RPD
Analyte	9	10	
Total solids	70.53	69.99	1
TOC	0.66	0.65	2

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Polychlorinated Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0114

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-IT215	20F0114-03	Sediment	06/05/20
LDW20-IT247	20F0114-05	Sediment	06/05/20
LDW20-SC336	20F0114-08	Sediment	06/05/20
LDW20-SC336FD	20F0114-09	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for High Resolution Superfund Methods Data Review (April 2016). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) Method 1613B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were within the QC limits for unlabeled compounds and labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds with the following exceptions:

Date	Compound	Concentration (Limits)	Associated Samples	Affected Compound	Flag	A or P
06/25/20	13C12-1,2,3,4,7,8,9-HpCDF	73.9 ng/mL (77-129)	LDW20-IT215 LDW20-IT247	1,2,3,4,7,8,9-HpCDF	J (all detects)	Р
06/26/20	13C12-1,2,3,6,7,8-HxCDD	79.0 ng/mL (85-118)	LDW20-SC336 LDW20-SC336FD	1,2,3,6,7,8-HxCDD	J (all detects)	Р

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
BIF0465-BLK1	06/22/20	1,2,3,7,8-PeCDD 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF OCDD Total PeCDD Total HpCDF	0.175 ng/Kg 0.0946 ng/Kg 0.166 ng/Kg 0.521 ng/Kg 1.32 ng/Kg 0.175 ng/Kg 0.166 ng/Kg	All samples in SDG 20F0114

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
LDW20-IT215	1,2,3,7,8-PeCDD	0.768 ng/Kg	0.768U ng/Kg
	2,3,4,6,7,8-HxCDF	0.203 ng/Kg	0.203U ng/Kg
LDW20-IT247	1,2,3,7,8-PeCDD	0.525 ng/Kg	0.525U ng/Kg
	2,3,4,6,7,8-HxCDF	0.416 ng/Kg	0.416U ng/Kg
LDW20-SC336FD	1,2,3,7,8-PeCDD	0.777 ng/Kg	0.777U ng/Kg

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

Samples LDW20-SC336 and LDW20-SC336FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentr		
Compound	LDW20-SC336	LDW20-SC336FD	RPD
2,3,7,8-TCDF	0.729	0.606	18
2,3,7,8-TCDD	0.356	0.996U	Not calculable
1,2,3,7,8-PeCDF	0.612	0.430	35
2,3,4,7,8-PeCDF	0.847	0.710	18
1,2,3,7,8-PeCDD	0.913	0.777	16
1,2,3,4,7,8-HxCDF	2.30	1.67	32
1,2,3,6,7,8-HxCDF	0.965	0.822	16
2,3,4,6,7,8-HxCDF	0.612	1.04	52
1,2,3,7,8,9-HxCDF	0.575	0.452	24
1,2,3,4,7,8-HxCDD	1.11	0.915	19
1,2,3,6,7,8-HxCDD	3.53	3.23	9
1,2,3,7,8,9-HxCDD	2.45	2.23	9
1,2,3,4,6,7,8-HpCDF	19.1	15.4	21
1,2,3,4,7,8,9-HpCDF	1.60	1.25	25
1,2,3,4,6,7,8-HpCDD	104	94.5	10
OCDF	45.8	44.9	2
OCDD	802	747	7
Total TCDF	6.68	3.17	71
Total TCDD	3.47	1.32	90

	Concentra		
Compound	LDW20-SC336	LDW20-SC336FD	RPD
Total PeCDF	6.83	5.89	15
Total PeCDD	1.70	1.58	7
Total HxCDF	26.5	23.4	12
Total HxCDD	28.9	27.8	4
Total HpCDF	63.1	54.6	14
Total HpCDD	242	243	0

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits.

XI. Compound Quantitation

All compound quantitations were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG 20F0114	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А
All samples in SDG 20F0114	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration concentration and compounds reported as EMPC, data were qualified as estimated or not detected in four samples.

Due to laboratory blank contamination, data were qualified as not detected in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 20F0114

Sample	Compound	Flag	A or P	Reason
LDW20-IT215 LDW20-IT247	1,2,3,4,7,8,9-HpCDF	J (all detects)	Р	Continuing calibration (concentration)
LDW20-SC336 LDW20-SC336FD	1,2,3,6,7,8-HxCDD	J (all detects)	Р	Continuing calibration (concentration)
LDW20-IT215 LDW20-IT247 LDW20-SC336 LDW20-SC336FD	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А	Compound quantitation (EMPC)
LDW20-IT215 LDW20-IT247 LDW20-SC336 LDW20-SC336FD	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А	Compound quantitation (EMPC)

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 20F0114

Sample	Compound	Modified Final Concentration	A or P
LDW20-IT215	1,2,3,7,8-PeCDD 2,3,4,6,7,8-HxCDF	0.768U ng/Kg 0.203U ng/Kg	Α
LDW20-IT247	1,2,3,7,8-PeCDD 2,3,4,6,7,8-HxCDF	0.525U ng/Kg 0.416U ng/Kg	А
LDW20-SC336FD	1,2,3,7,8-PeCDD	0.777U ng/Kg	Α

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 20F0114

No Sample Data Qualified in this SDG

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	#: <u>48785A21</u> VALIDATIO #: 20F0114		tage 2B	S WORKSHEET		Date: <u>08/14 /</u> Page: <u>l_of_l</u>
	ratory: <u>Analytical Resources, Inc.</u>	C	lage ZD		f	Reviewer: 1
	HOD: HRGC/HRMS Polychlorinated Diox	ins/Dibenzo	ofurans (EPA	Method 1613B)	2nd F	Reviewer:
	camples listed below were reviewed for eation findings worksheets.	ach of the fo	ollowing valida	ation areas. Validatio	on findings are	noted in attached
	Validation Area			Comm	nents (afficient time)
<u>l.</u>	Sample receipt/Technical holding times	SHIA	cooler tem	p.= 18.8°C 16,2	°C. 12.6°C	15.50 9.10
II.	HRGC/HRMS Instrument performance check	Δ		14.3°C 9.7	c 10,2°C	11.8%
111.	Initial calibration/ICV	ĂΛ	ICAL =	p.= 18.8°C 16.2 14.3°C 9.7° 20/352	IONE	ac limits
IV.	Continuing calibration	SW	COVS	ac limits	•	-
V.	Laboratory Blanks	SW				
VI.	Field blanks	I N				
VII.	Matrix spike/Matrix spike duplicates					
VIII.	Laboratory control samples	A	L	cs SRN	1	
IX.	Field duplicates	SN)) =	: 3/4		
Χ.	Labeled Compounds	A				
XI.	Compound quantitation RL/LOQ/LODs	N	EM	PC = J dets	(>PL); V	(<pl)< td=""></pl)<>
XII.	Target compound identification	N		200 L		
XIII.	System performance	N				
XIV.	Overall assessment of data	A				
lote:	N = Not provided/applicable R = Rin	lo compounds nsate ield blank	detected	D = Duplicate TB = Trip blank EB = Equipment blan	SB=Sour OTHER: ık	rce blank
	Client ID			Lab ID	Matrix	Date
1	LDW20-IT215			20F0114-03	Sediment	06/05/20
2	LDW20-IT247			20F0114-05	Sediment	06/05/20
3	LDW20-SC336			20F0114-08	Sediment	06/05/20
4	LDW20-SC336FD			20F0114-09	Sediment	06/05/20
5						
6						
7						
8						
9						
10						
otes:	10 TEXACT BOLL				<u> </u>	
_	BIFO465_ Keka					
_						

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:	 	 	

LDC #: 48785A21

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Page:_	<u>1</u> _of	1
Reviewer:_	JVC	}
2nd Reviewer:_	U	

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

- <u>Y</u> <u>N</u> <u>Y</u> Was a routine calibration performed at the beginning of each 12 hour period?
- Were all concentrations within method QC limits for unlabeled and labeled compounds?
- Did all routine calibration standards meet the Ion Abundance Ratio criteria?

#	Date	Standard ID	Compound	Conc:ng/mL (Limits)		Finding Ion Abundance Ratio	Associated Samples	Qualifications	
	06/25/20	SIF0380-ICV1	13C12-P	73.9	(77-129)		1, 2, BLK (Det)	J/UJ/P	(qual P)
					,				
	06/26/20	SIF0380-CCV1	13C12-D	79.0	(85-118)		3, 4 (Det)	J/UJ/P	(qual D)
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LDC #: 48785A21

VALIDATION FINDINGS WORKSHEET Blanks

Page	_1_of_1_
Reviewer:	JVG
2nd Reviewer:	

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Were all samples associated with a method blank?

¥ ¥ Y Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated?

Blank extraction date: 06/22/20 Blank analysis date: 06/25/20 Associated samples:_ Conc. units: ng/Kg

Compound	Blank ID		Sample Identification						
	BIF0465-BLK1	(5x)	1	2	4				
В	0.175	0.88	0.768/4	0.525/U	0,777/u				
М	0.0946*	0.47	0.203/	0.525/4	,				
0	0.166	0.83							
Q	0.521*	2.61							
G	1,32	6.60							
s	0.175	0.88							
Υ	0.166	0.83							

*EMPC

LDC#: 48785A21

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:	<u>1</u> of 1
Reviewer:	JVG
2nd Reviewer:	

METHOD: HRGC/HRMS PCDD/PCDF (EPA Method 1613B)

N NA
Were field duplicate pairs identified in this SDG?
Were target analytes detected in the field duplicate pairs?

	Concentra	Concentration (ng/Kg)		
Compound	3	4	RPD	
н	0.729	0.606	18	
Α	0.356*	0.996U	NC	
I _	0.612	0.430	35	
J	0.847	0.710	18	
В	0.913*	0.777	16	
К	2.30	1.67	32	
L	0.965	0.822	16	
М	0.612*	1.04	52	
N	0.575*	0.452	24	
С	1.11	0.915	19	
D	3.53	3.23	9	
Е	2.45	2.23	9	
o	19.1	15.4	21	
P	1.60	1.25	25	
F	104	94.5	10	
Q	45.8	44.9	2	
G	802	747	7	
v	6.68	3.17	71	
R	3.47	1.32	90	
w	6.83	5.89	15	
S	1.70	1.58	7	
х	26.5	23.4	12	
Т	28.9	27.8	4	
Υ	63.1	54.6	14	
U	242	243	0	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Semivolatiles

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0118

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS159	20F0118-01	Sediment	06/05/20
LDW20-SS167	20F0118-02	Sediment	06/05/20
LDW20-SS158	20F0118-03	Sediment	06/05/20
LDW20-SS154	20F0118-04	Sediment	06/05/20
LDW20-SS168	20F0118-05	Sediment	06/05/20
LDW20-SS101	20F0118-06	Sediment	06/05/20
LDW20-SS102	20F0118-07	Sediment	06/05/20
LDW20-SS102-FD	20F0118-08	Sediment	06/05/20
LDW20-SS102-FDRE	20F0118-08RE	Sediment	06/05/20
LDW20-SS109	20F0118-09	Sediment	06/05/20
LDW20-SS109-FD	20F0118-10	Sediment	06/05/20
LDW20-SS117	20F0118-12	Sediment	06/05/20
LDW20-SS159MS	20F0118-01MS	Sediment	06/05/20
LDW20-SS159MSD	20F0118-01MSD	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits with the following exceptions:

SRM ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
BIF0487-SRM1	Anthracene Bis(2-ethylhexyl)phthalate Benzo(a)pyrene	49.6 (57-143) 61.1 (62-138) 48.4 (54-146)	All samples in SDG 20F0118	J (all detects) UJ (all non-detects)	Р

X. Field Duplicates

Samples LDW20-SS102 and LDW20-SS102-FD, samples LDW20-SS102 and LDW20-SS102-FDRE, and samples LDW20-SS109 and LDW20-SS109-FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentra		
Compound	LDW20-SS102	LDW20-SS102-FD	RPD
Phenanthrene	28.2	36.7	26
Anthracene	14.1	10.0	34
Fluoranthene	72.5	70.9	2
Pyrene	74.2	73.2	1
Benzo(a)anthracene	35.9	30.7	16
Chrysene	68.2	43.5	44

	Concentra		
Compound	LDW20-SS102	LDW20-SS102-FD	RPD
Bis(2-ethylhexyl)phthalate	69.0	60.6	13
Benzofluoranthenes, total	103	89.3	14
Benzo(a)pyrene	38.7	31.0	22
Indeno(1,2,3-cd)pyrene	27.1	24.7	9
Benzo(g,h,i)perylene	19.9U	28.1	Not calculable

	Concentration (ug/Kg)		
Compound	LDW20-SS102	LDW20-SS102-FDRE	RPD
Phenol	19.9U	9.0	Not calculable
Naphthalene	19.9U	4.5	Not calculable
2-Methylnaphthalene	19.9U	4.7	Not calculable
Acenaphthylene	19.9U	2.7	Not calculable
Acenaphthene	19.9U	4.5	Not calculable
Dibenzofuran	19.9U	4.3	Not calculable
Fluorene	19.9U	4.1	Not calculable
Phenanthrene	28.2	31.9	12
Anthracene	14.1	7.8	58
Fluoranthene	72.5	56.7	24
Pyrene	74.2	57.1	26
Butylbenzylphthalate	19.9U	4.2	Not calculable
Benzo(a)anthracene	35.9	23.6	41
Chrysene	68.2	34.7	65
Bis(2-ethylhexyl)phthalate	69.0	49.4	33

	Concentra		
Compound	LDW20-SS102	LDW20-SS102-FDRE	RPD
Benzofluoranthenes, total	103	74.6	32
Benzo(a)pyrene	38.7	25.1	43
Indeno(1,2,3-cd)pyrene	27.1	20.1	30
Dibenzo(a,h)anthracene	19.9U	8.4	Not calculable
Benzo(g,h,i)perylene	19.9U	24.6	21

	Concentra		
Compound	LDW20-SS109	LDW20-SS109-FD	RPD
Phenanthrene	28.8	31.3	8
Anthracene	11.1	14.3	25
Fluoranthene	65.6	59.4	10
Pyrene	65.5	57.8	12
Butylbenzylphthalate	20.0U	11.3	56
Benzo(a)anthracene	28.7	29.6	3
Chrysene	44.7	45.9	3
Bis(2-ethylhexyl)phthalate	74.3	63.8	15
Benzofluoranthenes, total	93.7	89.5	5
Benzo(a)pyrene	31.4	33.3	6
Indeno(1,2,3-cd)pyrene	22.4	21.9	2
Benzo(g,h,i)perylene	25.4	25.5	0

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

In the case where more than one result was reported for an individual sample, the least technically acceptable results were deemed not reportable as follows:

Sample	Compound	Reason	Flag	A or P
LDW20-SS102-FDRE	All compounds	Results from original analyses were more usable.	Not reportable	А

Due to SRM %R, data were qualified as estimated in eleven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles - Data Qualification Summary - SDG 20F0118

Sample	Compound	Flag	A or P	Reason
LDW20-SS159 LDW20-SS167 LDW20-SS158 LDW20-SS154 LDW20-SS168 LDW20-SS101 LDW20-SS102 LDW20-SS102-FD LDW20-SS109 LDW20-SS109-FD LDW20-SS117	Anthracene Bis(2-ethylhexyl)phthalate Benzo(a)pyrene	J (all detects) UJ (all non-detects)	Р	Standard reference materials (%R)
LDW20-SS102-FDRE	All compounds	Not reportable	А	Overall assessment of data

Duwamish AOC4
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

Duwamish AOC4
Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785B2a SDG #: 20F0118

Stage 2B

Laboratory: Analytical Resources, Inc.

Reviewer: Ma 2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270E)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments (Insufficient time)
l.	Sample receipt/Technical holding times	SW/A	Cooler temp. = 18.8°C 16.2°C 12.6°C 15.5°C 9.1°C
II.	GC/MS Instrument performance check	A	14.3°C, 9.7°C, 10.2°C, 11.8°C
III.	Initial calibration/ICV	AA	1946 206 106 30%
IV.	Continuing calibration	l'A'	an 6, 20 %
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	L A	
VIII.	Matrix spike/Matrix spike duplicates	À	
IX.	Laboratory control samples	SW	LCS , SRM
X.	Field duplicates	SW	D=7/8 7/9 10/11
XI.	Internal standards	A	, ,
XII.	Compound quantitation RL/LOQ/LODs	N	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	SW)	

A = Acceptable Note:

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

	Client ID		Lab ID	Matrix	Date
1_	LDW20-SS159		20F0118-01	Sediment	06/05/20
2	LDW20-SS167		20F0118-02	Sediment	06/05/20
3	LDW20-SS158		20F0118-03	Sediment	06/05/20
4	LDW20-SS154		20F0118-04	Sediment	06/05/20
5	LDW20-SS168		20F0118-05	Sediment	06/05/20
6	LDW20-SS101		20F0118-06	Sediment	06/05/20
7	LDW20-SS102 D1 D2	***************************************	20F0118-07	Sediment	06/05/20
8	LDW20-SS102-FD D,		20F0118-08	Sediment	06/05/20
9	LDW20-SS102-FDRE D _V		20F0118-08RE	Sediment	06/05/20
10	LDW20-SS109	<i>V</i> 3	20F0118-09	Sediment	06/05/20
11	LDW20-SS109-FD	Dz	20F0118-10	Sediment	06/05/20
12	LDW20-SS117	-	20F0118-12	Sediment	06/05/20
13	LDW20-SS159MS		20F0118-01MS	Sediment	06/05/20
14	LDW20-SS159MSD		20F0118-01MSD	Sediment	06/05/20

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

LDC #: 48785 324

VALIDATION FINDINGS WORKSHEET Laboratory Control Samples (LCS) /S化M

Page:	
Reviewer:	Jyg ´
2nd Reviewer:	1

METHOD: GC/MS BNA (EPA SW 846 Method 8270¢)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y) N N/A Was a LCS required?

N N/A

Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	BIF0487- SRM		49.6 (57-143)	()	()	All (ND+Dat)	J/15/P
		EEE	61.1 (62-138)	()	()		3/1/3/1
		III	61.1 (62-138) 48.4 (54-146	()	()		/
			()	()	()		
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LDC#: 48785B2a

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:_1_of_2_ Reviewer: JVG
2nd Reviewer:

METHOD: GCMS SVOA (EPA SW 846 Method 8270E)

YN NA
YN NA
Were field duplicate pairs identified in this SDG?
Were target analytes detected in the field duplicate pairs?

	Concentrat	tion (ug/Kg)	
Compound	7 8		RPD
UU	28.2	36.7	26
w	14.1	10.0	34
YY	72.5	70.9	2
ZZ	74.2	73.2	1
ccc	35.9	30.7	16
DDD	68.2	43.5	44
EEE	69.0	60.6	13
A2	103	89.3	14
III	38.7	31.0	22
JJJ	27.1	24.7	9
LLL	19.9U	28.1	NC

	Concentra	ation (ug/Kg)		
Compound	7	9	RPD	
Α	19.9U	9.0	NC	
S	19.9U	4.5	NC	
w	19.9U	4.7	NC	
DD	19.9U	2.7	NC	
GG	19.9U	4.5	NC	
IJ	19.9U	4.3	NC	
NN	19.9U	4.1	NC	
UU	28.2	31.9	12	
w	14.1	7.8	58	
YY	72.5	56.7	24	
ZZ	74.2	57.1	26	
AAA	19.9U	4.2	NC	
ccc	35.9	23.6	41	
DDD	68.2	34.7	65	
EEE	69.0	49.4	33	
A2	103	74.6	32	
111	38.7	25.1	43	
າາາ	27.1	20.1	30	
ккк	19.9U	8.4	NC	
LLL	19.9U	24.6	21	

LDC#: 48785B2a

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:_2_of_2_ Reviewer:_ JVG 2nd Reviewer:____

METHOD: GC MS SVOA (EPA SW 846 Method 8270E)

Were field duplicate pairs identified in this SDG?

NA
Were target analytes detected in the field duplicate pairs?

	Concentrat		
Compound	10	11	RPD
UU	28.8	31.3	8
w	11.1	14.3	25
YY	65.6	59.4	10
ZZ	65.5	57.8	12
AAA	20.0U	11.3	56
ccc	28.7	29.6	3
DDD	44.7	45.9	3
EEE	74.3	63.8	15
A2	93.7	89.5	5
III	31.4	33.3	6
JJJ	22.4	21.9	2
LLL	25.4	25.5	0

V:\Josephine\FIELD DUPLICATES\48785B2a windward duwamish.wpd

LDC #:	48	7	85	B	20

VALIDATION FINDINGS WORKSHEET <u>Overall Assessment of Data</u>

Page: _	of
Reviewer: _	JVG
2nd Reviewer:	

METHOD: GC/MS BNA (EPA SW 846 Method 8270¢)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

N N/A Was the overall quality and usability of the data acceptable?

#	Date	Sample ID	Compound	Finding	Qualifications
		9	Åη	Conf.	NR/A
			•		
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<u> </u>					

Comments: _			
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Semivolatiles

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0118

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS159	20F0118-01	Sediment	06/05/20
LDW20-SS167	20F0118-02	Sediment	06/05/20
LDW20-SS158	20F0118-03	Sediment	06/05/20
LDW20-SS154	20F0118-04	Sediment	06/05/20
LDW20-SS168	20F0118-05	Sediment	06/05/20
LDW20-SS101	20F0118-06	Sediment	06/05/20
LDW20-SS102	20F0118-07	Sediment	06/05/20
LDW20-SS102-FD	20F0118-08	Sediment	06/05/20
LDW20-SS102-FDRE	20F0118-08RE	Sediment	06/05/20
LDW20-SS109	20F0118-09	Sediment	06/05/20
LDW20-SS109-FD	20F0118-10	Sediment	06/05/20
LDW20-SS117	20F0118-12	Sediment	06/05/20
LDW20-SS159MS	20F0118-01MS	Sediment	06/05/20
LDW20-SS159MSD	20F0118-01MSD	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r²) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/26/20	N-Nitrosodiphenylamine	41.9	All samples in SDG 20F0118	J (all detects) UJ (all non-detects)	А

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/26/20	Pentachlorophenol	23.0	LDW20-SS159 LDW20-SS167 LDW20-SS158 LDW20-SS154 LDW20-SS101 LDW20-SS102 LDW20-SS102 LDW20-SS109 LDW20-SS109 LDW20-SS109-FD LDW20-SS117	J (all detects) UJ (all non-detects)	Α
07/09/20	Benzoic acid Pentachlorophenol	33.8 40.3	LDW20-SS102-FDRE	J (all detects) J (all detects)	Α

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits with the following exceptions:

SRM ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
BIF0487-SRM2	1,4-Dichlorobenzene 1,2-Dichlorobenzene 2,4-Dimethylphenol	28.7 (34-166) 29.1 (36-164) 39.2 (40-160)	All samples in SDG 20F0118	J (all detects) UJ (all non-detects)	Р

X. Field Duplicates

Samples LDW20-SS102 and LDW20-SS102-FD, samples LDW20-SS102 and LDW20-SS102-FDRE, and samples LDW20-SS109 and LDW20-SS109-FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentra		
Compound	LDW20-SS102	LDW20-SS102-FD	RPD
Benzyl alcohol	10.8	7.4	37
Benzoic acid	47.0	69.0	38

	Concentra		
Compound	LDW20-SS102 LDW20-SS102-FDRE		RPD
Benzyl alcohol	10.8	6.6	48
Benzoic acid	47.0	69.0	38
1,4-Dichlorobenzene	5.0U	0.7	Not calculable
N-Nitrosodiphenylamine	5.0U	0.7	Not calculable
Pentachlorophenol	19.9U	2.0	Not calculable

	Concentra		
Compound	LDW20-SS109	LDW20-SS109-FD	RPD
Benzyl alcohol	18.1	4.9	115
Benzoic acid	33.2	37.2	11

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

In the case where more than one result was reported for an individual sample, the least technically acceptable results were deemed not reportable as follows:

Sample	Compound	Reason	Flag	A or P
LDW20-SS102-FDRE	All compounds	Results from original analyses were more usable.	Not reportable	А

Due to ICV %D, continuing calibration %D, and SRM %R, data were qualified as estimated in eleven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles – Data Qualification Summary - SDG 20F0118

Sample	Compound	Flag	A or P	Reason
LDW20-SS159 LDW20-SS167 LDW20-SS158 LDW20-SS154 LDW20-SS168 LDW20-SS101 LDW20-SS102 LDW20-SS102-FD LDW20-SS109 LDW20-SS109-FD LDW20-SS117	N-Nitrosodiphenylamine	J (all detects) UJ (all non-detects)	А	Initial calibration verification (%D)
LDW20-SS159 LDW20-SS167 LDW20-SS158 LDW20-SS154 LDW20-SS168 LDW20-SS101 LDW20-SS102 LDW20-SS102 LDW20-SS109-FD LDW20-SS109-FD LDW20-SS117	Pentachlorophenol	J (all detects) UJ (all non-detects)	А	Continuing calibration (%D)
LDW20-SS159 LDW20-SS167 LDW20-SS158 LDW20-SS154 LDW20-SS168 LDW20-SS101 LDW20-SS102 LDW20-SS102-FD LDW20-SS109-FD LDW20-SS109-FD LDW20-SS109-FD LDW20-SS117	1,4-Dichlorobenzene 1,2-Dichlorobenzene 2,4-Dimethylphenol	J (all detects) UJ (all non-detects)	Р	Standard reference materials (%R)
LDW20-SS102-FDRE	All compounds	Not reportable	Α	Overall assessment of data

Duwamish AOC4 Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

Duwamish AOC4
Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

LDC #: 48785B2b

VALIDATION COMPLETENESS WORKSHEET

Stage 2B

SDG #: 20F0118

Laboratory: Analytical Resources, Inc.

SVOA

METHOD: GC/MS Polynuclear Aromatic Hydrocarbons (EPA SW 846 Method 8270E-SIM)

Reviewer: 2nd Reviewer

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments (Insufficient)
l.	Sample receipt/Technical holding times	SW/A	Cooler temp. = 18.8°C 16.2°C 12.6°C 15.5°C 9,18 14.3°C 9.7°C 10.2°C 11.8°C
II.	GC/MS Instrument performance check	A	
111.	Initial calibration/ICV	A /SW	1CAL= 20% M WE 300
IV.	Continuing calibration	SW	CW = 20%
V.	Laboratory Blanks	Á	
VI.	Field blanks	0	
VII.	Surrogate spikes	Ä	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	SW	LCS SRM
X.	Field duplicates	SW	h = 7/8 7/9 10/n
XI.	Internal standards	A	,
XII.	Compound quantitation RL/LOQ/LODs	N	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	SIA	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date		
1	LDW20-SS159	20F0118-01	Sediment	06/05/20		
2	LDW20-SS167	20F0118-02	Sediment	06/05/20		
3	LDW20-SS158	20F0118-03	Sediment	06/05/20		
4	LDW20-SS154	20F0118-04	Sediment	06/05/20		
5	LDW20-SS168	20F0118-05	Sediment	06/05/20		
6	LDW20-SS101	20F0118-06	Sediment	06/05/20		
7	LDW20-SS102 D1 D	20F0118-07	Sediment	06/05/20		
8	LDW20-SS102-FD D,	20F0118-08	Sediment	06/05/20		
9	LDW20-SS102-FDRE	20F0118-08RE	Sediment	06/05/20		
10	LDW20-SS109	20F0118-09	Sediment	06/05/20		
11	LDW20-SS109-FD $\mathcal{D}_{\mathbf{z}}'$	20F0118-10	Sediment	06/05/20		
12	LDW20-SS117	20F0118-12	Sediment	06/05/20		
13	LDW20-SS159MS	20F0118-01MS	Sediment	06/05/20		
14	LDW20-SS159MSD	20F0118-01MSD	Sediment	06/05/20		

1. BIF0987-BK2

BIF 6 487-343 2,

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

A2. Benzofluoranthenes, Total

LDC #: 48 785 326

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page: _\ of _\
Reviewer: _\ JVG

2nd Reviewer: _

METHOD: GC/MS SVOA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was an initial calibration verification standard analyzed after each ICAL for each instrument?

<u>Y(N)N/A</u>	Were all %D with	nin the validation	n criteria of	≤ 20(30%)%D?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%(30%)	Associated Samples	Qualifications
	06/24/20	SIF0393 SCV1	RR	41.9	All (ND + Det)	J/UJ/A
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LDC #: 48785 B26

VALIDATION FINDINGS WORKSHEET <u>Continuing Calibration</u>

Page:_	_ <u>_</u> _of	
Reviewer:_	JVG	
2nd Reviewer:	4	

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?

Which is a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?

Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?

Y N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#	Date	Standard ID	Compound	Finding %D (Limit: <u><</u> 20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	06/26/20	NT100626155	TT	23.0		1-8, 10-14, MB1	(ND+Det) J/NJ/A
	07/09/20	NT10200709635	PPP TT	33.8 40.3		9 MB2 (Det)	,
	·						
	}						

LDC #: 48 785 \$26

VALIDATION FINDINGS WORKSHEET <u>Laboratory Control Samples (LCS)</u> /SRM

Page:	<u>of</u>	
Reviewer:	کا\XG	
2nd Reviewer:		

METHOD: GC/MS BNA (EPA SW 846 Method 8270) s/m)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A

Was a LCS required?

(Y) N) N/A

Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#_	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	BIF0487-SRM2	E	28.7 (34-166)	()	()	All (ND+Det)	J/115/P
		F	29.1 (36-164)	()	()		
		Ò	39.2 40-160)	()	()		
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LDC#: 48785B2b

VALIDATION FINDINGS WORKSHEET <u>Field Duplicates</u>

Page: 1 of 1
Reviewer: JVG
2nd Reviewer:

METHOD: GCMS SVOA (EPA SW 846 Method 8270E-SIM)

YNA Were field duplicate pairs identified in this SDG?

YN NA Were target analytes detected in the field duplicate pairs?

	Concentration (ug/Kg)		
Compound	7	8	RPD
QQQ	10.8	7.4	37
PPP	47.0	69.0	38

	Concentrati	RPD	
Compound	7 9		
QQQ	10.8	6.6	48
PPP	47.0	69.0	38
E	5.0U	0.7	NC
QQ	5.0U	0.7	NC
ТТ	19.9U	2.0	NC

	Concentration (ug/Kg)		
Compound	10	11	RPD
QQQ	18.1	4.9	115
PPP	33.2	37.2	11

V:\Josephine\FIELD DUPLICATES\48785B2b windward duwamish.wpd

LDC #: 48785 B 26

VALIDATION FINDINGS WORKSHEET Overall Assessment of Data

Page: .	of <i>_</i> _	
Reviewer:	JXG (
2nd Reviewer:		_

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

YN N/A

Was the overall quality and usability of the data acceptable?

#	Date	Sample ID	Compound	Finding	Qualifications
		9	All	Conf.	NR/A
	,				

Comments: _						<u> </u>
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Hexachlorobenzene

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0118

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS159	20F0118-01	Sediment	06/05/20
LDW20-SS167	20F0118-02	Sediment	06/05/20
LDW20-SS158	20F0118-03	Sediment	06/05/20
LDW20-SS154	20F0118-04	Sediment	06/05/20
LDW20-SS168	20F0118-05	Sediment	06/05/20
LDW20-SS101	20F0118-06	Sediment	06/05/20
LDW20-SS102	20F0118-07	Sediment	06/05/20
LDW20-SS102-FD	20F0118-08	Sediment	06/05/20
LDW20-SS109	20F0118-09	Sediment	06/05/20
LDW20-SS109-FD	20F0118-10	Sediment	06/05/20
LDW20-SS117	20F0118-12	Sediment	06/05/20
LDW20-SS159MS	20F0118-01MS	Sediment	06/05/20
LDW20-SS159MSD	20F0118-01MSD	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Hexachlorobenzene by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples LDW20-SS102 and LDW20-SS102-FD and samples LDW20-SS109 and LDW20-SS109-FD were identified as field duplicates. No results were detected in any of the samples.

XI. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4 Hexachlorobenzene - Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

Duwamish AOC4
Hexachlorobenzene - Laboratory Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

Duwamish AOC4 Hexachlorobenzene - Field Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET

LDC #: 48785B3a SDG #: 20F0118

Stage 2B

Laboratory: Analytical Resources, Inc.

METHOD: GC Hexachlorobenzene (EPA SW846 Method 8081B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments Insufficient time
1.	Sample receipt/Technical holding times	SW/ A	Cooler temp = 18,8°C 16.2°C 12.6°C 15.5°C 9.1°C 14.3°C 9.7°C, 10.2°C, 11.8°C 1CAL C 202 1CAL C 202
<u>II.</u>	GC Instrument Performance Check	l N	14.30 9.70 , 10.20 11.80
111.	Initial calibration/ICV	AIA	IGAL C 202 1 CUE 203
IV.	Continuing calibration	A'	CAL 502 1015 2013
V.	Laboratory Blanks	I A	
VI.	Field blanks	N	
VII.	Surrogate spikes / 15	A/A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	ND	D = 7/8 9/10
XI.	Compound quantitation/RL/LOQ/LODs	N	'
XII.	Target compound identification	N	
XIII.	System Performance	N_	
XIV	Overall assessment of data	LA	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate TB = Trip blank

TB = Trip blank OT EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS159	20F0118-01	Sediment	06/05/20
2	LDW20-SS167	20F0118-02	Sediment	06/05/20
3	LDW20-SS158	20F0118-03	Sediment	06/05/20
4	LDW20-SS154	20F0118-04	Sediment	06/05/20
- 5	LDW20-SS168	20F0118-05	Sediment	06/05/20
6_	LDW20-SS101	20F0118-06	Sediment	06/05/20
7	LDW20-SS102 $\mathcal{D}_{\mathbf{I}}$	20F0118-07	Sediment	06/05/20
8	LDW20-SS102-FD D,	20F0118-08	Sediment	06/05/20
9	LDW20-SS109 P _Y	20F0118-09	Sediment	06/05/20
10	LDW20-SS109-FD	20F0118-10	Sediment	06/05/20
17	LDW20-SS117	20F0118-12	Sediment	06/05/20
12	LDW20-SS159MS	20F0118-01MS	Sediment	06/05/20
13	LDW20-SS159MSD	20F0118-01MSD	Sediment	06/05/20
14_				
_ 15	BIF0464- B2K1			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Polychlorinated Biphenyls

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0118

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS159	20F0118-01	Sediment	06/05/20
LDW20-SS167	20F0118-02	Sediment	06/05/20
LDW20-SS158	20F0118-03	Sediment	06/05/20
LDW20-SS154	20F0118-04	Sediment	06/05/20
LDW20-SS168	20F0118-05	Sediment	06/05/20
LDW20-SS101	20F0118-06	Sediment	06/05/20
LDW20-SS102	20F0118-07	Sediment	06/05/20
LDW20-SS102-FD	20F0118-08	Sediment	06/05/20
LDW20-SS109	20F0118-09	Sediment	06/05/20
LDW20-SS109-FD	20F0118-10	Sediment	06/05/20
LDW20-SS117	20F0118-12	Sediment	06/05/20
LDW20-SS159MS	20F0118-01MS	Sediment	06/05/20
LDW20-SS159MSD	20F0118-01MSD	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	<u>%D</u>	Associated Samples	Flag	A or P
06/10/20	SIF0176-SCV1	2C	Aroclor-1260	21.0	All samples in SDG 20F0118	J (all detects)	A

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples LDW20-SS102 and LDW20-SS102-FD and samples LDW20-SS109 and LDW20-SS109-FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentra		
Compound	LDW20-SS102	LDW20-SS102-FD	RPD
Aroclor-1248	21.1	26.5	23
Aroclor-1254	27.4	36.3	28
Aroclor-1260	59.1	45.2	27

	Concentra		
Compound	LDW20-SS109	LDW20-SS109-FD	RPD
Aroclor-1248	22.4	18.8	17
Aroclor-1254	32.0	27.6	15
Aroclor-1260	35.4	30.1	16

X. Compound Quantitation

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
LDW20-SS159	Aroclor-1248	42.9	J (all detects)	А

Sample	Compound	RPD	Flag	A or P
LDW20-SS167	Aroclor-1248	42.6	J (all detects)	А
LDW20-SS158	Aroclor-1248	50.6	J (all detects)	А
LDW20-SS154	Aroclor-1248	48.6	J (all detects)	Α
LDW20-SS168	Aroclor-1248	60.6	J (all detects)	А

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D and RPD between two columns, data were qualified as estimated in eleven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Biphenyls - Data Qualification Summary - SDG 20F0118

Sample	Compound	Flag	A or P	Reason
LDW20-SS159 LDW20-SS167 LDW20-SS158 LDW20-SS154 LDW20-SS168 LDW20-SS101 LDW20-SS102 LDW20-SS102-FD LDW20-SS109 LDW20-SS109-FD LDW20-SS117	Aroclor-1260	J (all detects)	А	Initial calibration verification (%D)
LDW20-SS159 LDW20-SS167 LDW20-SS158 LDW20-SS154 LDW20-SS168	Aroclor-1248	J (all detects)	А	Compound quantitation (RPD between two columns)

Duwamish AOC4

Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

LDC #: 48785B3b VALIDATION COMPLETENESS WORKSHEET

SDG #: 20F0118

Stage 2B

Page: 1
Reviewer: 2
2nd Reviewer: 1

Laboratory: Analytical Resources, Inc.

METHOD: GC Polychlorinated Biphenyls (EPA SW846 Method 8082A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments (Insufficient)
1.	Sample receipt/Technical holding times	SN/A	Cooler temp. = 18.8°C, 16.2°C, 15.5°C, 9.1°C, 14.3°C
II.	Initial calibration/ICV	A/SN	Cooler temp. = 18.8°C, 16.2°C, 15.5°C, 9.1°C, 14.3°C, 12.6°C, 9.7°C, 10.2°C, 11.8°C, 12.6°C, 10.2°C, 1
III.	Continuing calibration	A	CW = 20 ?
IV.	Laboratory Blanks	Â	
V.	Field blanks	N	
VI.	Surrogate spikes /15	A/A	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	À	LCS
IX.	Field duplicates	SW	D = 7/8 9/10
X	Compound quantitation/RL/LOQ/LODs	Ski	' !
XI.	Target compound identification	N	
الك	Overall assessment of data	<u> </u>	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS159	20F0118-01	Sediment	06/05/20
2	LDW20-SS167	20F0118-02	Sediment	06/05/20
3	LDW20-SS158	20F0118-03	Sediment	06/05/20
4	LDW20-SS154	20F0118-04	Sediment	06/05/20
5	LDW20-SS168	20F0118-05	Sediment	06/05/20
6	LDW20-SS101	20F0118-06	Sediment	06/05/20
7	LDW20-SS102 D,	20F0118-07	Sediment	06/05/20
8	LDW20-SS102-FD D,	20F0118-08	Sediment	06/05/20
9	LDW20-SS109 D ₇	20F0118-09	Sediment	06/05/20
10	LDW20-SS109-FD $\mathcal{D}_{m{ u}}$	20F0118-10	Sediment	06/05/20
11	LDW20-SS117	20F0118-12	Sediment	06/05/20
12	LDW20-SS159MS	20F0118-01MS	Sediment	06/05/20
13	LDW20-SS159MSD	20F0118-01MSD	Sediment	06/05/20
14				
15				
16				
17	61 F0986 - BUK 1			

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPASW 846 Method 8081/8082)

A. alpha-BHC	K. Endrin	U. Toxaphene	EE. 2,4'-DDT	OO. trans-Heptachlor epoxide
B. beta-BHC	L. Endosulfan II	V. Aroclor-1016	FF. Hexachlorobenzene	PP. Mirex
C. delta-BHC	M. 4,4'-DDD	W. Aroclor-1221	GG. Chlordane	QQ çis-Chlordane
D. gamma-BHC	N. Endosulfan sulfate	X. Aroclor-1232	HH. Chlordane (Technical)	RR. trans-Chlordane
E. Heptachlor	O. 4,4'-DDT	Y. Aroclor-1242	II. Aroclor 1262	SS.
F. Aldrin	P. Methoxychlor	Z. Aroclor-1248	JJ. Aroclor 1268	тт.
G. Heptachlor epoxide	Q. Endrin ketone	AA. Aroclor-1254	KK. Oxychlordane	UU.
H. Endosulfan I	R. Endrin aldehyde	BB. Aroclor-1260	LL. trans-Nonachlor	vv
I. Dieldrin	S. alpha-Chlordane	CC. 2,4'-DDD	MM. cis-Nonachlor	ww.
J. 4,4'-DDE	T. gamma-Chlordane	DD. 2,4'-DDE	NN. cis-Heptachlor epoxide	XX.

Notes:	

LDC #: 48785 B 36

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	of
Reviewer:	JVG [']
2nd Reviewer:_	4

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

What type of initial calibration verification calculation was performed? /%D or %R

YN N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y(N)N/A Did the initial calibration verification standards meet the %D / %R validation criteria of <20.0% / 80-120%?

#	Date	Standard ID	Detector/ Column	Compound	%D (Limit ≤ 20.0)	Associated Samples	Qualifications
	6 10 20	SIF0176-SCV1	2C	βB	21.0	All (Det)	J/UJ/A (quel BB m
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LDC#: 48785B3b

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page	: <u> 1 of/1 </u>
Reviewer:	JVØ
2nd Reviewer:	Ø

METHOD: GC PCB (EPA SW 846 Method 8082A)

AN NA

Were field duplicate pairs identified in this SDG?
Were target analytes detected in the field duplicate pairs?

	Concentrat		
Compound	7	8	RPD
Aroclor 1248	21.1	26.5	23
Aroclor 1254	27.4	36.3	28
Aroclor 1260	59.1	45.2	27

	Concentrat		
Compound	9	10	RPD
Aroclor 1248	22.4	18.8	17
Aroclor 1254	32.0	27.6	15
Aroclor 1260	35.4	30.1	16

V:\Josephine\FIELD DUPLICATES\48785B3b windward duwamish.wpd

LDC #: 48785 \$ 36

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: _	<u>\</u> of_)
Reviewer: _	JÆ	
2nd Reviewer:	a	-

 ${\tt METHOD:} \quad {\color{red} \not_} \; {\tt GC} \; {\color{red} \bot} \; {\tt HPLC}$

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Level IV/D Only

Were CRQLs adjusted for sample dilutions, dry weight factors, etc.?

/ N N/A

Did the reported results for detected target compounds agree within 10.0% of the recalculated results?

Did the percent difference of detected compounds between two columns./detectors ≤40%?

If no, please see findings bellow.

#	Compound Name	Sample ID	%RPDD%D Between Two Columns/Detectors Limit (≤ 40%)	Qualifications
	Arodor 1248		42.9	J dets/A
		2	42.6	
		3	50.6	
		4	48.6	
		5	60.6	У

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Metals

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0118

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS159	20F0118-01	Sediment	06/05/20
LDW20-SS167	20F0118-02	Sediment	06/05/20
LDW20-SS158	20F0118-03	Sediment	06/05/20
LDW20-SS154	20F0118-04	Sediment	06/05/20
LDW20-SS168	20F0118-05	Sediment	06/05/20
LDW20-SS101	20F0118-06	Sediment	06/05/20
LDW20-SS102	20F0118-07	Sediment	06/05/20
LDW20-SS102-FD	20F0118-08	Sediment	06/05/20
LDW20-SS109	20F0118-09	Sediment	06/05/20
LDW20-SS109-FD	20F0118-10	Sediment	06/05/20
LDW20-SS117	20F0118-12	Sediment	06/05/20
LDW20-SS159MS	20F0118-01MS	Sediment	06/05/20
LDW20-SS159MSD	20F0118-01MSD	Sediment	06/05/20
LDW20-SS159DUP	20F0118-01DUP	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Arsenic, Cadmium, Chromium, Copper, Lead, Silver, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A Mercury by EPA SW 846 Method 7471B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Zinc	2.3 mg/Kg	All samples in SDG 20F0118
ICB/CCB	Arsenic	0.028 ug/L	LDW20-SS167 LDW20-SS158 LDW20-SS154 LDW20-SS168 LDW20-SS101 LDW20-SS102 LDW20-SS102-FD LDW20-SS109 LDW20-SS109-FD LDW20-SS117

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
LDW20-SS159MS/MSD (All samples in SDG 20F0118)	Mercury	144 (75-125)	150 (75-125)	J (all detects)	A

Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

XI. Field Duplicates

Samples LDW20-SS102 and LDW20-SS102-FD and samples LDW20-SS109 and LDW20-SS109-FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentra		
Analyte	LDW20-SS102	LDW20-SS102-FD	RPD
Arsenic	8.60	6.10	34
Cadmium	0.12	0.15	22

	Concentra		
Analyte	LDW20-SS102 LDW20-SS102-FD		RPD
Chromium	21.9	21.7	1
Copper	26.9	26.0	3
Lead	11.5	11.2	3
Mercury	0.189	0.110	53
Silver	0.30	0.12	86
Zinc	65.7	63.3	4

	Concentra		
Analyte	LDW20-SS109	LDW20-SS109-FD	RPD
Arsenic	9.15	9.67	6
Cadmium	0.13	0.15	14
Chromium	20.5	20.6	0
Copper	30.5	34.5	12
Lead	12.7	12.8	1
Mercury	0.104	0.0916	13
Silver	0.14	0.14	0
Zinc	70.7	71.9	2

XII. Internal Standards (ICP-MS)

Raw data were not reviewed for Stage 2B validation.

XIII. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in twelve samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Metals - Data Qualification Summary - SDG 20F0118

Sample	Analyte	Flag	A or P	Reason
LDW20-SS159 LDW20-SS167 LDW20-SS158 LDW20-SS154 LDW20-SS168 LDW20-SS101 LDW20-SS102 LDW20-SS102-FD LDW20-SS109-FD LDW20-SS109-FD LDW20-SS117 LDW20-SS159DUP	Mercury	J (all detects)	Α	Matrix spike/Matrix spike duplicate (%R)

Duwamish AOC4 Metals - Laboratory Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

Duwamish AOC4
Metals - Field Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

LDC #: 48785B4a VALIDATION COMPLETENESS WORKSHEET

SDG #: 20F0118 Stage 2B

Laboratory: Analytical Resources, Inc.

METHOD: Metals (EPA SW 846 Method 6020A/7471B)

Page:_Lof__ Reviewer:_____2nd Reviewer:_____

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
l.	Sample receipt/Technical holding times	AIA	
11.	ICP/MS Tune	A	
III.	Instrument Calibration	Α	
IV.	ICP Interference Check Sample (ICS) Analysis	Δ	
V	Laboratory Blanks	SW	
VI.	Field Blanks	\sim	
VII.	Matrix Spike/Matrix Spike Duplicates	SW	
VIII.	Duplicate sample analysis	A,	
IX.	Serial Dilution	\mathcal{N}	
X.	Laboratory control samples	A	LCS, SRM
XI.	Field Duplicates	SW	(7,8) (9,10)
XII.	Internal Standard (ICP-MS)	$\mathcal{N}_{\mathcal{N}}$	notrenewed
XIII.	Sample Result Verification	N	<u> </u>
XIV	Overall Assessment of Data	LA	

Note: A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS159	20F0118-01	Sediment	06/05/20
2	LDW20-SS167	20F0118-02	Sediment	06/05/20
3	LDW20-SS158	20F0118-03	Sediment	06/05/20
4	LDW20-SS154	20F0118-04	Sediment	06/05/20
5	LDW20-SS168	20F0118-05	Sediment	06/05/20
6	LDW20-SS101	20F0118-06	Sediment	06/05/20
7	LDW20-SS102	20F0118-07	Sediment	06/05/20
8	LDW20-SS102-FD	20F0118-08	Sediment	06/05/20
9	LDW20-SS109	20F0118-09	Sediment	06/05/20
10_	LDW20-SS109-FD	20F0118-10	Sediment	06/05/20
11_	LDW20-SS117	20F0118-12	Sediment	06/05/20
12	LDW20-SS159MS	20F0118-01MS	Sediment	06/05/20
13	LDW20-SS159MSD	20F0118-01MSD	Sediment	06/05/20
14	LDW20-SS159DUP	20F0118-01DUP	Sediment	06/05/20
15				

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 11	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
QC: 12-14	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
	· · · · · · · · · · · · · · · · · · ·
	Analysis Method

ICP	
ICP-MS	As, Cd, Cr, Cu, Pb, Ag, Zn
CVAA	Нg

VALIDATION FINDINGS WORKSHEET <u>Laboratory Blank Contamination (PB/ICB/CCB)</u>

Page 1 of 1 Reviewer:CR

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Soil preparation factor applied (if applicable):

Sample Concentration, unless otherwise noted: mg/Kg

Associated Samples: All

				Sample Identification							
Analyte	PB (mg/Kg)	Maximum ICB/CCB (ug/L)	level	No qualifiers							
Zn	2.3										

Sample Concentration, unless otherwise noted: mg/Kg Associated Samples: 2-11

				Sample Identification							
Analyte	PB (mg/Kg)	Maximum ICB/CCB (ug/L)	Action Level	No qualifiers							
As		0.028									

Comments: The listed analyte concentration is the highest ICB or CCB detected in the analysis. The action level, when applicable, is established at 5X the highest ICB, CCB, or PB concentration.

on their waterbases

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

MS/MSD analysis was performed by the laboratory. All MS/MSD percent recoveries (%R) and relative percent differences (RPDs) were within the acceptable limits with the following exceptions:

MS/MSD										
ID	Matrix	Analyte	MS %R	MSD %R	%R Limit	RPD	RPD Limit	Associated Samples	Qualification	Det/ND
12, 13	s	Hg	144	150	75-125			All	Jdet/A	Det
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Comments:

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page 1 of 1 Reviewer:CR

Method: Metals

	Concentrat	RPD	
Analyte	7	8	
Arsenic	8.60	6.10	34
Cadmium	0.12	0.15	22
Chromium	21.9	21.7	1
Copper	26.9	26.0	3
Lead	11.5	11.2	3
Mercury	0.189	0.110	53
Silver	0.30	0.12	86
Zinc	65.7	63.3	4

A It sto	Concentrat	RPD	
Analyte	9	10	
Arsenic	9.15	9.67	6
Cadmium	0.13	0.15	14
Chromium	20.5	20.6	0
Copper	30.5	34.5	12
Lead	12.7	12.8	1
Mercury	0.104	0.0916	13
Silver	0.14	0.14	0
Zinc	70.7	71.9	2

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0118

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS159	20F0118-01	Sediment	06/05/20
LDW20-SS167	20F0118-02	Sediment	06/05/20
LDW20-SS158	20F0118-03	Sediment	06/05/20
LDW20-SS154	20F0118-04	Sediment	06/05/20
LDW20-SS168	20F0118-05	Sediment	06/05/20
LDW20-SS101	20F0118-06	Sediment	06/05/20
LDW20-SS102	20F0118-07	Sediment	06/05/20
LDW20-SS102-FD	20F0118-08	Sediment	06/05/20
LDW20-SS109	20F0118-09	Sediment	06/05/20
LDW20-SS109-FD	20F0118-10	Sediment	06/05/20
LDW20-SS117	20F0118-12	Sediment	06/05/20
LDW20-SS159DUP	20F0118-01DUP	Sediment	06/05/20
LDW20-SS102-FDMS	20F0118-08MS	Sediment	06/05/20
LDW20-SS102-FDDUP	20F0118-08DUP	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

Total Solids by Standard Method 2540G

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples LDW20-SS102 and LDW20-SS102-FD and samples LDW20-SS109 and LDW20-SS109-FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concent		
Analyte	LDW20-SS102	LDW20-SS102-FD	RPD
Total solids	68.17	68.32	0
Total organic carbon	0.87	0.86	1

	Concen		
Analyte	LDW20-SS109	LDW20-SS109-FD	RPD
Total solids	63.30	64.65	2
Total organic carbon	1.28	1.13	12

X. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4
Wet Chemistry - Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Field Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

LDC #: 48785B6 VALIDATION COMPLETENESS WORKSHEET SDG #: 20F0118 Stage 2B

Date: 8/19/20
Page: of Reviewer: 7

Laboratory: Analytical Resources, Inc.

METHOD: (Analyte) TOC (EPA SW846 Method 9060A), Total Solids (SM 2540G)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
ı.	Sample receipt/Technical holding times	A A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	\triangle	
VII.	Duplicate sample analysis	Δ	_
VIII.	Laboratory control samples	A	LCS, SRM
IX.	Field duplicates	Syr	(7,8)(9,10)
X.	Sample result verification	N_	
XI	Overall assessment of data	LA_	

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank
EB = Equipment blank

SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS159	20F0118-01	Sediment	06/05/20
2	LDW20-SS167	20F0118-02	Sediment	06/05/20
3	LDW20-SS158	20F0118-03	Sediment	06/05/20
4	LDW20-SS154	20F0118-04	Sediment	06/05/20
5	LDW20-SS168	20F0118-05	Sediment	06/05/20
6	LDW20-SS101	20F0118-06	Sediment	06/05/20
7	LDW20-SS102	20F0118-07	Sediment	06/05/20
8	LDW20-SS102-FD	20F0118-08	Sediment	06/05/20
9	LDW20-SS109	20F0118-09	Sediment	06/05/20
10	LDW20-SS109-FD	20F0118-10	Sediment	06/05/20
11	LDW20-SS117	20F0118-12	Sediment	06/05/20
12	LDW20-SS159DUP	20F0118-01DUP	Sediment	06/05/20
13	LDW20-SS102-FDMS	20F0118-08MS	Sediment	06/05/20
14	LDW20-SS102-FDDUP	20F0118-08DUP	Sediment	06/05/20
15				

Notes:					 	

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 11	Total solids, TOC
QC: 12	TS
13, 14	тос
-	

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page 1 of 1 Reviewer:CR

METHOD: Inorganics

	Concent	ration (%)	RPD
Analyte	7	8	
Total solids	68.17	68.32	0
TOC	0.87	0.86	1

Analyte	Concent	ration (%)	RPD
Analyte	9	10	
Total solids	63.30	64.65	2
TOC	1.28	1.13	12

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Polychlorinated Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0118

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS159	20F0118-01	Sediment	06/05/20
LDW20-SS109	20F0118-09	Sediment	06/05/20
LDW20-SS109-FD	20F0118-10	Sediment	06/05/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for High Resolution Superfund Methods Data Review (April 2016). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) Method 1613B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 18.8°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were within the QC limits for unlabeled compounds and labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds with the following exceptions:

Date	Compound	Concentration (Limits)	Associated Samples	Affected Compound	Flag	A or P
06/26/20	13C12-1,2,3,6,7,8-HxCDD	79.0 ng/mL (85-118)	All samples in SDG 20F0118	1,2,3,6,7,8-HxCDD	J (all detects)	Р

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
BIF0465-BLK1	06/22/20	1,2,3,7,8-PeCDD 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF OCDD Total PeCDD Total HpCDF	0.175 ng/Kg 0.0946 ng/Kg 0.166 ng/Kg 0.521 ng/Kg 1.32 ng/Kg 0.175 ng/Kg 0.166 ng/Kg	All samples in SDG 20F0118

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
LDW20-SS159	1,2,3,7,8-PeCDD	0.400 ng/Kg	0.400U ng/Kg
	Total PeCDD	0.700 ng/Kg	0.700J ng/Kg
LDW20-SS109	1,2,3,7,8-PeCDD	0.557 ng/Kg	0.557U ng/Kg
	2,3,4,6,7,8-HxCDF	0.371 ng/Kg	0.371U ng/Kg
LDW20-SS109-FD	1,2,3,7,8-PeCDD	0.472 ng/Kg	0.472U ng/Kg
	2,3,4,6,7,8-HxCDF	0.403 ng/Kg	0.403U ng/Kg

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

Samples LDW20-SS109 and LDW20-SS109-FD were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentr		
Compound	LDW20-SS109	LDW20-SS109-FD	RPD
2,3,7,8-TCDF	0.502	0.395	24
2,3,7,8-TCDD	0.271	0.273	Not calculable
1,2,3,7,8-PeCDF	0.346	0.384	10
2,3,4,7,8-PeCDF	0.585	0.647	10
1,2,3,7,8-PeCDD	0.557	0.472	17
1,2,3,4,7,8-HxCDF	1.99	2.12	6
1,2,3,6,7,8-HxCDF	0.682	0.744	9
2,3,4,6,7,8-HxCDF	0.371	0.403	8
1,2,3,7,8,9-HxCDF	0.411	0.352	15
1,2,3,4,7,8-HxCDD	0.632	0.609	4
1,2,3,6,7,8-HxCDD	2.54	2.43	4
1,2,3,7,8,9-HxCDD	1.57	1.53	3
1,2,3,4,6,7,8-HpCDF	18.3	18.4	1
1,2,3,4,7,8,9-HpCDF	1.47	1.27	15
1,2,3,4,6,7,8-HpCDD	85.2	69.9	20
OCDF	91.2	138	41
OCDD	675	210	105
Total TCDF	5.033	3.55	35
Total TCDD	1.79	0.549	106

	Concentra		
Compound	LDW20-SS109	LDW20-SS109-FD	RPD
Total PeCDF	4.46	4.95	10
Total PeCDD	1.82	1.91	5
Total HxCDF	23.4	22.3	5
Total HxCDD	19.3	19.3	0
Total HpCDF	80.5	58.0	32
Total HpCDD	187	157	17

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits.

XI. Compound Quantitation

All compound quantitations were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG 20F0118	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	A
All samples in SDG 20F0118	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	Α

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration concentration and compounds reported as EMPC, data were qualified as estimated or not detected in three samples.

Due to laboratory blank contamination, data were qualified as not detected or estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 20F0118

Sample	Compound	Flag	A or P	Reason
LDW20-SS159 LDW20-SS109 LDW20-SS109-FD	1,2,3,6,7,8-HxCDD	J (all detects)	Р	Continuing calibration (concentration)
LDW20-SS159 LDW20-SS109 LDW20-SS109-FD	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А	Compound quantitation (EMPC)
LDW20-SS159 LDW20-SS109 LDW20-SS109-FD	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А	Compound quantitation (EMPC)

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 20F0118

Sample	Compound	Modified Final Concentration	A or P
LDW20-SS159	1,2,3,7,8-PeCDD Total PeCDD	0.400U ng/Kg 0.700J ng/Kg	А
LDW20-SS109	1,2,3,7,8-PeCDD 2,3,4,6,7,8-HxCDF	0.557U ng/Kg 0.371U ng/Kg	А
LDW20-SS109-FD	1,2,3,7,8-PeCDD 2,3,4,6,7,8-HxCDF	0.472U ng/Kg 0.403U ng/Kg	А

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 20F0118

No Sample Data Qualified in this SDG

SDG	#:48785B21VALIDATIO #:20F0118 ratory: <u>Analytical Resources, Inc.</u>		LETENES tage 2B	SS WORKSHEE	F	Date: 08/14 / Page: <u>l</u> of l Reviewer: <u></u>
MET	HOD: HRGC/HRMS Polychlorinated Diox	ins/Dibenzo	ofurans (EP	A Method 1613B)	2nd F	Reviewer:
	samples listed below were reviewed for ea ation findings worksheets.	ach of the fo	ollowing vali	dation areas. Valida	ition findings are i	noted in attached
	Validation Area			Com	ments (Ins	ufficient time
ı.	Sample receipt/Technical holding times	SNIA	Cooler t			
II.	HRGC/HRMS Instrument performance check	A		14.300;	6.2°C: 12.6°C. 9.7°C; 10.2°C	; 11.8°C
111.	Initial calibration/ICV	AIA	ICAL	د 20/35 %	WE	ac limits
IV.	Continuing calibration	SW		e ac limits		
V.	Laboratory Blanks	SW				
VI.	Field blanks	N				
VII.	Matrix spike/Matrix spike duplicates	N				
VIII.	Laboratory control samples	A		US SRI	И	
IX.	Field duplicates	SW	D.	= 2/3		
_X.	Labeled Compounds	A				
XI.	Compound quantitation RL/LOQ/LODs	N N		EMPC = J	dets (>FL)	, U (2RL)
XII.	Target compound identification	N				, , , , ,
XIII.	System performance	N				
XIV.	Overall assessment of data	A				
ote:	N = Not provided/applicable R = Rin	lo compounds nsate ield blank	detected	D = Duplicate TB = Trip blank EB = Equipment bl	SB=Sourc OTHER: ank	ce blank
	Client ID			Lab ID	Matrix	Date
1	LDW20-SS159	-		20F0118-01	Sediment	06/05/20
2	LDW20-SS109			20F0118-09	Sediment	06/05/20
3	LDW20-SS109-FD			20F0118-10	Sediment	06/05/20
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VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:	 	 	

LDC #: 48785B21

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Page: 1 of 1 Reviewer: JVG 2nd Reviewer:_

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

- <u>Y</u> <u>N</u> <u>Y</u> Was a routine calibration performed at the beginning of each 12 hour period?
- Were all concentrations within method QC limits for unlabeled and labeled compounds?
- Did all routine calibration standards meet the Ion Abundance Ratio criteria?

#	Date	Standard ID	Compound	Conc:ng/mL (Limits)	Finding Ion Abundance Ratio	Associated Samples	Qualifications
	06/25/20	SIF0380-ICV1	13C12-P	73.9 (77-129)		BLK	NQ (QC only)
	06/26/20	SIF0380-CCV1	13C12-D	79.0 (85-118)		All (-blk) (Det)	J/UJ/P (qual D)
\vdash							
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\sqcup							
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LDC #: 48785B21

VALIDATION FINDINGS WORKSHEET Blanks

Page _	_1_of_1_
Reviewer:_	JVG
2nd Reviewer:_	4

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

- Y Y Y Were all samples associated with a method blank?
- Was a method blank performed for each matrix and whenever a sample extraction was performed?
- Was the method blank contaminated?

Blank extraction date: 06/22/20 Blank analysis date: 06/25/20 Associated samples: Conc. units: ng/Kg

Compound	Blank ID		Sample Identification					
	BIF0465-BLK1	(5x)	1	2	3			
В	0.175	0.88	0.400/4	0.557 N	0.472/U			
M	0.0946*	0.47		0.371/1	0.403/1			
0	0.166	0.83						
Q	0.521*	2.61						
G	1.32	6.60						
S	0.175	0.88	0.700/5					
Υ	0.166	_0.83						

*EMPC

LDC#: 48785B21

Y/N NA

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: 1 of 1
Reviewer: JVG
2nd Reviewer:

METHOD: HRGC/HRMS PCDD/PCDF (EPA Method 1613B)
Y N NA
Were field duplicate pairs identified in this SDG?

Were target analytes detected in the field duplicate pairs?

	Concentra		
Compound	2	3	RPD
Н	0.502	0.395	24
Α	0.271*	0.273*	NC
1	0.346*	0.384*	10
J	0.585	0.647*	10
В	0.557	0.472	17
κ	1.99	2.12	6
L	0.682	0.744	9
М	0.371	0.403	8
N	0.411	0.352	15
С	0.632*	0.609	4
D	2.54	2.43	4
E	1.57	1.53	3
0	18.3	18.4	1
Р	1.47	1.27	15
F	85.2	69.9	20
Q	91.2	138	41
G	675	210	105
V	5.033	3.55	35
R	1.79	0.549	106
w	4.46	4.95	10
S	1.82	1.91	5
х	23.4	22.3	5
Т	19.3	19.3	0
Υ	80.5	58.0	32
U	187	157	17

V:\Josephine\FIELD DUPLICATES\48785B21 windward duwamish.wpd

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Semivolatiles

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0339

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS324	20F0339-01	Sediment	06/17/20
LDW20-SS326	20F0339-02	Sediment	06/17/20
LDW20-SS365	20F0339-03	Sediment	06/17/20
LDW20-SS368	20F0339-04	Sediment	06/17/20
LDW20-SS372	20F0339-05	Sediment	06/17/20
LDW20-SS426	20F0339-06	Sediment	06/17/20
LDW20-SS421	20F0339-07	Sediment	06/17/20
LDW20-SS327	20F0339-08	Sediment	06/17/20
LDW20-SS331	20F0339-09	Sediment	06/17/20
LDW20-SS332	20F0339-10	Sediment	06/17/20
LDW20-SS324MS	20F0339-01MS	Sediment	06/17/20
LDW20-SS324MSD	20F0339-01MSD	Sediment	06/17/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 12.6°C and 13.3°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4 Semivolatiles - Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4
Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

LDC #: 48785C2a	VALIDATION COMPLETENESS WORKSHEET
SDG #: 20F0339	Stage 2B

2nd Reviewer

Laboratory: Analytical Resources, Inc.

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270E)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
1.	Sample receipt/Technical holding times	SWIA	cooler temp. = 13.3°C, 12.6°C Insufficient
11.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	AIA	102 = 362
IV.	Continuing calibration	A	104 = 203 1W= 362
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	À	
IX.	Laboratory control samples	A	LCS SRM
X.	Field duplicates		
XI.	Internal standards	À	
XII.	Compound quantitation RL/LOQ/LODs	N	·
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS324	20F0339-01	Sediment	06/17/20
2	LDW20-SS326	20F0339-02	Sediment	06/17/20
3	LDW20-SS365	20F0339-03	Sediment	06/17/20
4	LDW20-SS368	20F0339-04	Sediment	06/17/20
5	LDW20-SS372	20F0339-05	Sediment	06/17/20
6	LDW20-SS426	20F0339-06	Sediment	06/17/20
7	LDW20-SS421	20F0339-07	Sediment	06/17/20
8	LDW20-SS327	20F0339-08	Sediment	06/17/20
9	LDW20-SS331	20F0339-09	Sediment	06/17/20
10	LDW20-SS332	20F0339-10	Sediment	06/17/20
11	LDW20-SS324MS	20F0339-01MS	Sediment	06/17/20
12	LDW20-SS324MSD	20F0339-01MSD	Sediment	06/17/20
13				
14	BIFO912-BULL			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Semivolatiles

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0339

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS324	20F0339-01	Sediment	06/17/20
LDW20-SS326	20F0339-02	Sediment	06/17/20
LDW20-SS365	20F0339-03	Sediment	06/17/20
LDW20-SS368	20F0339-04	Sediment	06/17/20
LDW20-SS372	20F0339-05	Sediment	06/17/20
LDW20-SS426	20F0339-06	Sediment	06/17/20
LDW20-SS421	20F0339-07	Sediment	06/17/20
LDW20-SS327	20F0339-08	Sediment	06/17/20
LDW20-SS331	20F0339-09	Sediment	06/17/20
LDW20-SS332	20F0339-10	Sediment	06/17/20
LDW20-SS324MS	20F0339-01MS	Sediment	06/17/20
LDW20-SS324MSD	20F0339-01MSD	Sediment	06/17/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 12.6°C and 13.3°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r²) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/26/20	N-Nitrosodiphenylamine	41.9	All samples in SDG 20F0339	J (all detects) UJ (all non-detects)	А

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/08/20	Benzoic acid	21.8	All samples in SDG 20F0339	J (all detects) UJ (all non-detects)	Α
	Pentachlorophenol	29.8		J (all detects) UJ (all non-detects)	

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D and continuing calibration %D, data were qualified as estimated in ten samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles – Data Qualification Summary - SDG 20F0339

Sample	Compound	Flag	A or P	Reason
LDW20-SS324 LDW20-SS326 LDW20-SS365 LDW20-SS372 LDW20-SS372 LDW20-SS426 LDW20-SS421 LDW20-SS327 LDW20-SS331 LDW20-SS331 LDW20-SS332	N-Nitrosodiphenylamine	J (all detects) UJ (all non-detects)	A	Initial calibration verification (%D)
LDW20-SS324 LDW20-SS326 LDW20-SS365 LDW20-SS368 LDW20-SS372 LDW20-SS426 LDW20-SS421 LDW20-SS327 LDW20-SS331 LDW20-SS331 LDW20-SS332	Benzoic acid Pentachlorophenol	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	А	Continuing calibration (%D)

Duwamish AOC4 Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4 Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

LDC #:_	48785C2b	VALIDATION COMPLETENESS WORKSHEET
SDG #:_	20F0339	Stage 2B

Reviewer: 2nd Reviewer

Laboratory: Analytical Resources, Inc.

SVTA

METHOD: GC/MS Polynuclear Aromatic Hydrocarbons (EPA SW 846 Method 8270E-SIM)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
l.	Sample receipt/Technical holding times	SN /A	Cooler temp. = 13,3°C 12.6°C (Insufficient
II.	GC/MS Instrument performance check	A	, , ,
III.	Initial calibration/ICV	AISW	10al = 206 r 10x303
IV.	Continuing calibration	SIAI	CW = 20%
V.	Laboratory Blanks	Â	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	Á	LG SRM
X.	Field duplicates		(
XI.	Internal standards	Å	
XII.	Compound quantitation RL/LOQ/LODs	N	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS324	20F0339-01	Sediment	06/17/20
2	LDW20-SS326	20F0339-02	Sediment	06/17/20
3	LDW20-SS365	20F0339-03	Sediment	06/17/20
4	LDW20-SS368	20F0339-04	Sediment	06/17/20
5	LDW20-SS372	20F0339-05	Sediment	06/17/20
6_	LDW20-SS426	20F0339-06	Sediment	06/17/20
7	LDW20-SS421	20F0339-07	Sediment	06/17/20
8	LDW20-SS327	20F0339-08	Sediment	06/17/20
9	LDW20-SS331	20F0339-09	Sediment	06/17/20
10	LDW20-SS332	20F0339-10	Sediment	06/17/20
11	LDW20-SS324MS	20F0339-01MS	Sediment	06/17/20
12	LDW20-SS324MSD	20F0339-01MSD	Sediment	06/17/20
13				
14	BIF0912-B1K2			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E.),4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O.)2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ N-Nitrosodiphenylamine	QQQ) Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R) 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT/Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

LDC #:	48785	C26
LDC#:	10,00	

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

	Page:	_of	L
ı	Reviewer:	JVG	1 _
2nd f	Reviewer:	D	

METHOD: GC/MS SVOA (EPA SW 846 Method 8270¢)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A

Was an initial calibration verification standard analyzed after each ICAL for each instrument?

YN N/A

Were all %D within the validation criteria of ≤20/30% %D?

#	Date	Standard ID	Compound	Finding %D (Limit: <2 0. 0%/30%)	Associated Samples	Qualifications
	06/24/20	SIF0393- SCV1	QQ	41,9	All (ND + Pet)	J/W/A
			· ·			
					1	
				·		
					-	
				<u> </u>		

LDC #: 48785 C26

VALIDATION FINDINGS WORKSHEET <u>Continuing Calibration</u>

Page:	of
Reviewer:	`JVG
2nd Reviewer:	4

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: <u>></u> 0.05)	Associated Samples	Qualifications
	07/08/20	NT 10 200 708035	PPP	21.8		All (ND+Det)	J/UJ/A
		_	T	29.8			
							<i></i>
	i						
					,		
						1	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Hexachlorobenzene

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0339

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS324	20F0339-01	Sediment	06/17/20
LDW20-SS326	20F0339-02	Sediment	06/17/20
LDW20-SS365	20F0339-03	Sediment	06/17/20
LDW20-SS368	20F0339-04	Sediment	06/17/20
LDW20-SS372	20F0339-05	Sediment	06/17/20
LDW20-SS426	20F0339-06	Sediment	06/17/20
LDW20-SS421	20F0339-07	Sediment	06/17/20
LDW20-SS327	20F0339-08	Sediment	06/17/20
LDW20-SS331	20F0339-09	Sediment	06/17/20
LDW20-SS332	20F0339-10	Sediment	06/17/20
LDW20-SS324MS	20F0339-01MS	Sediment	06/17/20
LDW20-SS324MSD	20F0339-01MSD	Sediment	06/17/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Hexachlorobenzene by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 12.6°C and 13.3°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4

Hexachlorobenzene - Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Laboratory Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Field Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

LDC #: 48785C3a VALIDATION COMPLETENESS WORKSHEET

SDG #: 20F0339

Stage 2B

Laboratory: Analytical Resources, Inc.

Reviewer: W 2nd Reviewer: 4

METHOD: GC Hexachlorobenzene (EPA SW846 Method 8081B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments			
I.	Sample receipt/Technical holding times	SWIA	Cooler temp = 13,3°C, 12,6°C (Insufficient time to cool			
<u>II.</u>	GC Instrument Performance Check	N_	'			
III.	Initial calibration/ICV	A/A	10AL = 20%. 10NE 20%			
IV.	Continuing calibration	A	CM = 20 %			
V.	Laboratory Blanks	Â				
VI.	Field blanks	N				
VII.	Surrogate spikes / / S	A/A				
VIII.	Matrix spike/Matrix spike duplicates	Α΄				
IX.	Laboratory control samples	À	UCS			
X.	Field duplicates	N				
XI.	Compound quantitation/RL/LOQ/LODs	N				
XII.	Target compound identification	N				
XIII.	System Performance	N_				
XIV	Overall assessment of data	A				

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS324	20F0339-01	Sediment	06/17/20
2_	LDW20-SS326	20F0339-02	Sediment	06/17/20
3_	LDW20-SS365	20F0339-03	Sediment	06/17/20
4	LDW20-SS368	20F0339-04	Sediment	06/17/20
5	LDW20-SS372	20F0339-05	Sediment	06/17/20
6	LDW20-SS426	20F0339-06	Sediment	06/17/20
7	LDW20-SS421	20F0339-07	Sediment	06/17/20
8	LDW20-SS327	20F0339-08	Sediment	06/17/20
9_	LDW20-SS331	20F0339-09	Sediment	06/17/20
10_	LDW20-SS332	20F0339-10	Sediment	06/17/20
11	LDW20-SS324MS	20F0339-01MS	Sediment	06/17/20
12	LDW20-SS324MSD	20F0339-01MSD	Sediment	06/17/20
13				
14				
15	BI F0907-BUK1			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Polychlorinated Biphenyls

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0339

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS324	20F0339-01	Sediment	06/17/20
LDW20-SS326	20F0339-02	Sediment	06/17/20
LDW20-SS365	20F0339-03	Sediment	06/17/20
LDW20-SS368	20F0339-04	Sediment	06/17/20
LDW20-SS372	20F0339-05	Sediment	06/17/20
LDW20-SS426	20F0339-06	Sediment	06/17/20
LDW20-SS421	20F0339-07	Sediment	06/17/20
LDW20-SS327	20F0339-08	Sediment	06/17/20
LDW20-SS331	20F0339-09	Sediment	06/17/20
LDW20-SS332	20F0339-10	Sediment	06/17/20
LDW20-SS326MS	20F0339-02MS	Sediment	06/17/20
LDW20-SS326MSD	20F0339-02MSD	Sediment	06/17/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 12.6°C and 13.3°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	%D	Associated Samples	Flag	A or P
07/02/20	SIG0056-SCV1	1C	Aroclor-1260	21.8	All samples in SDG 20F0339	J (all detects)	Α

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Affected Compound	Flag	A or P
BIF0913-BS1	Aroclor-1260	123 (56-120)	All samples in SDG 20F0339	Aroclor-1248 Aroclor-1254 Aroclor-1260	J (all detects) J (all detects) J (all detects)	Р

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
LDW20-SS421	Aroclor-1248	50	J (all detects)	А
LDW20-SS327	Aroclor-1248	43.5	J (all detects)	А
LDW20-SS331	Aroclor-1254 Aroclor-1260	69.1 41.2	J (all detects) J (all detects)	А
LDW20-SS332	Aroclor-1248 Aroclor-1260	64.3 50.7	J (all detects) J (all detects)	А

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D, LCS %R, and RPD between two columns, data were qualified as estimated in ten samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Biphenyls - Data Qualification Summary - SDG 20F0339

Sample	Compound	Flag	A or P	Reason
LDW20-SS324 LDW20-SS326 LDW20-SS365 LDW20-SS368 LDW20-SS372 LDW20-SS426 LDW20-SS421 LDW20-SS327 LDW20-SS331 LDW20-SS331	Aroclor-1260	J (all detects)	A	Initial calibration verification (%D)
LDW20-SS324 LDW20-SS326 LDW20-SS365 LDW20-SS372 LDW20-SS372 LDW20-SS426 LDW20-SS421 LDW20-SS327 LDW20-SS331 LDW20-SS331 LDW20-SS332	Aroclor-1248 Aroclor-1254 Aroclor-1260	J (all detects) J (all detects) J (all detects)	Р	Laboratory control samples (%R)
LDW20-SS421 LDW20-SS327	Aroclor-1248	J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS331	Aroclor-1254 Aroclor-1260	J (all detects) J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS332	Aroclor-1248 Aroclor-1260	J (all detects) J (all detects)	A	Compound quantitation (RPD between two columns)

Duwamish AOC4

Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

SDG # Labora METH The sa	#:48785C3bVALIDAT #:20F0339 atory:_Analytical Resources, Inc. IOD: GC Polychlorinated Biphenyls (Bamples listed below were reviewed fotion findings worksheets.	Sta EPA SW846 Met	,	2nd	Date: 68/14 / Page: 1 of 1 Reviewer: 37/6 Reviewer: 4 Reviewer: 4
	Validation Area		Comr	nents	
1.	Sample receipt/Technical holding times	SN/A			(Insufficient time to cool
II.	Initial calibration/ICV	A SN	Coroler temp. = 13.3°C	10152	02
111.	Continuing calibration	Á	Ca € 20%		
IV.	Laboratory Blanks	Ä			
V.	Field blanks	l N			
VI.	Surrogate spikes //S	A/A			
VII.	Matrix spike/Matrix spike duplicates	A			
VIII.	Laboratory control samples	SN	LCS , SRM		
IX.	Field duplicates	4	•		
X.	Compound quantitation/RL/LOQ/LODs	QN			
XI.	Target compound identification	N			
XII_	Overall assessment of data				
Note:	N = Not provided/applicable R =	9 = No compounds d = Rinsate = Field blank	etected D = Duplicate TB = Trip blank EB = Equipment blan	OTHE	ource blank R:
	Client ID		Lab ID	Matrix	Date
	_DW20-SS324		20F0339-01	Sediment	06/17/20
	_DW20-SS326		20F0339-02	Sediment	06/17/20
	DMOO CCOCE		2050220.02	Codimont	06/17/20

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS324	20F0339-01	Sediment	06/17/20
2	LDW20-SS326	20F0339-02	Sediment	06/17/20
3	LDW20-SS365	20F0339-03	Sediment	06/17/20
4	LDW20-SS368	20F0339-04	Sediment	06/17/20
5	LDW20-SS372	20F0339-05	Sediment	06/17/20
6	LDW20-SS426	20F0339-06	Sediment	06/17/20
7	LDW20-SS421	20F0339-07	Sediment	06/17/20
8	LDW20-SS327	20F0339-08	Sediment	06/17/20
9	LDW20-SS331	20F0339-09	Sediment	06/17/20
10	LDW20-SS332	20F0339-10	Sediment	06/17/20
11	LDW20-SS326MS	20F0339-02MS	Sediment	06/17/20
12	LDW20-SS326MSD	20F0339-02MSD	Sediment	06/17/20
13				
14				

Note	Notes:						
-	BIF 8 913-BULL						

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPASW 846 Method 8081/8082)

A. alpha-BHC	K. Endrin	U. Toxaphene	EE. 2,4'-DDT	OO. trans-Heptachlor epoxide
B. beta-BHC	L. Endosulfan II	V. Aroclor-1016	FF. Hexachlorobenzene	PP. Mirex
C. delta-BHC	M. 4,4'-DDD	W. Aroclor-1221	GG. Chlordane	QQ çis-Chlordane
D. gamma-BHC	N. Endosulfan sulfate	X. Aroclor-1232	HH. Chlordane (Technical)	RR. trans-Chlordane
E. Heptachlor	O. 4,4'-DDT	Y. Aroclor-1242	II. Aroclor 1262	SS.
F. Aldrin	P. Methoxychlor	Z. Aroclor-1248	JJ. Aroclor 1268	TT.
G. Heptachlor epoxide	Q. Endrin ketone	AA. Aroclor-1254	KK. Oxychlordane	UU.
H. Endosulfan I	R. Endrin aldehyde	BB. Aroclor-1260	LL. trans-Nonachlor	vv
I. Dieldrin	S. alpha-Chlordane	CC. 2,4'-DDD	MM. cis-Nonachlor	ww.
J. 4,4'-DDE	T. gamma-Chlordane	DD. 2,4'-DDE	NN. cis-Heptachlor epoxide	XX.

Notes:	

LDC #: 48785 C36

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	of
Reviewer:	JVG
2nd Reviewer:	

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

What type of initial calibration verification calculation was performed? / %D or %R

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument? Y/N)N/A

Did the initial calibration verification standards meet the %D / %R validation criteria of <20.0% / 80-120%?

#	Date	Standard ID	Detector/ Column	Compound	%D (Limit ≤ 20.0)	Associated Samples	Qualifications
	07/62/20	SI 40056-SCV1	10	BB	21.8	All (Det)	J/MT/A
	/ /						J/NJ/A (qual BB only)
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LDC #: 48 785 C36

VALIDATION FINDINGS WORKSHEET Laboratory Control Samples

	Page:	of
	Reviewer:	JУG
2nd	Reviewer:	4

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Y N N/A Were laboratory control samples (LCS) and laboratory control sample duplicate (LCSD) analyzed for each matrix in this SDG?

Were the LCS percent recoveries (%R) and relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	BIF0913-BS1	BB	123 (56-120)	()	()	All (Det)	J dets/P
			()	()	()		Jud & Z. AA BB
			()	()	()		
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LDC #:_	48785C3h	<u> </u>

VALIDATION FINDINGS WORKSHEET <u>Compound Quantitation and Reported RLs</u>

Page: _____of___ Reviewer: ____JVG 2nd Reviewer: _____

METHOD: GC

Were the relative percent difference of detected compounds between

Y(N)	N/A Were the relative percent difference of detected compounds between two columns <40%?					
#	Sample ID	Compound Name	%RPD Between Two Columns (Limit < 40%)	Qualifications		
	1	Z	50	Jack /A		
	\$		43.5			
	9	ÅA BB	69.1 41.>			
	10	ス 85	64,3 50.7			

Comments: _	See sample calculation verification worksheet for recalculations	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Metals

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0339

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS324	20F0339-01	Sediment	06/17/20
LDW20-SS326	20F0339-02	Sediment	06/17/20
LDW20-SS365	20F0339-03	Sediment	06/17/20
LDW20-SS368	20F0339-04	Sediment	06/17/20
LDW20-SS372	20F0339-05	Sediment	06/17/20
LDW20-SS426	20F0339-06	Sediment	06/17/20
LDW20-SS421	20F0339-07	Sediment	06/17/20
LDW20-SS327	20F0339-08	Sediment	06/17/20
LDW20-SS331	20F0339-09	Sediment	06/17/20
LDW20-SS332	20F0339-10	Sediment	06/17/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Arsenic, Cadmium, Chromium, Copper, Lead, Silver, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A Mercury by EPA SW 846 Method 7471B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Silver	0.02 mg/Kg	All samples in SDG 20F0339
ICB/CCB	Silver	0.02 ug/L	All samples in SDG 20F0339

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
LDW20-SS324	Silver	0.16 mg/Kg	0.16U mg/Kg
LDW20-SS326	Silver	0.11 mg/Kg	0.11U mg/Kg
LDW20-SS365	Silver	0.08 mg/Kg	0.08U mg/Kg

Sample	Analyte	Reported Concentration	Modified Final Concentration
LDW20-SS368	Silver	0.05 mg/Kg	0.05U mg/Kg
LDW20-SS372	Silver	0.15 mg/Kg	0.15U mg/Kg
LDW20-SS426	Silver	0.08 mg/Kg	0.08U mg/Kg
LDW20-SS421	Silver	0.09 mg/Kg	0.09U mg/Kg
LDW20-SS327	Silver	0.14 mg/Kg	0.14U mg/Kg
LDW20-SS331	Silver	0.11 mg/Kg	0.11U mg/Kg
LDW20-SS332	Silver	0.11 mg/Kg	0.11U mg/Kg

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

Raw data were not reviewed for Stage 2B validation.

XIII. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to laboratory blank contamination, data were qualified as not detected in ten samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Metals - Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4 Metals - Laboratory Blank Data Qualification Summary - SDG 20F0339

Sample	Analyte	Modified Final Concentration	A or P
LDW20-SS324	Silver	0.16U mg/Kg	Α
LDW20-SS326	Silver	0.11U mg/Kg	А
LDW20-SS365	Silver	0.08U mg/Kg	А
LDW20-SS368	Silver	0.05U mg/Kg	А
LDW20-SS372	Silver	0.15U mg/Kg	А
LDW20-SS426	Silver	0.08U mg/Kg	А
LDW20-SS421	Silver	0.09U mg/Kg	А
LDW20-SS327	Silver	0.14U mg/Kg	А
LDW20-SS331	Silver	0.11U mg/Kg	А
LDW20-SS332	Silver	0.11U mg/Kg	А

Duwamish AOC4
Metals - Field Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

LDC #: 48785C4a VALIDATION COMPLETENESS WORKSHEET SDG #: 20F0339 Stage 2B

Laboratory: Analytical Resources, Inc.

Page: of Reviewer: 2nd Reviewer:

METHOD: Metals (EPA SW 846 Method 6020A/7471B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
l.	Sample receipt/Technical holding times	AA	
H.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	SW	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	N	
VIII.	Duplicate sample analysis	N	
IX.	Serial Dilution	N	
X.	Laboratory control samples	A	LCS, SRM
XI.	Field Duplicates	\sim	
XII.	Internal Standard (ICP-MS)	N	not revened
XIII.	Sample Result Verification	N	
XIV	Overall Assessment of Data	A	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate
TB = Trip blank

TB = Trip blank EB = Equipment blank SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS324	20F0339-01	Sediment	06/17/20
2	LDW20-SS326	20F0339-02	Sediment	06/17/20
3	LDW20-SS365	20F0339-03	Sediment	06/17/20
4	LDW20-SS368	20F0339-04	Sediment	06/17/20
5	LDW20-SS372	20F0339-05	Sediment	06/17/20
6	LDW20-SS426	20F0339-06	Sediment	06/17/20
7 _	LDW20-SS421	20F0339-07	Sediment	06/17/20
8 _	LDW20-SS327	20F0339-08	Sediment	06/17/20
9	LDW20-SS331	20F0339-09	Sediment	06/17/20
10_	LDW20-SS332	20F0339-10	Sediment	06/17/20
11				
12				
13				

Notes:		 	 	
	-			

ICP-MS

CVAA

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page 1 of 1 Reviewer:CR

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 10	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
	Analysis Method
ICP	

As, Cd, Cr, Cu, Pb, Ag, Zn

Hg

VALIDATION FINDINGS WORKSHEET <u>Laboratory Blank Contamination (PB/ICB/CCB)</u>

Page 1 of 1 Reviewer:CR

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Soil preparation factor applied (if applicable):

				Sample Identification									
Analyte	PB (mg/Kg)	Maximum ICB/CCB (ug/L)	Action Level	1	2	3	4	5	6	7	8	9	10
Ag	0.02	0.02		0.16	0.11	0.08	0.05	0.15	0.08	0.09	0.14	0.11	0.11

Comments: The listed analyte concentration is the highest ICB or CCB detected in the analysis. The action level, when applicable, is established at 5X the highest ICB, CCB, or PB concentration.

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0339

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS324	20F0339-01	Sediment	06/17/20
LDW20-SS326	20F0339-02	Sediment	06/17/20
LDW20-SS365	20F0339-03	Sediment	06/17/20
LDW20-SS368	20F0339-04	Sediment	06/17/20
LDW20-SS372	20F0339-05	Sediment	06/17/20
LDW20-SS426	20F0339-06	Sediment	06/17/20
LDW20-SS421	20F0339-07	Sediment	06/17/20
LDW20-SS327	20F0339-08	Sediment	06/17/20
LDW20-SS331	20F0339-09	Sediment	06/17/20
LDW20-SS332	20F0339-10	Sediment	06/17/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

Total Solids by Standard Method 2540G

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4
Wet Chemistry - Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4

Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Field Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

LDC #: 48785C6 VALIDATION COMPLETENESS WORKSHEET SDG #: 20F0339 Stage 2B

Laboratory: Analytical Resources, Inc.

METHOD: (Analyte) TOC (EPA SW846 Method 9060A), Total Solids (SM 2540G)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
l.	Sample receipt/Technical holding times	AA	
П	Initial calibration	A	
	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N.	
VII.	Duplicate sample analysis	\mathcal{N}	
VIII.	Laboratory control samples	A	LCS SQM
IX.	Field duplicates	N	/
X	Sample result verification	N	
xı	Overall assessment of data	l A	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS324	20F0339-01	Sediment	06/17/20
2	LDW20-SS326	20F0339-02	Sediment	06/17/20
3	LDW20-SS365	20F0339-03	Sediment	06/17/20
4	LDW20-SS368	20F0339-04	Sediment	06/17/20
5	LDW20-SS372	20F0339-05	Sediment	06/17/20
6	LDW20-SS426	20F0339-06	Sediment	06/17/20
7	LDW20-SS421	20F0339-07	Sediment	06/17/20
8	LDW20-SS327	20F0339-08	Sediment	06/17/20
9	LDW20-SS331	20F0339-09	Sediment	06/17/20
10	LDW20-SS332	20F0339-10	Sediment	06/17/20
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Notes:				_				
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VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 10	Total solids, TOC
-	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Polychlorinated Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0339

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS327	20F0339-08	Sediment	06/17/20
LDW20-SS332	20F0339-10	Sediment	06/17/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for High Resolution Superfund Methods Data Review (April 2016). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) Method 1613B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 12.6°C and 23.3°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were within the QC limits for unlabeled compounds and labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
BIF0803-BLK1	07/06/20	1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF 1,2,3,4,6,7,8-HpCDD OCDF OCDD	0.140 ng/Kg 0.0330 ng/Kg 0.535 ng/Kg 1.37 ng/Kg 6.33 ng/Kg	All samples in SDG 20F0339

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits.

XI. Compound Quantitation

All compound quantitations were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG 20F0339	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А
All samples in SDG 20F0339	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	A
All samples in SDG 20F0339	All compounds flagged "X" due to chlorinated diphenyl ether (CDPE) interference.	J (all detects)	А

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to compounds reported as EMPC and CDPE interference, data were qualified as estimated or not detected in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 20F0339

Sample	Compound	Flag	A or P	Reason
LDW20-SS327 LDW20-SS332	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	Α	Compound quantitation (EMPC)
LDW20-SS327 LDW20-SS332	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А	Compound quantitation (EMPC)
LDW20-SS327 LDW20-SS332	All compounds flagged "X" due to chlorinated diphenyl ether (CDPE) interference.	J (all detects)	А	Compound quantitation (CDPE interference)

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 20F0339

No Sample Data Qualified in this SDG

DG #: .aborat	20F0339 ory: <u>Analytical Resources, Inc.</u>	S	tage 2B	S WORKSHEET	F 2nd F	Date: 08/14/ Page: _l of _l Reviewer: _04 Reviewer: _
	DD: HRGC/HRMS Polychlorinated Dioxi		,	,		
	nples listed below were reviewed for ea on findings worksheets.	ch of the fo	ollowing valid	ation areas. Validatio	n findings are	noted in attached
	Validation Area			Comm	ents	•
1.	Sample receipt/Technical holding times	SW/A	Cooler	temp. = 13.3°C	12,6%	Ensufficient time to cool
II.	HRGC/HRMS Instrument performance check	A		,		/
	Initial calibration/ICV	AIA	19AL 9	20/35%	IN = 6	ic limits
	Continuing calibration	A	CHE	20/25% ac limits		
	Laboratory Blanks	SW				
	Field blanks	I II				
	Matrix spike/Matrix spike duplicates	N				
	Laboratory control samples	A	1	CS SRM		
	Field duplicates	1		() ()		
	Labeled Compounds	Δ				
	Compound quantitation RL/LOQ/LODs	Sym		EMPC = Jde	ts (>PL)	· U(=4)
	Target compound identification	N				, , , , ,
	System performance	N				
	Overall assessment of data	A				
ote:	N = Not provided/applicable R = Rin	o compounds sate eld blank	detected	D = Duplicate TB = Trip blank EB = Equipment blanl	SB=Sour OTHER:	ce blank
CI	ient ID			Lab ID	Matrix	Date
LD	0W20-SS327			20F0339-08	Sediment	06/17/20
ഥ	0W20-SS332			20F0339-10	Sediment	06/17/20
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P	DI F0803-BLK1					

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:	

LDC #: 48 785 C21

VALIDATION FINDINGS WORKSHEET Blanks

Page:_	of
Reviewer:_	JVG ₂
2nd Reviewer:	4

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Rease see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all samples associated with a method blank?

M N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?

N N/A Was the method blank contaminated?

Blank extraction date: 07/66/26 Blank analysis date: 07/69/26 Conc. units: 1/6 / 1/6

Associated samples:___

(>5X)

Compound	Blank ID		Sample Identification						
	BIF0803- 0.140 ¥	BLK2 (57)							
0	0.140¥	6.70							
P	0.0330 * 0.535 *	0,165							
F	0.535 *	2.675							
Q	1, 37	6.850							
G	6.33	31.65							

Blank extraction date: _____ Blank analysis date: ____ Associated Samples: _____ # EMPC

Compound	Blank ID	Sample Identification							

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 48785 CZ1

VALIDATION FINDINGS WORKSHEET <u>Compound Quantitation and Reported RLs</u>

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y)N N/A Were the correct labeled compound, quantitation ions and relative response factors (RRF) used to quantitate the compound?

V N N/A Compound quantitation and RLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Compound	Finding	Qualifications
		All		All results flagged as EMPC > R <	Jdets/A
				All results flagged as EMPC > R < < R <	U/A
		All		All results flagged "X" by the lab due to chlorinated	Jdets/A
			<u></u>	diphenyl ether (CDPE) interference	
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Comments:	 	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Semivolatiles

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0352

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS251	20F0352-01	Sediment	06/18/20
LDW20-SS264	20F0352-02	Sediment	06/18/20
LDW20-SS409	20F0352-03	Sediment	06/18/20
LDW20-SS310	20F0352-04	Sediment	06/18/20
LDW20-SS318	20F0352-05	Sediment	06/18/20
LDW20-SS322	20F0352-06	Sediment	06/18/20
LDW20-SS359	20F0352-07	Sediment	06/18/20
LDW20-SS377	20F0352-08	Sediment	06/18/20
LDW20-SS379	20F0352-09	Sediment	06/18/20
LDW20-SS379DL	20F0352-09DL	Sediment	06/18/20
LDW20-SS388	20F0352-10	Sediment	06/18/20
LDW20-SS251MS	20F0352-01MS	Sediment	06/18/20
LDW20-SS251MSD	20F0352-01MSD	Sediment	06/18/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 12.0°C and 19.2°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
BIG0057-BLK1	07/03/20	Benzo(g,h,i)perylene	14.4 ug/Kg	All samples in SDG 20F0352

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
LDW20-SS359	Benzo(g,h,i)perylene	14.5 ug/Kg	14.5U ug/Kg

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

In the case where more than one result was reported for an individual sample, the least technically acceptable results were deemed not reportable as follows:

Sample	Compound	Reason	Flag	A or P
LDW20-SS379	Phenanthrene Fluoranthene Pyrene Benzo(a)anthracene Chrysene	Results exceeded calibration range.	Not reportable	А
LDW20-SS379DL	All compounds except Phenanthrene Fluoranthene Pyrene Benzo(a)anthracene Chrysene	Results from undiluted analyses were more usable.	Not reportable	А

Due to laboratory blank contamination, data were qualified as not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles - Data Qualification Summary - SDG 20F0352

Sample	Compound	Flag	A or P	Reason		
LDW20-SS379	Phenanthrene Fluoranthene Pyrene Benzo(a)anthracene Chrysene	Not reportable	А	Overall assessment of data		
LDW20-SS379DL	All compounds except Phenanthrene Fluoranthene Pyrene Benzo(a)anthracene Chrysene	Not reportable	А	Overall assessment of data		

Duwamish AOC4 Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0352

Sample Compound		Modified Final Concentration	A or P
LDW20-SS359	Benzo(g,h,i)perylene	14.5U ug/Kg	А

Duwamish AOC4
Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785D2a SDG #: 20F0352

Stage 2B

Reviewer: 2nd Reviewer:

Laboratory: Analytical Resources, Inc.

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270E)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments (Insufficient time to cool)
1.	Sample receipt/Technical holding times	SW/ A	Cooler temp. = 19.2°C 12.0°C
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	AA	1CAL = 20% 1CW = 30%
IV.	Continuing calibration	A L	au <u>c</u> 20%
V.	Laboratory Blanks	SW	
VI.	Field blanks	N	
VII.	Surrogate spikes	Á	
VIII.	Matrix spike/Matrix spike duplicates	Ä	
IX.	Laboratory control samples	A	LCS SRM
X.	Field duplicates	N	·
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	N	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	SW	

A = Acceptable Note:

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank

EB = Equipment blank

SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS251	20F0352-01	Sediment	06/18/20
2	LDW20-SS264	20F0352-02	Sediment	06/18/20
3	LDW20-SS409	20F0352-03	Sediment	06/18/20
4	LDW20-SS310	20F0352-04	Sediment	06/18/20
5	LDW20-SS318	20F0352-05	Sediment	06/18/20
6	LDW20-SS322	20F0352-06	Sediment	06/18/20
7	LDW20-SS359	20F0352-07	Sediment	06/18/20
8	LDW20-SS377	20F0352-08	Sediment	06/18/20
9	LDW20-SS379	20F0352-09	Sediment	06/18/20
10	LDW20-SS379REDL	20F0352-09REDL	Sediment	06/18/20
11_	LDW20-SS388	20F0352-10	Sediment	06/18/20
12	LDW20-SS251MS	20F0352-01MS	Sediment	06/18/20
13	LDW20-SS251MSD	20F0352-01MSD	Sediment	06/18/20
14				

BI G0057-BULL

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ, Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

LDC #:	48785	Dra
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VALIDATION FINDINGS WORKSHEET Blanks

Page: ₋	of
Reviewer:	JVG
2nd Reviewer:_	4

	Y N N/A Was a me	below for all quesethod blank analyethod blank analyethod blank analyethod blank asso	stions answere yzed for each r yzed for each o ciated with eve	matrix? concentration pre ery sample? ase see qualifica te: <u>07/11/20</u>	eparation level?		s "N/A". 		2nd Revie	wer:
Compound Blank ID										
_		BIG0057-1	uc1	7						
LR	-) LLL	14.4		14.5/U						
				1						
	Blank extraction date: Conc. units:	Blank ar	nalysis date:_	 Associa	ated Samples:					
	Compound	Blank ID								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

Common contaminants such as the phthalates and TICs noted above that were detected in samples within ten times the associated method blank concentration were qualified as not detected, "U". Other contaminants within five times the method blank concentration were also qualified as not detected, "U".

LDC	#:	48	785	D	ra

VALIDATION FINDINGS WORKSHEET Overall Assessment of Data

Page: ,	_of	1
Reviewer:	_JVG	_
2nd Reviewer:		

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

Y N N/A

Was the overall quality and usability of the data acceptable?

#_	Date	Sample ID	Compound	Finding	Qualifications
		9	Compound 44 , 77 , Z2 , CCC , DDD	Finding 7 cal range	NR/A
		10	All except above	dil	<u> </u>
					· · · · · · · · · · · · · · · · · · ·
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Comments:				

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Semivolatiles

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0352

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS251	20F0352-01	Sediment	06/18/20
LDW20-SS264	20F0352-02	Sediment	06/18/20
LDW20-SS409	20F0352-03	Sediment	06/18/20
LDW20-SS310	20F0352-04	Sediment	06/18/20
LDW20-SS318	20F0352-05	Sediment	06/18/20
LDW20-SS322	20F0352-06	Sediment	06/18/20
LDW20-SS359	20F0352-07	Sediment	06/18/20
LDW20-SS377	20F0352-08	Sediment	06/18/20
LDW20-SS379	20F0352-09	Sediment	06/18/20
LDW20-SS388	20F0352-10	Sediment	06/18/20
LDW20-SS251MS	20F0352-01MS	Sediment	06/18/20
LDW20-SS251MSD	20F0352-01MSD	Sediment	06/18/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 12.0°C and 19.2°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r²) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/26/20	N-Nitrosodiphenylamine	41.9	All samples in SDG 20F0352	J (all detects) UJ (all non-detects)	А

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/11/20	Benzyl alcohol	21.1	All samples in SDG 20F0352	J (all detects) UJ (all non-detects)	Α
	Pentachlorophenol	28.6		J (all detects) UJ (all non-detects)	

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D and continuing calibration %D, data were qualified as estimated in ten samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles – Data Qualification Summary - SDG 20F0352

Sample	Compound	Flag	A or P	Reason
LDW20-SS251 LDW20-SS264 LDW20-SS409 LDW20-SS310 LDW20-SS318 LDW20-SS322 LDW20-SS359 LDW20-SS377 LDW20-SS379 LDW20-SS379 LDW20-SS379	N-Nitrosodiphenylamine	J (all detects) UJ (all non-detects)	А	Initial calibration verification (%D)
LDW20-SS251 LDW20-SS264 LDW20-SS3409 LDW20-SS310 LDW20-SS318 LDW20-SS322 LDW20-SS359 LDW20-SS377 LDW20-SS379 LDW20-SS379	Benzyl alcohol Pentachlorophenol	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	А	Continuing calibration (%D)

Duwamish AOC4

Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

Duwamish AOC4

Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

LDC #: 48785D2b VALIDATION CO	MPLETENESS WORKSHEET	Date: <u>08/s4 /</u> -
SDG #: 20F0352	Stage 2B	Page: lof l
Laboratory: Analytical Resources, Inc.	•	Reviewer: 114
SVOÄ		2nd Reviewer:
METHOD: GC/MS Polynuclear Aromatic Hydrocarbon	s (EPA SW 846 Method 8270E-SIM)	

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
l.	Sample receipt/Technical holding times	SW/A	Cooler temp. = 19.2°C 12.0°C Fine to cool
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	AISN	1CA1 = 202 12 105 36%
IV.	Continuing calibration	SN	1041 = 20% 105 36%.
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	Δ	
IX.	Laboratory control samples	Á	LG SRM
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	N	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note:	A = Acceptable	ND = No compounds detected	D = Duplicate	SB=Source blank
	N = Not provided/applicable	R = Rinsate	TB = Trip blank	OTHER:
	SW = See worksheet	FB = Field blank	EB = Equipment blank	

	Olice t ID	Labin	BA adaily	D-4-
	Client ID	Lab ID	Matrix	Date
1	LDW20-SS251	20F0352-01	Sediment	06/18/20
2	LDW20-SS264	20F0352-02	Sediment	06/18/20
3	LDW20-SS409	20F0352-03	Sediment	06/18/20
4	LDW20-\$S310	20F0352-04	Sediment	06/18/20
5	LDW20-SS318	20F0352-05	Sediment	06/18/20
6	LDW20-SS322	20F0352-06	Sediment	06/18/20
7	LDW20-SS359	20F0352-07	Sediment	06/18/20
8	LDW20-SS377	20F0352-08	Sediment	06/18/20
9	LDW20-SS379	20F0352-09	Sediment	06/18/20
10	LDW20-SS388	20F0352-10	Sediment	06/18/20
11	LDW20-SS251MS	20F0352-01MS	Sediment	06/18/20
12	LDW20-SS251MSD	20F0352-01MSD	Sediment	06/18/20
13				
14	BIG0057-12k2			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

LDC #: 48785 D26

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page: _of _ Reviewer: _JVG 2nd Reviewer: ___

METHOD: GC/MS SVOA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

N N/A Were all %D within the validation criteria of ≤20/30% %D?

<i>y</i> #	Date	Standard ID	Compound	Finding %D (Limit: <u><20.0%</u> /30%)	Associated <u>Sa</u> mples	Qualifications
	06/26/20	SIF0393- XV1	QQ	41.9	All (ND + pet)	J/WJ/A
	1 1 1 1	102/		N. C.		7 / 15 / 17
						· · · · · · · · · · · · · · · · · · ·

185 DZŁ	د
	185 DZF

N/A

VALIDATION FINDINGS WORKSHEET <u>Continuing Calibration</u>

	Page:	1	_of <u>}</u>
	Reviewer:		IJλĠ
2nd	Reviewer:		

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?

Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?

Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: >0.05)	Associated Şamples	Qualifications
	07/11/20	HT10200711035	QQQ	21.1		All (ND + Det)	J/WJ/A
			TT	28.6			
						 	
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Hexachlorobenzene

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0352

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS251	20F0352-01	Sediment	06/18/20
LDW20-SS264	20F0352-02	Sediment	06/18/20
LDW20-SS409	20F0352-03	Sediment	06/18/20
LDW20-SS310	20F0352-04	Sediment	06/18/20
LDW20-SS318	20F0352-05	Sediment	06/18/20
LDW20-SS322	20F0352-06	Sediment	06/18/20
LDW20-SS359	20F0352-07	Sediment	06/18/20
LDW20-SS377	20F0352-08	Sediment	06/18/20
LDW20-SS379	20F0352-09	Sediment	06/18/20
LDW20-SS388	20F0352-10	Sediment	06/18/20
LDW20-SS264MS	20F0352-02MS	Sediment	06/18/20
LDW20-SS264MSD	20F0352-02MSD	Sediment	06/18/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Hexachlorobenzene by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 12.0°C and 19.2°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4
Hexachlorobenzene - Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Laboratory Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Field Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785D3a SDG #: 20F0352 Stage 2B Laboratory: Analytical Resources, Inc.

Date:	08/14/20
Page:_	
Reviewer:	JV&
2nd Reviewer:	U

METHOD: GC Hexachlorobenzene (EPA SW846 Method 8081B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Commen	ts
1.	Sample receipt/Technical holding times	SW/A	Cooler temp = 19.2°C	12,0°C (Insufficient)
	GC Instrument Performance Check	A)	· · · · · · · · · · · · · · · · · · ·	
	Initial calibration/ICV	AIA	10AL & 20%	10/5 20/s
IV.	Continuing calibration	I A'	10AL & 20 B	
V.	Laboratory Blanks	A		
VI	Field blanks	N		
VII.	Surrogate spikes /\S	À	τ	
VIII.	Matrix spike/Matrix spike duplicates	Á		
IX.	Laboratory control samples	A	LCS	
X	Field duplicates	N		
XI.	Compound quantitation/RL/LOQ/LODs	N		
XII.	Target compound identification	N		
XIII.	System Performance	N		
XIV	Overall assessment of data	A		

Note:

A = Acceptable N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS251	20F0352-01	Sediment	06/18/20
2	LDW20-SS264	20F0352-02	Sediment	06/18/20
3	LDW20-SS409	20F0352-03	Sediment	06/18/20
4	LDW20-SS310	20F0352-04	Sediment	06/18/20
5	LDW20-SS318	20F0352-05	Sediment	06/18/20
6	LDW20-SS322	20F0352-06	Sediment	06/18/20
7	LDW20-SS359	20F0352-07	Sediment	06/18/20
8	LDW20-SS377	20F0352-08	Sediment	06/18/20
9	LDW20-SS379	20F0352-09	Sediment	06/18/20
10	LDW20-SS388	20F0352-10	Sediment	06/18/20
11	LDW20-SS264MS	20F0352-02MS	Sediment	06/18/20
12	LDW20-SS264MSD	20F0352-02MSD	Sediment	06/18/20
13				
14				
15	BIG0059-BLK1			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Polychlorinated Biphenyls

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0352

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
			
LDW20-SS251	20F0352-01	Sediment	06/18/20
LDW20-SS264	20F0352-02	Sediment	06/18/20
LDW20-SS409	20F0352-03	Sediment	06/18/20
LDW20-SS310	20F0352-04	Sediment	06/18/20
LDW20-SS318	20F0352-05	Sediment	06/18/20
LDW20-SS322	20F0352-06	Sediment	06/18/20
LDW20-SS359	20F0352-07	Sediment	06/18/20
LDW20-SS377	20F0352-08	Sediment	06/18/20
LDW20-SS379	20F0352-09	Sediment	06/18/20
LDW20-SS388	20F0352-10	Sediment	06/18/20
LDW20-SS409MS	20F0352-03MS	Sediment	06/18/20
LDW20-SS409MSD	20F0352-03MSD	Sediment	06/18/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 12.0°C and 19.2°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	%D	Associated Samples	Flag	A or P
07/02/20	SIG0056-SCV1	1C	Aroclor-1260	21.8	All samples in SDG 20F0352	J (all detects)	А

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Affected Compound	Flag	A or P
BIG0061-BS1	Aroclor-1260	121 (58-120)	All samples in SDG 20F0352	Aroclor-1248 Aroclor-1254 Aroclor-1260	J (all detects) J (all detects) J (all detects)	Р

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
LDW20-SS251	Aroclor-1254	48.6	J (all detects)	А
LDW20-SS409	Aroclor-1248	57.4	J (all detects)	А
LDW20-SS310	Aroclor-1248	42.1	J (all detects)	А
LDW20-SS318	Aroclor-1248 Aroclor-1254	49.9 42.5	J (all detects) J (all detects)	A
LDW20-SS359	Aroclor-1248	49.8	J (all detects)	А
LDW20-SS377	Aroclor-1248	65.3	J (all detects)	А

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D, LCS %R, and RPD between two columns, data were qualified as estimated in ten samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Biphenyls - Data Qualification Summary - SDG 20F0352

Sample	Compound	Flag	A or P	Reason
LDW20-SS251 LDW20-SS264 LDW20-SS409 LDW20-SS310 LDW20-SS318 LDW20-SS322 LDW20-SS359 LDW20-SS377 LDW20-SS379 LDW20-SS379	Aroclor-1260	J (all detects)	Α	Initial calibration verification (%D)
LDW20-SS251 LDW20-SS264 LDW20-SS3409 LDW20-SS310 LDW20-SS318 LDW20-SS322 LDW20-SS359 LDW20-SS377 LDW20-SS379 LDW20-SS379 LDW20-SS388	Aroclor-1248 Aroclor-1254 Aroclor-1260	J (all detects) J (all detects) J (all detects)	P	Laboratory control samples (%R)
LDW20-SS251	Aroclor-1254	J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS409 LDW20-SS310 LDW20-SS359 LDW20-SS377	Aroclor-1248	J (all detects)	Α	Compound quantitation (RPD between two columns)
LDW20-SS318	Aroclor-1248 Aroclor-1254	J (all detects) J (all detects)	Α	Compound quantitation (RPD between two columns)

Duwamish AOC4

Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

SDG #	#: 48785D3b VALIDATIC #: 20F0352 atory: Analytical Resources, Inc.		L ETENESS age 2B	WORKS	HEET	R	Date: <u>08/14</u> Page: _of_\ eviewer: _\V_
	IOD: GC Polychlorinated Biphenyls (EPA	A SW846 Me	thod 8082A)			2nd R	eviewer:(_
	amples listed below were reviewed for eation findings worksheets.	ach of the fo	llowing valida	tion areas. \	∕alidation f	indings are n	oted in attached
	Validation Area				Commen	ts	
l.	Sample receipt/Technical holding times	SW/ A	Cooler	temp. =	19.2°C	12.00	Insufficient time to
11.	Initial calibration/ICV	AISW		د 20%		ICU = 20%.	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
III.	Continuing calibration	Δ	Cong	20%			
IV.	Laboratory Blanks	Ä					
V.	Field blanks	N					
VI.	Surrogate spikes / LS	A/A					
VII.	Matrix spike/Matrix spike duplicates	A					
VIII.	Laboratory control samples	Sh)	LC	<u>s So</u>	en .		
IX.	Field duplicates	N					
X.	Compound quantitation/RL/LOQ/LODs	SW					
XI.	Target compound identification	N					
XII	Overall assessment of data						
Note:	N = Not provided/applicable R = Rir	volo compounds densate ield blank	letected	D = Duplicat TB = Trip bla EB = Equipn	ank	SB=Source OTHER:	blank
	Client ID			Lab ID		Matrix	Date
1 1	LDW20-SS251			20F0352-01		Sediment	06/18/20
	LDW20-SS264			20F0352-02		Sediment	06/18/20
3 1	LDW20-SS409			20F0352-03		Sediment	06/18/20
4 1	LDW20-SS310			20F0352-04		Sediment	06/18/20
5 I	LDW20-SS318			20F0352-05		Sediment	06/18/20
	LDW20-SS322			20F0352-06		Sediment	06/18/20
7 l	_DW20-SS359			20F0352-07		Sediment	06/18/20
8 1	_DW20-\$\$377	T. T		20F0352-08		Sediment	06/18/20
9 I	_DW20-SS379			20F0352-09		Sediment	06/18/20
10 I	_DW20-\$\$388			20F0352-10		Sediment	06/18/20
11	_DW20-SS409MS			20F0352-03M	s	Sediment	06/18/20

20F0352-03MSD

06/18/20

Sediment

12

13

LDW20-SS409MSD

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPASW 846 Method 8081/8082)

A. alpha-BHC	K. Endrin	U. Toxaphene	EE. 2,4'-DDT	OO. trans-Heptachlor epoxide
B. beta-BHC	L. Endosulfan II	V. Aroclor-1016	FF. Hexachlorobenzene	PP. Mirex
C. delta-BHC	M. 4,4'-DDD	W. Aroclor-1221	GG. Chlordane	QQ çis-Chlordane
D. gamma-BHC	N. Endosulfan sulfate	X. Aroclor-1232	HH. Chlordane (Technical)	RR. trans-Chlordane
E. Heptachlor	O. 4,4'-DDT	Y. Aroclor-1242	II. Aroclor 1262	SS.
F. Aldrin	P. Methoxychlor	Z. Aroclor-1248	JJ. Aroclor 1268	тт.
G. Heptachlor epoxide	Q. Endrin ketone	AA. Aroclor-1254	KK. Oxychlordane	UU.
H. Endosulfan I	R. Endrin aldehyde	BB. Aroclor-1260	LL. trans-Nonachlor	vv
I. Dieldrin	S. alpha-Chlordane	CC. 2,4'-DDD	MM. cis-Nonachlor	ww.
J. 4,4'-DDE	T. gamma-Chlordane	DD. 2,4'-DDE	NN. cis-Heptachlor epoxide	xx.

Notes:	•	

LDC #: 48785 P36

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	of
Reviewer:_	JVG
2nd Reviewer:	

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

What type of initial calibration verification calculation was performed? __%D or __%R N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Did the initial calibration verification standards meet the %D / %R validation criteria of <20.0% / 80-120%?

#	Date	Standard ID SIG0056-\$C	Detector/ Column	Compound	%D (Limit ≤ 20.0)	Associated Samples	Qualifications
	07/62/20	SIG0056-50	V1 1C	BB	21-8	All (pet)	J/WJ/A
	1 ' ' 1						(qual BB only)
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LDC #: 48785 D36

VALIDATION FINDINGS WORKSHEET <u>Laboratory Control Samples</u>

Page:_	T-of1	_
Reviewer:_	JX 6	
2nd Reviewer:_		_

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Were laboratory control samples (LCS) and laboratory control sample duplicate (LCSD) analyzed for each matrix in this SDG?

Y/N) N/A Were the LCS percent recoveries (%R) and relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)		LCSD %R (Limits)		RPD (Limits)	Associated Samples	Qualifications
	BIG0061-BS1	BB	121 (58-1	26)	()	()	All (bet)	J dets/P
			()	()	()		J dets/P qual Z AA, BB
			()	()	()		10 11 11
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LDC #: 48785 \$35

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: _	of
Reviewer: _	JVG
2nd Reviewer:	4

METHOD: _GC _ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Level IV/D Only

Y(N)N/A

N N/A Were CRQLs adjusted for sample dilutions, dry weight factors, etc.?

Did the reported results for detected target compounds agree within 10.0% of the recalculated results?

Did the percent difference of detected compounds between two columns./detectors ≤40%?

If no, please see findings bellow.

#	Compound Name	Sample ID	%RPD/%D Between Two Columns/Detectors Limit (≤ 40%)	Qualifications
	Aroclar 1254]	48.0	J dets /A
	10.6	2	-7.4	, ,
	248	3	57.4	
	1248	4	42.1	
	1248	5	42.5	
-	1254		42.5	
	1248	7	49.8	
	1248	8	65.3	/
-				

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Metals

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0352

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS251	20F0352-01	Sediment	06/18/20
LDW20-SS264	20F0352-02	Sediment	06/18/20
LDW20-SS409	20F0352-03	Sediment	06/18/20
LDW20-SS310	20F0352-04	Sediment	06/18/20
LDW20-SS318	20F0352-05	Sediment	06/18/20
LDW20-SS322	20F0352-06	Sediment	06/18/20
LDW20-SS359	20F0352-07	Sediment	06/18/20
LDW20-SS377	20F0352-08	Sediment	06/18/20
LDW20-SS379	20F0352-09	Sediment	06/18/20
LDW20-SS388	20F0352-10	Sediment	06/18/20
LDW20-SS251MS	20F0352-01MS	Sediment	06/18/20
LDW20-SS251MSD	20F0352-01MSD	Sediment	06/18/20
LDW20-SS251DUP	20F0352-01DUP	Sediment	06/18/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Arsenic, Cadmium, Chromium, Copper, Lead, Silver, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A Mercury by EPA SW 846 Method 7471B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Mercury	0.0224 mg/Kg	All samples in SDG 20F0352

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

Raw data were not reviewed for Stage 2B validation.

XIII. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4 Metals - Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

Duwamish AOC4 Metals - Laboratory Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

Duwamish AOC4
Metals - Field Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785D4a SDG #: 20F0352

Laboratory: Analytical Resources, Inc.

Stage 2B

METHOD: Metals (EPA SW 846 Method 6020A/7471B)

2nd Reviewer:

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
1.	Sample receipt/Technical holding times	AM	
11.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	SW	
VI.	Field Blanks	\sim	
VII.	Matrix Spike/Matrix Spike Duplicates	A	
VIII.	Duplicate sample analysis	A	
IX.	Serial Dilution	\mathcal{N}	
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	\mathcal{N}	
XII.	Internal Standard (ICP-MS)	Ν	not reviewed
XIII.	Sample Result Verification	N	
XIV	Overall Assessment of Data	A	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1_	LDW20-SS251	20F0352-01	Sediment	06/18/20
2_	LDW20-SS264	20F0352-02	Sediment	06/18/20
3	LDW20-SS409	20F0352-03	Sediment	06/18/20
4	LDW20-SS310	20F0352-04	Sediment	06/18/20
5	LDW20-SS318	20F0352-05	Sediment	06/18/20
6	LDW20-SS322	20F0352-06	Sediment	06/18/20
7	LDW20-SS359	20F0352-07	Sediment	06/18/20
8	LDW20-SS377	20F0352-08	Sediment	06/18/20
9	LDW20-SS379	20F0352-09	Sediment	06/18/20
10	LDW20-SS388	20F0352-10	Sediment	06/18/20
11_	LDW20-SS251MS	20F0352-01MS	Sediment	06/18/20
12	LDW20-SS251MSD	20F0352-01MSD	Sediment	06/18/20
13_	LDW20-SS251DUP	20F0352-01DUP	Sediment	06/18/20
14				

Notes:

LDC #: 48785D4a

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page 1 of 1 Reviewer:CR

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 10	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
QC: 11-13	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
	Analysis Method

Analysis Method

ICP	
ICP-MS	As, Cd, Cr, Cu, Pb, Ag, Zn
CVAA	Hg

VALIDATION FINDINGS WORKSHEET <u>Laboratory Blank Contamination (PB/ICB/CCB)</u>

Page 1 of 1 Reviewer:CR

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Soil preparation factor applied (if applicable):

Sample Concentration, unless otherwise noted: mg/Kg

Associated Samples: All

				Sample Identification							
Analyte	PB (mg/Kg)	Maximum ICB/CCB (ug/L)	Action Level	No Qual							
Hg	0.0224										

Comments: The listed analyte concentration is the highest ICB or CCB detected in the analysis. The action level, when applicable, is established at 5X the highest ICB, CCB, or PB concentration.

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0352

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS251	20F0352-01	Sediment	06/18/20
LDW20-SS264	20F0352-02	Sediment	06/18/20
LDW20-SS409	20F0352-03	Sediment	06/18/20
LDW20-SS310	20F0352-04	Sediment	06/18/20
LDW20-SS318	20F0352-05	Sediment	06/18/20
LDW20-SS322	20F0352-06	Sediment	06/18/20
LDW20-SS359	20F0352-07	Sediment	06/18/20
LDW20-SS377	20F0352-08	Sediment	06/18/20
LDW20-SS379	20F0352-09	Sediment	06/18/20
LDW20-SS388	20F0352-10	Sediment	06/18/20
LDW20-SS379MS	20F0352-09MS	Sediment	06/18/20
LDW20-SS379DUP	20F0352-09DUP	Sediment	06/18/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

Total Solids by Standard Method 2540G

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4 Wet Chemistry - Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Field Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

LDC #: 48785D6 VALIDATION COMPLETENESS WORKSHEET SDG #: 20F0352 Stage 2B Laboratory: Analytical Resources, Inc.

Date: 8/19/20
Page: (of)
Reviewer: 2nd Reviewer: ______

METHOD: (Analyte) TOC (EPA SW846 Method 9060A), Total Solids (SM 2540G)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	AIA	
II	Initial calibration	A	
III.	Calibration verification		
IV	Laboratory Blanks	A	
V	Field blanks	\mathcal{N}	
VI.	Matrix Spike/Matrix Spike Duplicates	A	
VII.	Duplicate sample analysis	A	
VIII.	Laboratory control samples	A	LCS, SQ M
IX.	Field duplicates	\ <i>1</i>	
X.	Sample result verification	N	
XI	Overall assessment of data	4	

Note: A = A

A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS251	20F0352-01	Sediment	06/18/20
2	LDW20-SS264	20F0352-02	Sediment	06/18/20
3	LDW20-SS409	20F0352-03	Sediment	06/18/20
4	LDW20-SS310	20F0352-04	Sediment	06/18/20
5	LDW20-SS318	20F0352-05	Sediment	06/18/20
6	LDW20-SS322	20F0352-06	Sediment	06/18/20
7	LDW20-SS359	20F0352-07	Sediment	06/18/20
8	LDW20-SS377	20F0352-08	Sediment	06/18/20
9	LDW20-SS379	20F0352-09	Sediment	06/18/20
10_	LDW20-SS388	20F0352-10	Sediment	06/18/20
11	LDW20-SS379MS	20F0352-09MS	Sediment	06/18/20
12	LDW20-SS379DUP	20F0352-09DUP	Sediment	06/18/20
13				
14				
15				

ــــــــــــــــــــــــــــــــــــــ	 	 	 	 	 	

LDC #: 48785D6

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page 1 of 1 Reviewer:CR

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 10	Total solids, TOC
QC: 11	TOC
12	TS, TOC

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Polychlorinated Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0352

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS379	20F0352-09	Sediment	06/18/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for High Resolution Superfund Methods Data Review (April 2016). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) Method 1613B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported at 19.2°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were within the QC limits for unlabeled compounds and labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
BIF0803-BLK1	07/06/20	1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF 1,2,3,4,6,7,8-HpCDD OCDF OCDD	0.140 ng/Kg 0.0330 ng/Kg 0.535 ng/Kg 1.37 ng/Kg 6.33 ng/Kg	All samples in SDG 20F0352

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits.

XI. Compound Quantitation

All compound quantitations were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG 20F0352	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А
All samples in SDG 20F0352	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to compounds reported as EMPC, data were qualified as estimated or not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 20F0352

Sample	Compound	Flag	A or P	Reason
LDW20-SS379	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А	Compound quantitation (EMPC)
LDW20-SS379	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А	Compound quantitation (EMPC)

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 20F0352

No Sample Data Qualified in this SDG

SDG # _abora	t: 20F0352 atory: <u>Analytical Resources, Inc.</u>	S	tage 2B	WORKSHEET	F	Date: 68/14 Page: \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
The sa	OD: HRGC/HRMS Polychlorinated Dioxi amples listed below were reviewed for eation findings worksheets.				on findings are ı	noted in attached
	Validation Area			Comm	nents	
1.	Sample receipt/Technical holding times	SW/A	coster	temp = 19.29	c (Insut	ticiend)
II.	HRGC/HRMS Instrument performance check	A				
Ш.	Initial calibration/ICV	AIA	ICAL S	20/35%	100 s	= ac limits
IV.	Continuing calibration	A'	an e	ac limits		
V.	Laboratory Blanks	SW				
VI.	Field blanks	1				
VII.	Matrix spike/Matrix spike duplicates	12				
VIII.	Laboratory control samples	A	W	S SRM		
IX.	Field duplicates	N				
Χ.	Labeled Compounds	A				
XI.	Compound quantitation RL/LOQ/LODs	N	हा	MPC = Jdet	5 (-PL);	U(ZRL)
XII.	Target compound identification	N			* * - / /	
XIII.	System performance	N				
XIV.	Overall assessment of data	٨				
lote:	N = Not provided/applicable R = Rin	o compounds sate eld blank	detected	D = Duplicate TB = Trip blank EB = Equipment blar	SB=Source OTHER:	ce blank
	Client ID			Lab ID	Matrix	Date
<u> 1 L</u>	DW20-SS379			20F0352-09	Sediment	06/18/20
2				L		
3						
4						
5						
6						
7						
8						
9		-				
10						
lotes:						
	BIF6863-BLK1		_			

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:	

LDC #: 48785 \$21

VALIDATION FINDINGS WORKSHEET

Page:_	of_	
Reviewer:_	JVG	
nd Reviewer:	7/	

				<u> Biani</u>	<u>(S</u>				Reviewe 2nd Reviewe	er: JVG ' er: (/
METHOD: HRGC/HRMS									ZIIG I (CVICW	UI
Please see qualifications				applicable que	stions are ide	entified as "N/	A ".			
Y N N/A Were all	samples associa									
YN N/A Was a m	nethod blank per		th matrix and	d whenever a s	sample extrac	tion was perf	ormed?			
Y N N/A Was the Brank extraction date:_	method blank co	ontaminated?	- de4 04	les la		A ! - 4 -		A 11		
Conc. units: ng / k	07/04/20	Biank analysi	s date: <i>0</i> /	109/20		Associate	d samples:_	<u> </u>		
Conc. units. 107 1 No		г								
Compound	Blank ID				Sam	ple Identification	on			
	BIF0803-1	UK I (5X)								
0	0.140 +	0.70								
P	0.6370*	0.165								
F	0. 535 *	2.675								
R	1, 37	6.850				· · · · · · · · · · · · · · · · · · ·				1
G	6,33	31.65								
Blank extraction date:_ Conc. units:_	Blank a	analysis date:		sociated Sam	ples:	46	MPC			
Compound	Blank ID				Sam	ple Identification	on			
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I—————————————————————————————————————										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Semivolatiles

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0359

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS224	20F0359-01	Sediment	06/19/20
LDW20-SS232	20F0359-02	Sediment	06/19/20
LDW20-SS240	20F0359-03	Sediment	06/19/20
LDW20-SS244	20F0359-04	Sediment	06/19/20
LDW20-SS243	20F0359-05	Sediment	06/19/20
LDW20-SS269	20F0359-06	Sediment	06/19/20
LDW20-SS261	20F0359-07	Sediment	06/19/20
LDW20-SS255	20F0359-08	Sediment	06/19/20
LDW20-SS250	20F0359-09	Sediment	06/19/20
LDW20-SS245	20F0359-10	Sediment	06/19/20
LDW20-SS222	20F0359-11	Sediment	06/19/20
LDW20-SS223	20F0359-12	Sediment	06/19/20
LDW20-SS226	20F0359-13	Sediment	06/19/20
LDW20-SS230	20F0359-14	Sediment	06/19/20
LDW20-SS235	20F0359-15	Sediment	06/19/20
LDW20-SS238	20F0359-16	Sediment	06/19/20
LDW20-SS240MS	20F0359-03MS	Sediment	06/19/20
LDW20-SS240MSD	20F0359-03MSD	Sediment	06/19/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 8.8°C and 20.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/13/20	Fluoranthene Pyrene	22.3 21.5	LDW20-SS269 LDW20-SS261 LDW20-SS255 LDW20-SS250 LDW20-SS245 LDW20-SS222 LDW20-SS223 LDW20-SS226 LDW20-SS230 LDW20-SS230 LDW20-SS235 LDW20-SS235	J (all detects) J (all detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits with the following exceptions:

SRM ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
BIG0068-SRM1	Naphthalene 2-Methylnaphthalene Acenaphthylene Acenaphthene	20.5 (41-159) 33.6 (51-149) 43.7 (57-142) 48.0 (59-141)	All samples in SDG 20F0359	J (all detects) UJ (all non-detects)	A

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and SRM %R, data were qualified as estimated in sixteen samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles - Data Qualification Summary - SDG 20F0359

Sample	Compound	Flag	A or P	Reason
LDW20-SS269 LDW20-SS261 LDW20-SS255 LDW20-SS250 LDW20-SS245 LDW20-SS222 LDW20-SS223 LDW20-SS226 LDW20-SS230 LDW20-SS235 LDW20-SS235	Fluoranthene Pyrene	J (all detects) J (all detects)	Α	Continuing calibration (%D)
LDW20-SS224 LDW20-SS232 LDW20-SS240 LDW20-SS244 LDW20-SS243 LDW20-SS269 LDW20-SS255 LDW20-SS255 LDW20-SS250 LDW20-SS245 LDW20-SS222 LDW20-SS223 LDW20-SS233 LDW20-SS230 LDW20-SS235 LDW20-SS235 LDW20-SS235 LDW20-SS235	Naphthalene 2-Methylnaphthalene Acenaphthylene Acenaphthene	J (all detects) UJ (all non-detects)	А	Standard reference materials (%R)

Duwamish AOC4

Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

Duwamish AOC4

Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

LDC #:_	487 <u>85</u> E2a	VALIDATION COMPLETENESS WORKSHEET
SDG #:_	20F0359	Stage 2B
Laborato	ory: Analytical	Resources, Inc.

Date: 08/17/20
Page: of 7
Reviewer: 54
2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270E)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments (Insufficient time to cool
I.	Sample receipt/Technical holding times	SWIA	Cooler temps = 8.8°C 13.2°C 20.4°C
II.	GC/MS Instrument performance check	A	,
III.	Initial calibration/ICV	AIA	1CAL ≤ 20? r~ 1CU = 36?
IV.	Continuing calibration	SW	EN & 20%
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	Ä	
IX.	Laboratory control samples	SW	LCS SRM
X.	Field duplicates	H	
XI.	Internal standards	Å	
XII.	Compound quantitation RL/LOQ/LODs	N	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note: A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank EB = Equipment blank SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS224	20F0359-01	Sediment	06/19/20
2	LDW20-SS232	20F0359-02	Sediment	06/19/20
3 _	LDW20-SS240	20F0359-03	Sediment	06/19/20
4	LDW20-SS244	20F0359-04	Sediment	06/19/20
5	LDW20-SS243	20F0359-05	Sediment	06/19/20
6	LDW20-SS269	20F0359-06	Sediment	06/19/20
7	LDW20-SS261 .	20F0359-07	Sediment	06/19/20
В	LDW20-SS255	20F0359-08	Sediment	06/19/20
9	LDW20-SS250	20F0359-09	Sediment	06/19/20
10	LDW20-SS245	20F0359-10	Sediment	06/19/20
11	LDW20-SS222	20F0359-11	Sediment	06/19/20
12	LDW20-SS223	20F0359-12	Sediment	06/19/20
13	LDW20-SS226	20F0359-13	Sediment	06/19/20
14	LDW20-SS230	20F0359-14	Sediment	06/19/20

SDG Labo	#: 48785E2a #: 20F0359 pratory: Analytical Resource HOD: GC/MS Semivolati		Date: 68/17/2 Page: 20f 2 Reviewer: 2nd Reviewer:				
	Client ID				Lab ID	Matrix	Date
15_	LDW20-SS235				20F0359-15	Sediment	06/19/20
16_	LDW20-SS238				20F0359-16	Sediment	06/19/20
17	LDW20-SS240MS	_			20F0359-03MS	Sediment	06/19/20
18	LDW20-SS240MSD				20F0359-03MSD	Sediment	06/19/20
19							
20_							
21							
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VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF, Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ, 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

LDC #: 48785 E2a

VALIDATION FINDINGS WORKSHEET <u>Continuing Calibration</u>

Page: ___of __ Reviewer: __JVG 2nd Reviewer: ___

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A
Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?

N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: >0.05)	Associated Samulas	Qualifications
					(Lillit. <u>20.03)</u>	Associated Samples	Qualifications
	07/13/20	NT1020671302	77	22,3		6-16 (Det)	J/45/A
1	 		ZZ	21.5			1 / 1
						V	<u> </u>
<u> </u>	-						
				<u> </u>			
-							
 					 		

LDC #: 48785 E 2a

VALIDATION FINDINGS WORKSHEET <u>Laboratory Control Samples (LCS)</u> / SRW

Page: ___of___ Reviewer: __JVG 2nd Reviewer: ____

METHOD: GC/MS BNA (EPA SW 846 Method 8270¢)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A Was a LCS required?

Y/N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#_	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	BIG6068-SRM1	, S	20.5 (41-159)	()	()	All (ND+Det)	J/us/A
		n)	33.6 (5 - 149)	()	()		1
		DD	43.7 (57-142)	()	()		
		pp 66	48.0 (59-141)	()	()) <i>y</i>	
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Semivolatiles

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0359

Commission distribution	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS224	20F0359-01	Sediment	06/19/20
LDW20-SS232	20F0359-02	Sediment	06/19/20
LDW20-SS240	20F0359-03	Sediment	06/19/20
LDW20-SS244	20F0359-04	Sediment	06/19/20
LDW20-SS243	20F0359-05	Sediment	06/19/20
LDW20-SS269	20F0359-06	Sediment	06/19/20
LDW20-SS261	20F0359-07	Sediment	06/19/20
LDW20-SS255	20F0359-08	Sediment	06/19/20
LDW20-SS250	20F0359-09	Sediment	06/19/20
LDW20-SS245	20F0359-10	Sediment	06/19/20
LDW20-SS222	20F0359-11	Sediment	06/19/20
LDW20-SS223	20F0359-12	Sediment	06/19/20
LDW20-SS226	20F0359-13	Sediment	06/19/20
LDW20-SS230	20F0359-14	Sediment	06/19/20
LDW20-SS235	20F0359-15	Sediment	06/19/20
LDW20-SS238	20F0359-16	Sediment	06/19/20
LDW20-SS240MS	20F0359-03MS	Sediment	06/19/20
LDW20-SS240MSD	20F0359-03MSD	Sediment	06/19/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 8.8°C and 20.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r²) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/26/20 (SIF0395-SCV1)	N-Nitrosodiphenylamine	65.7	LDW20-SS224 LDW20-SS232 LDW20-SS240 LDW20-SS244 LDW20-SS243	J (all detects) UJ (all non-detects)	А
06/26/20 (SIF0393-SCV1)	N-Nitrosodiphenylamine	41.9	LDW20-SS269 LDW20-SS261 LDW20-SS255 LDW20-SS250 LDW20-SS245 LDW20-SS222 LDW20-SS223 LDW20-SS226 LDW20-SS230 LDW20-SS230 LDW20-SS235 LDW20-SS235	J (all detects) UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/11/20	Benzoic acid Pentachlorophenol	20.5 34.3	LDW20-SS224 LDW20-SS232 LDW20-SS240 LDW20-SS244 LDW20-SS243	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A
07/13/20	Benzyl alcohol Pentachlorophenol	28.5 37.1	LDW20-SS269 LDW20-SS261 LDW20-SS255 LDW20-SS250 LDW20-SS245 LDW20-SS222 LDW20-SS223 LDW20-SS226 LDW20-SS230 LDW20-SS235 LDW20-SS235 LDW20-SS238	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Α

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits with the following exceptions:

SRM ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
BIG0068-SRM2	1,2-Dichlorobenzene	13.3 (17-184)	All samples in SDG 20F0359	UJ (all non-detects)	Р

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D, continuing calibration %D, and SRM %R, data were qualified as estimated in sixteen samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles – Data Qualification Summary - SDG 20F0359

0	200000001	Flan	A D	Passan
Sample	Compound	Flag	A or P	Reason
LDW20-SS224 LDW20-SS232 LDW20-SS240 LDW20-SS244 LDW20-SS243 LDW20-SS269 LDW20-SS261 LDW20-SS255 LDW20-SS250 LDW20-SS250 LDW20-SS222 LDW20-SS223 LDW20-SS230 LDW20-SS230 LDW20-SS235 LDW20-SS235 LDW20-SS235	N-Nitrosodiphenylamine	J (all detects) UJ (all non-detects)	А	Initial calibration verification (%D)
LDW20-SS224 LDW20-SS232 LDW20-SS240 LDW20-SS244 LDW20-SS243	Benzoic acid Pentachlorophenol	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	А	Continuing calibration (%D)
LDW20-SS269 LDW20-SS261 LDW20-SS255 LDW20-SS250 LDW20-SS245 LDW20-SS222 LDW20-SS223 LDW20-SS226 LDW20-SS230 LDW20-SS235 LDW20-SS235 LDW20-SS235	Benzyl alcohol Pentachlorophenol	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
LDW20-SS224 LDW20-SS232 LDW20-SS240 LDW20-SS244 LDW20-SS243 LDW20-SS269 LDW20-SS255 LDW20-SS250 LDW20-SS250 LDW20-SS245 LDW20-SS222 LDW20-SS223 LDW20-SS223 LDW20-SS233 LDW20-SS230 LDW20-SS235 LDW20-SS235 LDW20-SS235 LDW20-SS235	1,2-Dichlorobenzene	UJ (all non-detects)	Р	Standard reference materials (%R)

Duwamish AOC4 Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

Duwamish AOC4 Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

LDC #: 48785E2b	_ VALIDATION COMPLETENESS WORKSHEET	
SDG #: 20F0359	_ Stage 2B	
aboratory: Analytical Resou	urces. Inc.	Re

Page: of 2
Reviewer: 2nd Reviewer:

METHOD: GC/MS Polynuclear Arematic Hydrocarbons (EPA SW 846 Method 8270E-SIM)

SVOA

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
l.	Sample receipt/Technical holding times	SNIA	Cooler temps = 8,8°C 13.2°C 20.4°C (#nsufficient
11.	GC/MS Instrument performance check	A	
111.	Initial calibration/ICV	AISW	1GL 202 12 1W=303
IV.	Continuing calibration	SW	CW = 202
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	À	
IX.	Laboratory control samples	SN	LCS , SRM
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	N	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note: A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank EB = Equipment blank

SB=Source blank OTHER:

		T T		
	Client ID	Lab ID	Matrix	Date
1	LDW20-SS224	20F0359-01	Sediment	06/19/20
2	LDW20-SS232	20F0359-02	Sediment	06/19/20
3	LDW20-SS240	20F0359-03	Sediment	06/19/20
4	LDW20-SS244	20F0359-04	Sediment	06/19/20
5	LDW20-SS243	20F0359-05	Sediment	06/19/20
6	LDW20-SS269	20F0359-06	Sediment	06/19/20
7	LDW20-SS261	20F0359-07	Sediment	06/19/20
8	LDW20-SS255	20F0359-08	Sediment	06/19/20
9	LDW20-SS250	20F0359-09	Sediment	06/19/20
10_	LDW20-SS245	20F0359-10	Sediment	06/19/20
11_	LDW20-SS222	20F0359-11	Sediment	06/19/20
12	LDW20-SS223	20F0359-12	Sediment	06/19/20
13_	LDW20-SS226	20F0359-13	Sediment	06/19/20
14_	LDW20-SS230	20F0359-14	Sediment	06/19/20

DG abo	C#: <u>48785E2b</u> C#: <u>20F0359</u> Coratory: <u>Analytical Resoul</u> FHOD: GC/MS Polynucle	rces, Inc.	Stage 2B	46 Method 8270E-SIM)	F 2nd F	Date: <u>0%/</u> Page: <u>2</u> -of. Reviewer:
_	Client ID			Lab ID	Matrix	Date
15_	LDW20-SS235			20F0359-15	Sediment	06/19/20
16	LDW20-SS238			20F0359-16	Sediment	06/19/20
17_	LDW20-SS240MS			20F0359-03MS	Sediment	06/19/20
18 19	LDW20-SS240MSD			20F0359-03MSD	Sediment	06/19/20
20						
21 Votes	3:					
	BI 60068-BLK2					
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VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA Butulbaan dababalata	AAAA Dii	
A. Phenoi	AA. 2-Cnioronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chiorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

LDC #: 48785 E 26

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	of)
Reviewer:_	JŲG
2nd Reviewer:_	

METHOD: GC/MS SVOA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

<u>N N/A</u> Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y(N)N/A Were all %D within the validation criteria of ≤20/30% %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤ 20.0 %(30%)	Associated Samples	Qualifications
	06/24/20	SIF0395-SCV1	QQ.	65.7	1-5, 17,18, MB (ND+D	y) J/uJ/A
	06/26/20	SIF0393-5W1	ØQ.	41.9	6-16 (ND+Det)	

LDC#: 48785 E26

VALIDATION FINDINGS WORKSHEET <u>Continuing Calibration</u>

Page:_	of	<u> </u>
Reviewer:_	JXG	
2nd Reviewer:_	U	

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?

Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?

Y (N) N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#	Date	Standard ID	Compound	Finding %D (Limit: <u><</u> 20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
	07/11/20	NT14 200711035	PPP	20,5		1-5 17 18 MB (ND	+P++) 5/U5/A
	, , , , , , , , , , , , , , , , , , ,		77	34.3			7,007,7
	07/13/20	NT10200713035	RRR	28,5		6-16 (ND+D	et) J/UJ/A
		,	TT	37.1			
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LDC #: 48785 E 26

VALIDATION FINDINGS WORKSHEET <u>Laboratory Control Samples (LCS)</u> **RM**

Page:	<u></u> of/
Reviewer:	JXG
2nd Reviewer:	W.

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

<u>r N N/A</u>

Was a LCS required?

Y N N/A

Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#_	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	BIG0068- SRM2	F	13,3 (17-184)	()	()	All (ND)	J/45/P
			()	()	()	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	1
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Hexachlorobenzene

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0359

0	Laboratory Sample	N - 4 - 2	Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS224	20F0359-01	Sediment	06/19/20
LDW20-SS232	20F0359-02	Sediment	06/19/20
LDW20-SS240	20F0359-03	Sediment	06/19/20
LDW20-SS244	20F0359-04	Sediment	06/19/20
LDW20-SS243	20F0359-05	Sediment	06/19/20
LDW20-SS269	20F0359-06	Sediment	06/19/20
LDW20-SS261	20F0359-07	Sediment	06/19/20
LDW20-SS255	20F0359-08	Sediment	06/19/20
LDW20-SS250	20F0359-09	Sediment	06/19/20
LDW20-SS245	20F0359-10	Sediment	06/19/20
LDW20-SS222	20F0359-11	Sediment	06/19/20
LDW20-SS223	20F0359-12	Sediment	06/19/20
LDW20-SS226	20F0359-13	Sediment	06/19/20
LDW20-SS230	20F0359-14	Sediment	06/19/20
LDW20-SS235	20F0359-15	Sediment	06/19/20
LDW20-SS238	20F0359-16	Sediment	06/19/20
LDW20-SS240MS	20F0359-03MS	Sediment	06/19/20
LDW20-SS240MSD	20F0359-03MSD	Sediment	06/19/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Hexachlorobenzene by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 8.8°C and 20.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4

Hexachlorobenzene - Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Laboratory Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Field Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

LDC #: 48785E3a VALIDATION COMPLETENESS WORKSHEET SDG #: 20F0359 Stage 2B

Date: 08/17/20
Page: 1 of 7
Reviewer: 2nd Reviewer:

Laboratory: Analytical Resources, Inc.

METHOD: GC Hexachlorobenzene (EPA SW846 Method 8081B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area Comments					
l.	Sample receipt/Technical holding times	SW, A	cooler temps = 8.8°C, 13.2°C, 20.4°C	Insufficient,		
II.	GC Instrument Performance Check	N	· ·			
III.	Initial calibration/ICV	A/A	1GAL = 263 1005	20/3		
IV.	Continuing calibration	Δ΄	1925 263 1015 COV = 202			
V.	Laboratory Blanks	Ä				
VI.	Field blanks	N				
VII.	Surrogate spikes / Int Struc	AA				
VIII.	Matrix spike/Matrix spike duplicates	A A				
IX.	Laboratory control samples	A	ucs/b			
X.	Field duplicates	Ŋ				
XI.	Compound quantitation/RL/LOQ/LODs	N				
XII.	Target compound identification	N				
XIII.	System Performance	N				
XIV	Overall assessment of data	A				

Note: A

A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS224	20F0359-01	Sediment	06/19/20
2	LDW20-SS232	20F0359-02	Sediment	06/19/20
3	LDW20-SS240	20F0359-03	Sediment	06/19/20
4	LDW20-SS244	20F0359-04	Sediment	06/19/20
5	LDW20-SS243	20F0359-05	Sediment	06/19/20
6	LDW20-SS269	20F0359-06	Sediment	06/19/20
7	LDW20-SS261	20F0359-07	Sediment	06/19/20
8	LDW20-SS255	20F0359-08	Sediment	06/19/20
9	LDW20-SS250	20F0359-09	Sediment	06/19/20
10	LDW20-SS245	20F0359-10	Sediment	06/19/20
11	LDW20-SS222	20F0359-11	Sediment	06/19/20
12	LDW20-SS223	20F0359-12	Sediment	06/19/20
13	LDW20-SS226	20F0359-13	Sediment	06/19/20
14	LDW20-SS230	20F0359-14	Sediment	06/19/20
15	LDW20-SS235	20F0359-15	Sediment	06/19/20

SDG _abo	C#: 48785E3a VALIDATION COMP G#: 20F0359 S oratory: Analytical Resources, Inc. FHOD: GC Hexachlorobenzene (EPA SW846 Method	tage 2B	S WORKSHEET		Date: 68/17/ Page: 2 of 2 eviewer: 0 eviewer: 0
	Client ID		Lab ID	Matrix	Date
16	LDW20-SS238		20F0359-16	Sediment	06/19/20
17_	LDW20-SS240MS		20F0359-03MS	Sediment	06/19/20
18_	LDW20-SS240MSD		20F0359-03MSD	Sediment	06/19/20
19_					
20					
21_					
Votes	3.				
	BI G0069-BLKI				
		1 1		ı	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Polychlorinated Biphenyls

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0359

Sample Identification	Laboratory Sample	Matrix	Collection Date
LDW20-SS224	20F0359-01	Sediment	06/19/20
LDW20-SS232	20F0359-02	Sediment	06/19/20
LDW20-SS240	20F0359-03	Sediment	06/19/20
LDW20-SS244	20F0359-04	Sediment	06/19/20
LDW20-SS243	20F0359-05	Sediment	06/19/20
LDW20-SS269	20F0359-06	Sediment	06/19/20
LDW20-SS261	20F0359-07	Sediment	06/19/20
LDW20-SS255	20F0359-08	Sediment	06/19/20
LDW20-SS250	20F0359-09	Sediment	06/19/20
LDW20-SS245	20F0359-10	Sediment	06/19/20
LDW20-SS222	20F0359-11	Sediment	06/19/20
LDW20-SS223	20F0359-12	Sediment	06/19/20
LDW20-SS226	20F0359-13	Sediment	06/19/20
LDW20-SS230	20F0359-14	Sediment	06/19/20
LDW20-SS235	20F0359-15	Sediment	06/19/20
LDW20-SS238	20F0359-16	Sediment	06/19/20
LDW20-SS240MS	20F0359-03MS	Sediment	06/19/20
LDW20-SS240MSD	20F0359-03MSD	Sediment	06/19/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 8.8°C and 20.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	%D	Associated Samples	Flag	A or P
07/02/20	SIG0056-SCV1	1C	Aroclor-1260	21.8	All samples in SDG 20F0359	J (all detects)	А

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
LDW20-SS224	Aroclor-1248 Aroclor-1260	44.2 42.7	J (all detects) J (all detects)	A
LDW20-SS240	Aroclor-1254	48.9	J (all detects)	А
LDW20-SS244	Aroclor-1254 Aroclor-1260	41.1 59.2	J (all detects) J (all detects)	A
LDW20-SS243	Aroclor-1254 Aroclor-1260	41.2 40.5	J (all detects) J (all detects)	А
LDW20-SS269	Aroclor-1248 Aroclor-1260	42.4 40.7	J (all detects) J (all detects)	А
LDW20-SS255	Aroclor-1254	49.2	J (all detects)	А
LDW20-SS250	Aroclor-1248 Aroclor-1254	42 44.8	J (all detects) J (all detects)	А
LDW20-SS222	Aroclor-1254	43	J (all detects)	А
LDW20-SS226	Aroclor-1254	44.6	J (all detects)	А

Sample	Compound	RPD	Flag	A or P
LDW20-SS230	Aroclor-1248 Aroclor-1254	42.1 54.8	J (all detects) J (all detects)	А
LDW20-SS235	Aroclor-1254	40.8	J (all detects)	А
LDW20-SS238	Aroclor-1254	51.5	J (all detects)	А

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D and RPD between two columns, data were qualified as estimated in sixteen samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Biphenyls - Data Qualification Summary - SDG 20F0359

Sample	Compound	Flag	A or P	Reason
LDW20-SS224 LDW20-SS232 LDW20-SS240 LDW20-SS244 LDW20-SS243 LDW20-SS269 LDW20-SS255 LDW20-SS255 LDW20-SS250 LDW20-SS250 LDW20-SS222 LDW20-SS222 LDW20-SS223 LDW20-SS233 LDW20-SS230 LDW20-SS235 LDW20-SS235 LDW20-SS235	Aroclor-1260	J (all detects)	А	Initial calibration verification (%D)
LDW20-SS224 LDW20-SS269	Aroclor-1248 Aroclor-1260	J (all detects) J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS240 LDW20-SS255 LDW20-SS222 LDW20-SS226 LDW20-SS235 LDW20-SS238	Aroclor-1254	J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS244 LDW20-SS243	Aroclor-1254 Aroclor-1260	J (all detects) J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS250 LDW20-SS230	Aroclor-1248 Aroclor-1254	J (all detects) J (all detects)	А	Compound quantitation (RPD between two columns)

Duwamish AOC4

Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

LDC #: 48785E3b VALIDATION COMPLETENESS WORKSHEET SDG #: 20F0359 Stage 2B Laboratory: Analytical Resources, Inc.

METHOD: GC Polychlorinated Biphenyls (EPA SW846 Method 8082A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments	
<u>l.</u>	Sample receipt/Technical holding times	SW/A	Cooler temps = 8.8 °C, 13.2°C, 20.4°C time to	Tent Occ
11.	Initial calibration/ICV	A I SW	100 L 20%, 100 = 20%	
111.	Continuing calibration	I A	CU = 20 %	
IV.	Laboratory Blanks	A		╝
V.	Field blanks			_
VI.	Surrogate spikes	A		
VII.	Matrix spike/Matrix spike duplicates	Ä		
VIII.	Laboratory control samples	A	US SRM	
IX.	Field duplicates	N		
X.	Compound quantitation/RL/LOQ/LODs	SW		
XI.	Target compound identification	N		
ХII	Overall assessment of data	A		

Note: A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS224	20F0359-01	Sediment	06/19/20
2	LDW20-SS232	20F0359-02	Sediment	06/19/20
3	LDW20-SS240	20F0359-03	Sediment	06/19/20
4	LDW20-SS244	20F0359-04	Sediment	06/19/20
5	LDW20-SS243	20F0359-05	Sediment	06/19/20
6	LDW20-SS269	20F0359-06	Sediment	06/19/20
7	LDW20-SS261	20F0359-07	Sediment	06/19/20
8	LDW20-SS255	20F0359-08	Sediment	06/19/20
9	LDW20-SS250	20F0359-09	Sediment	06/19/20
10	LDW20-SS245	20F0359-10	Sediment	06/19/20
11	LDW20-SS222	20F0359-11	Sediment	06/19/20
12	LDW20-SS223	20F0359-12	Sediment	06/19/20
13	LDW20-SS226	20F0359-13	Sediment	06/19/20
14	LDW20-SS230	20F0359-14	Sediment	06/19/20
15	LDW20-SS235	20F0359-15	Sediment	06/19/20
16	LDW20-SS238	20F0359-16	Sediment	06/19/20
17	LDW20-SS240MS	20F0359-03MS	Sediment	06/19/20

SDG Labo	#: 48785E3b 6 #: 20F0359 pratory: Analytical Resource CHOD: GC Polychlorinated	VALIDATION COMPLET Stage ces, Inc. d Biphenyls (EPA SW846 Metho	e 2B		1	Date: 08/17/2 Page: 2_of 2/ Reviewer: 19/4 Reviewer:
	Client ID			Lab ID	Matrix	Date
18	LDW20-SS240MSD			20F0359-03MSD	Sediment	06/19/20
19						
20						
21						
Notes	:					
	BIG0670-B441					
\Box					1	

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPASW 846 Method 8081/8082)

A. alpha-BHC	K. Endrin	U. Toxaphene	EE. 2,4'-DDT	OO. trans-Heptachlor epoxide
B. beta-BHC	L. Endosulfan II	V. Aroclor-1016	FF. Hexachlorobenzene	PP. Mirex
C. delta-BHC	M. 4,4'-DDD	W. Aroclor-1221	GG. Chlordane	QQ çis-Chlordane
D. gamma-BHC	N. Endosulfan sulfate	X. Aroclor-1232	HH. Chlordane (Technical)	RR. trans-Chlordane
E. Heptachlor	O. 4,4'-DDT	Y. Aroclor-1242	II. Aroclor 1262	SS.
F. Aldrin	P. Methoxychlor	Z. Aroclor-1248	JJ. Aroclor 1268	тт.
G. Heptachlor epoxide	Q. Endrin ketone	AA. Aroclor-1254	KK. Oxychlordane	UU.
H. Endosulfan I	R. Endrin aldehyde	BB. Aroclor-1260	LL. trans-Nonachlor	vv
I. Dieldrin	S. alpha-Chlordane	CC. 2,4'-DDD	MM. cis-Nonachlor	ww.
J. 4,4'-DDE	T. gamma-Chlordane	DD. 2,4'-DDE	NN. cis-Heptachlor epoxide	XX.

Notes:	

LDC #: 48715 E36

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:__l_of__l Reviewer:__JVG_ 2nd Reviewer:___

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

What type of initial calibration verification calculation was performed? _____%D or ______%R

(Y)N_N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y(N)N/A Did the initial calibration verification standards meet the %D / %R validation criteria of <20.0% / 80-120%?

#	Date	Standard ID	Detector/ Column	Compound	%D (Limit ≤ 20.0)	Associated Samples	Qualifications
	07/02/20	SIG 0056-SCV	1 16	BB	21.8	All (Pet)	J/UJ/A
	7					(10)	(qual BB only)
<u> </u>							
<u> </u>							
<u> </u>							
-							
<u> </u>							
-			, , , , , , , , , , , , , , , , , , ,				
-							

LDC #: 48785 E35

VALIDATION FINDINGS WORKSHEET <u>Compound Quantitation and Reported CRQLs</u>

Page:	of
Reviewer: _	JYG
2nd Reviewer:	9

METHOD: __GC __ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Level IV/D Only

YN N/A Were CRQLs adjusted for sample dilutions, dry weight factors, etc.?

N N/A Did the reported results for detected target compounds agree within 10.0% of the recalculated results?

Did the percent difference of detected compounds between two columns./detectors ≤40%?

If no, please see findings bellow.

#	Compound Name	Sample ID	%RPD/%D Between Two Columns/Detectors Limit (≤ 40%)	Qualifications
	Argolor 1248		44.2	J dets/A
	260	<u> </u>	42.7	
	1254	3	48.9	
	1254	4	41.1	
	1260	V	59.2	
	1254	5	41.2	
	1260		40.5	
	1248	6	42,4	
	1260		40.7	
	1254	8	49,2	
	1248	9	42	
	1254		44-8	<i>Y</i>

Comments: See sample calculation verification worksheet for recalculations

LDC #: 48785 F36

VALIDATION FINDINGS WORKSHEET <u>Compound Quantitation and Reported CRQLs</u>

Page: 2 of 2
Reviewer: JVG
2nd Reviewer:

METHOD: \angle GC _ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Level IV/D Only

<u>WN N/A</u> W

Were CRQLs adjusted for sample dilutions, dry weight factors, etc.?

<u>X' N N/A</u> Y (\bar{V}\N/A Did the reported results for detected target compounds agree within 10.0% of the recalculated results?

Did the percent difference of detected compounds between two columns./detectors ≤40%?

If no, please see findings bellow.

#	Compound Name	Sample ID	%RPD/%D Between Two Columns/Detectors Limit (≤ 40%)	Qualifications
	Aroclor 1294)\	43	J dets /A
	1254	13	44.6	
	1248	14	42.)	
	254	<u> </u>	54.8	
	1254	15	40.8	
			5ml be	
	1254	16	51.5	<i>y</i>
-				
		······································		
-				

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Metals

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0359

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS224	20F0359-01	Sediment	06/19/20
LDW20-SS232	20F0359-02	Sediment	06/19/20
LDW20-SS240	20F0359-03	Sediment	06/19/20
LDW20-SS244	20F0359-04	Sediment	06/19/20
LDW20-SS243	20F0359-05	Sediment	06/19/20
LDW20-SS269	20F0359-06	Sediment	06/19/20
LDW20-SS261	20F0359-07	Sediment	06/19/20
LDW20-SS255	20F0359-08	Sediment	06/19/20
LDW20-SS250	20F0359-09	Sediment	06/19/20
LDW20-SS245	20F0359-10	Sediment	06/19/20
LDW20-SS222	20F0359-11	Sediment	06/19/20
LDW20-SS223	20F0359-12	Sediment	06/19/20
LDW20-SS226	20F0359-13	Sediment	06/19/20
LDW20-SS230	20F0359-14	Sediment	06/19/20
LDW20-SS235	20F0359-15	Sediment	06/19/20
LDW20-SS238	20F0359-16	Sediment	06/19/20
LDW20-SS224MS	20F0359-01MS	Sediment	06/19/20
LDW20-SS224MSD	20F0359-01MSD	Sediment	06/19/20
LDW20-SS224DUP	20F0359-01DUP	Sediment	06/19/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Arsenic, Cadmium, Chromium, Copper, Lead, Silver, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A Mercury by EPA SW 846 Method 7471B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Silver	0.022 ug/L	LDW20-SS224 LDW20-SS244 LDW20-SS243 LDW20-SS269 LDW20-SS255 LDW20-SS255 LDW20-SS250 LDW20-SS245 LDW20-SS222 LDW20-SS223 LDW20-SS226 LDW20-SS230 LDW20-SS235 LDW20-SS238 LDW20-SS238 LDW20-SS224DUP
PB (prep blank)	Zinc	1.1 mg/Kg	All samples in SDG 20F0359

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
LDW20-SS224	Silver	0.19 mg/Kg	0.19U mg/Kg
LDW20-SS244	Silver	0.14 mg/Kg	0.14U mg/Kg
LDW20-SS243	Silver	0.24 mg/Kg	0.24U mg/Kg
LDW20-SS269	Silver	0.19 mg/Kg	0.19U mg/Kg
LDW20-SS261	Silver	0.15 mg/Kg	0.15U mg/Kg
LDW20-SS255	Silver	0.15 mg/Kg	0.15U mg/Kg
LDW20-SS250	Silver	0.19 mg/Kg	0.19U mg/Kg
LDW20-SS245	Silver	0.19 mg/Kg	0.19U mg/Kg
LDW20-SS222	Silver	0.2 mg/Kg	0.2U mg/Kg
LDW20-SS223	Silver	0.18 mg/Kg	0.18U mg/Kg
LDW20-SS226	Silver	0.18 mg/Kg	0.18U mg/Kg
LDW20-SS230	Silver	0.16 mg/Kg	0.16U mg/Kg
LDW20-SS235	Silver	0.16 mg/Kg	0.16U mg/Kg
LDW20-SS238	Silver	0.16 mg/Kg	0.16U mg/Kg
LDW20-SS224DUP	Silver	0.15 mg/Kg	0.15U mg/Kg

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

Raw data were not reviewed for Stage 2B validation.

XIII. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to laboratory blank contamination, data were qualified as not detected in fifteen samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Metals - Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

Duwamish AOC4 Metals - Laboratory Blank Data Qualification Summary - SDG 20F0359

Sample	Analyte	Modified Final Concentration	A or P
LDW20-SS224	Silver	0.19U mg/Kg	А
LDW20-SS244	Silver	0.14U mg/Kg	А
LDW20-SS243	Silver	0.24U mg/Kg	А
LDW20-SS269	Silver	0.19U mg/Kg	А
LDW20-SS261	Silver	0.15U mg/Kg	Α
LDW20-SS255	Silver	0.15U mg/Kg	Α
LDW20-SS250	Silver	0.19U mg/Kg	А
LDW20-SS245	Silver	0.19U mg/Kg	А
LDW20-SS222	Silver	0.2U mg/Kg	А
LDW20-SS223	Silver	0.18U mg/Kg	А
LDW20-SS226	Silver	0.18U mg/Kg	А
LDW20-SS230	Silver	0.16U mg/Kg	А
LDW20-SS235	Silver	0.16U mg/Kg	А
LDW20-SS238	Silver	0.16U mg/Kg	А
LDW20-SS224DUP	Silver	0.15U mg/Kg	А

Duwamish AOC4
Metals - Field Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785E4a SDG #: 20F0359

Laboratory: Analytical Resources, Inc.

Stage 2B

2nd Reviewer

METHOD: Metals (EPA SW 846 Method 6020A/7471B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
l.	Sample receipt/Technical holding times	A-A	
<u>II.</u>	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	Sw	
VI.	Field Blanks	\mathcal{N}	
VII.	Matrix Spike/Matrix Spike Duplicates	A	
VIII.	Duplicate sample analysis	A	
IX.	Serial Dilution	N.	
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	\mathcal{N}_{-}	
XII.	Internal Standard (ICP-MS)	ĺ N	noncerieur
XIII.	Sample Result Verification	N	
XIV	Overall Assessment of Data	A	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS224	20F0359-01	Sediment	06/19/20
2	LDW20-SS232	20F0359-02	Sediment	06/19/20
3	LDW20-SS240	20F0359-03	Sediment	06/19/20
4	LDW20-SS244	20F0359-04	Sediment	06/19/20
5	LDW20-SS243	20F0359-05	Sediment	06/19/20
6	LDW20-SS269	20F0359-06	Sediment	06/19/20
7	LDW20-SS261	20F0359-07	Sediment	06/19/20
8	LDW20-SS255	20F0359-08	Sediment	06/19/20
9	LDW20-SS250	20F0359-09	Sediment	06/19/20
10	LDW20-SS245	20F0359-10	Sediment	06/19/20
11	LDW20-SS222	20F0359-11	Sediment	06/19/20
12	LDW20-SS223	20F0359-12	Sediment	06/19/20
13	LDW20-SS226	20F0359-13	Sediment	06/19/20
14	LDW20-SS230	20F0359-14	Sediment	06/19/20
15	LDW20-SS235	20F0359-15	Sediment	06/19/20

LDC #:48785E4a	VALIDATION COMPLETENESS WORKSHEET	Date:
SDG #: 20F0359	Stage 2B	Page:
Laboratory: <u>Analytical Resour</u>	ces, Inc.	Reviewer:

Date: Strate Place Page: 2 of 2
Reviewer: 2
2nd Reviewer: 1

METHOD: Metals (EPA SW 846 Method 6020A/7471B)

	Client ID	Lab ID	Matrix	Date
16	LDW20-SS238	20F0359-16	Sediment	06/19/20
17	LDW20-SS224MS	20F0359-01MS	Sediment	06/19/20
18	LDW20-SS224MSD	20F0359-01MSD	Sediment	06/19/20
19	LDW20-SS224DUP	20F0359-01DUP	Sediment	06/19/20
20				
21				
22				

ICP-MS

CVAA

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 16	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
QC: 17-19	As, Cd, Cr, Cu, Pb, Ag, Zn
	Analysis Method
ICD	

As, Cd, Cr, Cu, Pb, Ag, Zn

Hg

VALIDATION FINDINGS WORKSHEET <u>Laboratory Blank Contamination (PB/ICB/CCB)</u>

Page 1 of 1 Reviewer:CR

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Soil preparation factor applied (if applicable):

Sample Concentration, unless otherwise noted: mg/Kg Associated Samples: 1, 4-16, 19

									Samp	le Ide	ntificat	tion						
Analyte	PB (mg/Kg)	Maximum ICB/CCB (ug/L)	Action Level	1	4	5	6	7	8	9	10	11	12	13	14	15	16	19
Ag		0.022		0.19	0.14	0.24	0.19	0.15	0.15	0.19	0.19	0.2	0.18	0.18	0.16	0.16	0.16	0.15

Sample Concentration, unless otherwise noted: mg/Kg Associated Samples: All

							Samp	ole Ide	ntifica	tion			
Analyte	PB (mg/Kg)	Maximum ICB/CCB (ug/L)	Action Level	No quals							1		
Zn	1.1												

Comments: The listed analyte concentration is the highest ICB or CCB detected in the analysis. The action level, when applicable, is established at 5X the highest ICB, CCB, or PB concentration.

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0359

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS224	20F0359-01	Sediment	06/19/20
LDW20-SS232	20F0359-02	Sediment	06/19/20
LDW20-SS240	20F0359-03	Sediment	06/19/20
LDW20-SS244	20F0359-04	Sediment	06/19/20
LDW20-SS243	20F0359-05	Sediment	06/19/20
LDW20-SS269	20F0359-06	Sediment	06/19/20
LDW20-SS261	20F0359-07	Sediment	06/19/20
LDW20-SS255	20F0359-08	Sediment	06/19/20
LDW20-SS250	20F0359-09	Sediment	06/19/20
LDW20-SS245	20F0359-10	Sediment	06/19/20
LDW20-SS222	20F0359-11	Sediment	06/19/20
LDW20-SS223	20F0359-12	Sediment	06/19/20
LDW20-SS226	20F0359-13	Sediment	06/19/20
LDW20-SS230	20F0359-14	Sediment	06/19/20
LDW20-SS235	20F0359-15	Sediment	06/19/20
LDW20-SS238	20F0359-16	Sediment	06/19/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

Total Solids by Standard Method 2540G

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4 Wet Chemistry - Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Field Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

LDC #: 48785E6 VALIDATION COMPLETENESS WORKSHEET SDG #: 20F0359 Stage 2B

Laboratory: Analytical Resources, Inc.

METHOD: (Analyte) TOC (EPA SW846 Method 9060A), Total Solids (SM 2540G)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I	Sample receipt/Technical holding times	AA	
!	Initial calibration	A	
111.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	\mathcal{N}	
VI.	Matrix Spike/Matrix Spike Duplicates	<u> </u>	
VII.	Duplicate sample analysis	\mathcal{N}	
VIII.	Laboratory control samples	IA	CS GRM
IX.	Field duplicates	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
X.	Sample result verification	N	
XI	Overall assessment of data	10	

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank
EB = Equipment blank

SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS224	20F0359-01	Sediment	06/19/20
2	LDW20-SS232	20F0359-02	Sediment	06/19/20
3	LDW20-SS240	20F0359-03	Sediment	06/19/20
4	LDW20-SS244	20F0359-04	Sediment	06/19/20
5	LDW20-SS243	20F0359-05	Sediment	06/19/20
6	LDW20-SS269	20F0359-06	Sediment	06/19/20
7	LDW20-SS261	20F0359-07	Sediment	06/19/20
8	LDW20-SS255	20F0359-08	Sediment	06/19/20
9	LDW20-SS250	20F0359-09	Sediment	06/19/20
10	LDW20-SS245	20F0359-10	Sediment	06/19/20
11	LDW20-SS222	20F0359-11	Sediment	06/19/20
12	LDW20-SS223	20F0359-12	Sediment	06/19/20
13	LDW20-SS226	20F0359-13	Sediment	06/19/20
14	LDW20-SS230	20F0359-14	Sediment	06/19/20
15	LDW20-SS235	20F0359-15	Sediment	06/19/20
16	LDW20-SS238	20F0359-16	Sediment	06/19/20
17				

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Polychlorinated Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0359

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS244	20F0359-04	Sediment	06/19/20
LDW20-SS243	20F0359-05	Sediment	06/19/20
LDW20-SS244DUP	20F0359-04DUP	Sediment	06/19/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for High Resolution Superfund Methods Data Review (April 2016). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) Method 1613B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 8.8°C and 13.2°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were within the QC limits for unlabeled compounds and labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
BIG0062-BLK1	07/09/20	1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDD OCDF OCDD	0.0645 ng/Kg 0.319 ng/Kg 0.727 ng/Kg 2.68 ng/Kg	All samples in SDG 20F0359

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates/Duplicate Sample Analysis

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
LDW20-SS244DUP	1,2,3,4,6,7,8-HpCDF	105 (≤25)	J (all detects)	А
(LDW20-SS244)	OCDF	29.5 (≤25)	J (all detects)	

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits.

XI. Compound Quantitation

All compound quantitations were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG 20F0359	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А
All samples in SDG 20F0359	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А
All samples in SDG 20F0359	All compounds flagged "X" due to chlorinated diphenyl ether (CDPE) interference.	J (all detects)	Α

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to DUP RPD, compounds reported as EMPC, and CDPE interference, data were qualified as estimated or not detected in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 20F0359

Sample	Compound	Flag	A or P	Reason
LDW20-SS244	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	А	Duplicate sample analysis (RPD)
LDW20-SS244 LDW20-SS243	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А	Compound quantitation (EMPC)
LDW20-SS244 LDW20-SS243	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А	Compound quantitation (EMPC)
LDW20-SS244 LDW20-SS243	All compounds flagged "X" due to chlorinated diphenyl ether (CDPE) interference.	J (all detects)	А	Compound quantitation

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 20F0359

No Sample Data Qualified in this SDG

SDG#	±: 48785E21 VALIDATIO ±: 20F0359 atory: Analytical Resources, Inc.		LETENES tage 2B	S WORKSHEET	F	Date: 0 1/2/2 Page: 1 of 1 Reviewer: 244 Reviewer: 4
METH	IOD: HRGC/HRMS Polychlorinated Dioxi	ins/Dibenzo	furans (EPA	Method 1613B)	ZHQT	reviewer
	amples listed below were reviewed for eation findings worksheets.	ich of the fo	llowing valida	ation areas. Validatio	on findings are	noted in attached
	Validation Area			Comm	nents	
I.	Sample receipt/Technical holding times	SW/A	Cooler	temps = 8.800	- 13.2°C	time to coo
II.	HRGC/HRMS Instrument performance check	L A				
111.	Initial calibration/ICV	AZA	ICAL	= 20/35 %	love	ac limits
IV.	1 4 1 2 2 2					
V.	Laboratory Blanks	SW				
VI.	Field blanks	N				
VII.	Matrix spike/Matrix spike duplicates	H/SW				
VIII.	Laboratory control samples	L	CS, SRM			
IX.	Field duplicates	l N		, 		
X.	Labeled Compounds	A			4	
XI.	Compound quantitation RL/LOQ/LODs		EMPC = Ja	ets (>RL)	, U(ZEL)	
XII.	Target compound identification	N				
XIII.	System performance	N				
XIV.	Overall assessment of data	A				
lote:	N = Not provided/applicable R = Rin	lo compounds isate ield blank	detected	D = Duplicate TB = Trip blank EB = Equipment blar	SB=Sour OTHER: nk	ce blank
	Client ID			Lab ID	Matrix	Date
1 L	_DW20-SS244			20F0359-04	Sediment	06/19/20
2 l	_DW20-SS243			20F0359-05	Sediment	06/19/20
3 l	_DW20-SS244DUP			20F0359-04DUP	Sediment	06/19/20
4						
5			<u> </u>			
6						
7			· · · · · · · · · · · · · · · · · · ·			
8						
9		*-				
10						
lotes:						
+	BIG0062- BLK1					

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:			

LDC #: 48785 E21

VALIDATION FINDINGS WORKSHEET Blanks

Reviewer: JV 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all samples associated with a method blank?

Y N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?

Y N N/A Was the method blank contaminated?

Blank analysis date: 67/13/20 Blank extraction date: 07/69/20 Conc. units: Ng/kg

Associated samples:

Compound	Blank ID		Sample Identification					
	BIG0062-B	4K1 (5X)						
ð	BIG0062-B 0.0645	0.3225						
F	0.319	1.595						
Q	0.127	3.635		_				
G	2.68	13.4				-		

Blank extraction date: Blank analysis date: Associated Samples: Conc. units:

Compound	Blank ID	Sample Identification					
			1				

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected. "U".

LDC#: 48785 E21

VALIDATION FINDINGS WORKSHEET Duplicate Analysis

Page:	of
Reviewer:_	JVG
2nd Reviewer:	\mathcal{A}

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". Not applicable questions are identified as "N/A". Was a duplicate sample analyzed for each matrix in this SDG?

YN	1 6 1 / 6	184 11 1 17 4			percent differences			_
V/ Ni	1 NI / A	Ware all dublicate	Leamnia	ralativa	narcant dittarancae		1 / 75	٠,
11 11	/ 1 11 / / 1	vvcic an uubiicale	; Jailiule	ICIAUVE	Delicell dillerences	INFU	· -	•

Duplicate ID	Compound	RPD (Limits)	Associated Samples	Qualifications
3	0	105 (< 25)	1 (Det)	J dets (A
	Q	29. 5 (≤ ,)) '
		(≤		
		(≤		
		(≤		
		(≤		
		(<)	
		(≤) [
		(≤		
		(≤		
		(≤)	
		(≤)	
		(≤)	
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<u> </u>		(≤)	
		(≤)	
		(≤)	
		(≤)	
		(≤		
		(≤)	
		(≤)	
		(≤)	

Comments:					
	_				
		 	······································		

LDC #:487852-2

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported RLs

Page: _	<u>/of /</u>
Reviewer:	<u> </u>
2nd Reviewer:	

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B/SGS AXYS Method MLA-017)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

		7	
Y	N	N/A	
Y	N	N/A	/
		$\overline{}$	

Were the correct labeled compound, quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and RLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		All	All results flagged as EMPC		Jdets/A
		All	All results flagged "X" by the lab due to chlorinated		Jdets/A
<u></u>			diphenyl ether (CDPE) interference		
<u></u>					

Comments:	ee sample calculation verification worksheet for recalculations
_	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Semivolatiles

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0392

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS411	20F0392-13	Sediment	06/22/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported at 15.0°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/13/20	Fluoranthene Pyrene	22.3 21.5	LDW20-SS411	J (all detects) J (all detects)	А

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits with the following exceptions:

SRM ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
BIG0068-SRM1	Naphthalene 2-Methylnaphthalene Acenaphthylene Acenaphthene	20.5 (41-159) 33.6 (51-149) 43.7 (57-142) 48.0 (59-141)	All samples in SDG 20F0392	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	Р

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and SRM %R, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles - Data Qualification Summary - SDG 20F0392

Sample	Compound	Flag	A or P	Reason
LDW20-SS411	Fluoranthene Pyrene	J (all detects) J (all detects)	Α	Continuing calibration (%D)
LDW20-SS411	Naphthalene 2-Methylnaphthalene Acenaphthylene Acenaphthene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	Р	Standard reference materials (%R)

Duwamish AOC4
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

Duwamish AOC4 Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

SDG a Labora METH The sa	#:48785F2aVALIDATIO #:20F0392atory: Analytical Resources, Inc. HOD: GC/MS Semivolatiles (EPA SW 846 amples listed below were reviewed for eation findings worksheets.	Si Method 82	tage 2B ^{270E)}	S WORKSHEET ation areas. Validation	F Revi 2nd Revi	
	Validation Area	<u> </u>		Comme	ente	
l.	Sample receipt/Technical holding times	SWIA	Cooler			cient time)
II.	GC/MS Instrument performance check	A		γ.	+	cient time) o cool
III.	Initial calibration/ICV	A/A	ICAI	427	1W = 30	.7
IV.	Continuing calibration	SW	C(N	£ 20%.	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	// 6
V.	Laboratory Blanks	Δ		2 5 7 5		
VI.	Field blanks	1)				
VII.		Δ				
VIII.	Surrogate spikes Matrix spike/Matrix spike duplicates	T N				
IX.	Matrix spike/Matrix spike duplicates	SW	LC:	S . 5RM		
	Laboratory control samples	N	<u>~</u>	5 , 3 / PT		
XI.	Field duplicates Internal standards	A				
XII.		N				
XIII.	Compound quantitation RL/LOQ/LODs Target compound identification	N				
XIV.	System performance Overall assessment of data	A				
Note:	A = Acceptable ND = N N = Not provided/applicable R = Rin	o compounds	detected	D = Duplicate TB = Trip blank EB = Equipment blank	SB=Source b OTHER:	lank
	Client ID			Lab ID	Matrix	Date
1	LDW20-SS411			20F0392-13	Sediment	06/22/20
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VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

METHOD: COMIC CVORT				
A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachiorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

LDC #: 48785 F2a

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Page: _of _ Reviewer: _JVG 2nd Reviewer: _

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?

Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?

Y (N) N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#		Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
	07/13/20	NT1020071302	77	22.3		1 (Pet)	J/UJ/A
	1 // // /		YY Zz	21.5			1
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LDC #: 48785 F2a

VALIDATION FINDINGS WORKSHEET Laboratory Control Samples (LCS)

	Page:	<u> 1 o</u> 1	<u> </u>
	Reviewer:	JV	Ģ_
2nd	Reviewer:		

METHOD: GC/MS BNA (EPA SW 846 Method 82706)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A

Was a LCS required?

A/K ON Y

Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#		Compound	L %R (.CS Limits)	LCSD %R (Limits)		RPD (Limits)		Associated	Samples	Qualificati	ions
	BIG0068- SRM	1 5	20.5	(41-159)	()	()		ND2	J/uJ	
		W	336	(51-159)	()	()		1		-
		DD	43.7	(57-142)	()	()				
		Dp 6G	48,0	(57-142) (59-141)	()	()		Y	}	
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Semivolatiles

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0392

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS411	20F0392-13	Sediment	06/22/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 8.8°C and 20.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/26/20	N-Nitrosodiphenylamine	41.9	LDW20-SS411	UJ (all non-detects)	Α

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/13/20	Benzyl alcohol Pentachlorophenol	28.5 37.1	LDW20-SS411	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Α

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits with the following exceptions:

SRM ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
BIG0068-SRM2	1,2-Dichlorobenzene	13.3 (17-184)	All samples in SDG 20F0392	UJ (all non-detects)	Р

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
LDW20-SS411	Benzoic acid	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D, continuing calibration %D, SRM %R, and results exceeding calibration, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles – Data Qualification Summary - SDG 20F0392

Sample	Compound	Flag	A or P	Reason
LDW20-SS411	N-Nitrosodiphenylamine	UJ (all non-detects)	А	Initial calibration verification (%D)
LDW20-SS411	Benzyl alcohol Pentachlorophenol	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
LDW20-SS411	1,2-Dichlorobenzene	UJ (all non-detects)	Р	Standard reference materials (%R)
LDW20-SS411 Benzoic acid		J (all detects)	Р	Compound quantitation (exceeded range)

Duwamish AOC4
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

Duwamish AOC4
Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

SDG # _abora MET H	t: 48785F2b VALIDATIO #: 20F0392 atory: Analytical Resources, Inc. Svort IOD: GC/MS Polynuclear Aromatic Hydro	S ocarbon s (E	tage 2B EPA SW 846 I	Method 82	70E-SIM)	2nd Re	Date: 08/17/2 Page: 1 of 1 eviewer: 36 eviewer:
	amples listed below were reviewed for ea tion findings worksheets.	ch of the fo	ollowing valida	ition areas	. Validation	findings are n	oted in attached
	Validation Area	Comm			Comme	nts (Trackall)	1. # /)
I.	Sample receipt/Technical holding times	SN A	Cooler to	imp. = 1	5.00	10017710	cool ine
11.	GC/MS Instrument performance check	A		<u> </u>			ĺ
III.	Initial calibration/ICV	AISW	ICAL!	= 20%	44	ICVE	203
IV.	Continuing calibration	SN	cova	= 20%			
V.	Laboratory Blanks	Α					
VI.	Field blanks	N					
VII.	Surrogate spikes	I A					
VIII.	Matrix spike/Matrix spike duplicates	N					
IX.	Laboratory control samples	SW	V	5 5	RM		
Χ.	Field duplicates	N					
XI.	Internal standards	Δ					
XII.	Compound quantitation RL/LOQ/LODs	SIN					
XIII.	Target compound identification	N		·			
XIV.	System performance	N			· <u></u>		
XV.	Overall assessment of data	A	-			4	
Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank OTHER: SW = See worksheet FB = Field blank EB = Equipment blank						e blank	
	Client ID			Lab ID		Matrix	Date
1	LDW20-SS411			20F0392-1	3	Sediment	06/22/20
2	55.55.2.5						
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VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. ,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F_1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLŁ. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O.)2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ) N-Nitrosodiphenylamine	QQQ Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R) 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT.Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ, Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	of	<u> </u>
Reviewer:_	JУG	
2nd Reviewer:	4	

METHOD: GC/MS SVOA (EPA SW 846 Method 8270¢)
Please see qualifications below for all and its Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤29/30% %D?

#	Date	Standard ID	Compound	Finding %D (Limit: <u><20.0</u> %(30%)	Associated Samples	Qualifications
	04 /24 /20	SIF 6395- SCV1	Ø.R.	65.7	MB	NA (QC only)
	06/26/20	SI F0393- &v 1	Ø Q	41. 9	1_ (ND)	J/uJ/A

48 785 F2b

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Page:_	<u> </u>
Reviewer:_	JVG
2nd Reviewer:_	

METHOD: GC/MS BNA (EPA SW 846 Method 82700)

Please see qualifications below for all

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

 $\sqrt{2}$ N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument? N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?

Y(N) N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: <u>></u> 0.05)	Associated Samples	Qualifications
	67/11/20	NT1420671163S	PPP TT	20.5 34.3		MB	NA (acony)
	07/13/20	NT 10 2007 130S	KAR	28.5 37.1		1 (ND + D++)	J/UJ/A

LDC #: 48785 F26

VALIDATION FINDINGS WORKSHEET <u>Laboratory Control Samples (LCS)</u> /SRM

Page:	<u></u> _of
Reviewer:	_JVG
2nd Reviewer:	

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was a LCS required?

N N/A

Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	%F	LCS R (Limits)		LCSD %R (Limits)	RPD (Limi	ts)	Ass	ociated Samples	Qualifications
	BIGOOG8-SRMZ	F	13.3	(17-	184)	()	(1)	All	(ND)	J/UJ/P
				(•)	()	(,)			
				()	(')	()			
				()	()	()			
				()	()	()			
				()	()	()			
		·		()	()	()			
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				()	()	()			
				()	(´)	()			
				()	()	()			
				()	()	()			

LDC #: 48785 F 26

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported RLs

Page: ˌ	<u> </u>	
Reviewer:	_JVG	
2nd Reviewer:		

METHOD: GC/MS PAH (EPA SW 846 Method 8270C-SIM)

Please see qual	ilications below for all questions answered "N". Not applicable questions are identified as "N/A".
<u>Y N N/A</u>	Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?
/	(), I

Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?

#	Date	Sample ID	Compound	Finding	Qualifications
	·		PPP	7 cal range	Jdets/P
					·
<u> </u>					
 					
[] 					
<u> </u>					
<u> </u>	<u> </u>				

Comments:	See sample calculation	<u>verification wor</u>	ksheet for reca	<u>lculations</u>							
	Note:	Analyst	did not	rerun	extract.	as the	Benzoic	aud was	in range in	the Full	stan
			alizing co						•		٠,

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Hexachlorobenzene

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0392

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS411	20F0392-13	Sediment	06/22/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Hexachlorobenzene by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported at 15.0°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4 Hexachlorobenzene - Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

Duwamish AOC4
Hexachlorobenzene - Laboratory Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

Duwamish AOC4 Hexachlorobenzene - Field Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

SDG #	t: 48785F3a VALIDATIO t: 20F0392 atory: Analytical Resources, Inc.		_ETENES age 2B	S WORKSHE	F	Date: 08/17/2 Page: 1 of 1 Reviewer: 5/4 Reviewer: 1
METH	IOD: GC Hexachlorobenzene (EPA SW8	346 Method	8081B)		Ziiu r	Reviewer
	amples listed below were reviewed for eation findings worksheets.	ach of the fol	lowing valida	ation areas. Vali	dation findings are	noted in attached
	Validation Area			Co	omments	
I.	Sample receipt/Technical holding times	SW/A	Cooker	temp = 15	.0°C (2ns	ufficient time
II.	GC Instrument Performance Check	N		•		
III.	Initial calibration/ICV	AA	ICALE	202	1045	20%
IV.	Continuing calibration	A	cas	20%		
V.	Laboratory Blanks	A				
VI.	Field blanks	N				
VII.	Surrogate spikes //nt 5tm	AA	•			
VIII.	Matrix spike/Matrix spike duplicates	I N				
IX.	Laboratory control samples	Á		us /b		
X.	Field duplicates	1				
XI.	Compound quantitation/RL/LOQ/LODs	N				
XII.	Target compound identification	N				
XIII.	System Performance	N				
ΧIV	Overall assessment of data	I A I				
Note:	N = Not provided/applicable R = Rir	lo compounds nsate ield blank	detected	D = Duplicate TB = Trip blank EB = Equipmen		ce blank
(Client ID			Lab ID	Matrix	Date
	LDW20-SS411			20F0392-13	Sediment	06/22/20
2						
3						
4						
5						
6						
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8						
9						
10						
11						
lotes:						
	BIG0069- BUKL					

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Polychlorinated Biphenyls

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0392

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-IT301	20F0392-01	Sediment	06/22/20
LDW20-IT302	20F0392-02	Sediment	06/22/20
LDW20-IT302RE	20F0392-02RE	Sediment	06/22/20
LDW20-IT306	20F0392-03	Sediment	06/22/20
LDW20-IT306RE	20F0392-03RE	Sediment	06/22/20
LDW20-IT309	20F0392-04	Sediment	06/22/20
LDW20-IT309RE	20F0392-04RE	Sediment	06/22/20
LDW20-IT312	20F0392-05	Sediment	06/22/20
LDW20-IT312RE	20F0392-05RE	Sediment	06/22/20
LDW20-IT316	20F0392-06	Sediment	06/22/20
LDW20-IT320	20F0392-07	Sediment	06/22/20
LDW20-IT323	20F0392-08	Sediment	06/22/20
LDW20-IT308	20F0392-09	Sediment	06/22/20
LDW20-IT401	20F0392-10	Sediment	06/22/20
LDW20-IT406	20F0392-11	Sediment	06/22/20
LDW20-IT406RE	20F0392-11RE	Sediment	06/22/20
LDW20-IT411	20F0392-12	Sediment	06/22/20
LDW20-SS411	20F0392-13	Sediment	06/22/20
LDW20-SS411RE	20F0392-13RE	Sediment	06/22/20
LDW20-IT301MS	20F0392-01MS	Sediment	06/22/20
LDW20-IT301MSD	20F0392-01MSD	Sediment	06/22/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 10.9°C and 20.3°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	%D	Associated Samples	Flag	A or P
07/02/20	SIG0056-SCV1	1C	Aroclor-1260	21.8	All samples in SDG 20F0392	J (all detects)	А

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits with the following exceptions:

Sample	Column	Internal Standards	%R (Limits)	Affected Compound	Flag	A or P
LDW20-IT406	1C	Hexabromobiphenyl	49 (50-200)	Aroclor-1260	J (all detects)	А
LDW20-SS411	1C	Hexabromobiphenyl	31 (50-200)	Aroclor-1260	J (all detects)	А

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

In the case where more than one result was reported for an individual sample, the least technically acceptable results were deemed not reportable as follows:

Sample	Compound	Reason	Flag	A or P
LDW20-IT302	Aroclor-1254	Results exceeded calibration range.	Not reportable	-

Sample	Compound	Reason	Flag	A or P
LDW20-IT302RE	All compounds except Aroclor-1254	Results from undiluted analyses were more usable.	Not reportable	-
LDW20-IT306 LDW20-IT309 LDW20-IT312	Aroclor-1248 Aroclor-1254	Results exceeded calibration range.	Not reportable	-
LDW20-IT306RE LDW20-IT309RE LDW20-IT312RE	All compounds except Aroclor-1248 Aroclor-1254	Results from undiluted analyses were more usable.	Not reportable	-
LDW20-IT406 LDW20-SS411	Aroclor-1260	Internal standard failure.	Not reportable	-
LDW20-IT406RE LDW20-SS411RE	All compounds except Aroclor-1260	Professional judgement.	Not reportable	-

Due to ICV %D, data were qualified as estimated in thirteen samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Biphenyls - Data Qualification Summary - SDG 20F0392

Sample	Compound	Flag	A or P	Reason
LDW20-IT301 LDW20-IT302 LDW20-IT306 LDW20-IT309 LDW20-IT312 LDW20-IT316 LDW20-IT320 LDW20-IT323 LDW20-IT323 LDW20-IT401 LDW20-IT401 LDW20-IT401 LDW20-IT406RE LDW20-IT411 LDW20-SS411RE	Aroclor-1260	J (all detects)	A	Initial calibration verification (%D)
LDW20-IT302	Aroclor-1254	Not reportable	_	Overall assessment of data
LDW20-IT302RE	All compounds except Aroclor-1254	Not reportable	-	Overall assessment of data
LDW20-IT306 LDW20-IT309 LDW20-IT312	Aroclor-1248 Aroclor-1254	Not reportable	-	Overall assessment of data
LDW20-IT306RE LDW20-IT309RE LDW20-IT312RE	All compounds except Aroclor-1248 Aroclor-1254	Not reportable	-	Overall assessment of data
LDW20-IT406 LDW20-SS411	Aroclor-1260	Not reportable	-	Overall assessment of data
LDW20-IT406RE LDW20-SS411RE	All compounds except Aroclor-1260	Not reportable	-	Overall assessment of data

Duwamish AOC4

Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785F3b SDG #: 20F0392

Stage 2B

Date: 68/17/20
Page: <u>l</u> of <u>l</u>
Reviewer: 1/6
2nd Reviewer:

Laboratory: Analytical Resources, Inc.

METHOD: GC Polychlorinated Biphenyls (EPA SW846 Method 8082A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments (Insufficient time to cool)
l.	Sample receipt/Technical holding times	SW/A	cooler temps. = 12.70c, 20.30c, 10.90c, 15.00c
11.	Initial calibration/ICV	A /SW	ICAL = 20%, ICN = 20%
III.	Continuing calibration	A	Car = 20%
IV.	Laboratory Blanks	Ä	
V.	Field blanks	N	
VI.	Surrogate spikes /(S	A/SXXA	
VII.	Matrix spike/Matrix spike duplicates	Á	
VIII.	Laboratory control samples	A	us, srm
IX.	Field duplicates	N	
X.	Compound quantitation/RL/LOQ/LODs	N	
XI.	Target compound identification	N	
اللا	Overall assessment of data	SW	

Note:

A = Acceptable

SW = See worksheet

N = Not provided/applicable

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-IT301	20F0392-01	Sediment	06/22/20
2	LDW20-IT302	20F0392-02	Sediment	06/22/20
3	LDW20-IT302RE	20F0392-02RE	Sediment	06/22/20
4	LDW20-IT306	20F0392-03	Sediment	06/22/20
5	LDW20-IT306RE	20F0392-03RE	Sediment	06/22/20
6	LDW20-IT309	20F0392-04	Sediment	06/22/20
7	LDW20-IT309RE	20F0392-04RE	Sediment	06/22/20
8	LDW20-IT312	20F0392-05	Sediment	06/22/20
9	LDW20-IT312RE	20F0392-05RE	Sediment	06/22/20
10	LDW20-IT316	20F0392-06	Sediment	06/22/20
11	LDW20-IT320	20F0392-07	Sediment	06/22/20
12	LDW20-IT323	20F0392-08	Sediment	06/22/20
13	LDW20-IT308	20F0392-09	Sediment	06/22/20
14	LDW20-IT401	20F0392-10	Sediment	06/22/20
15	LDW20-IT406	20F0392-11	Sediment	06/22/20
16	LDW20-IT406RE	20F0392-11RE	Sediment	06/22/20
17	LDW20-IT411	20F0392-12	Sediment	06/22/20

DC #: 48785F3b VALIDATION COMPLETENESS WORKSHEET SDG #: 20F0392 Stage 2B Laboratory: Analytical Resources, Inc. METHOD: GC Polychlorinated Biphenyls (EPA SW846 Method 8082A)					
	Client ID	Lal	b ID	Matrix	Date
18	LDW20-SS411	206	F0392-13	Sediment	06/22/20
19	LDW20-SS411RE	201	F0392-13RE	Sediment	06/22/20
20	LDW20-IT301MS	201	F0392-01MS	Sediment	06/22/20

20F0392-01MSD

Sediment

06/22/20

24						
Note	s:					
	BIG0073-BLK1					

LDW20-IT301MSD

22

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPASW 846 Method 8081/8082)

A. alpha-BHC	K. Endrin	U. Toxaphene	EE. 2,4'-DDT	OO. trans-Heptachlor epoxide
B. beta-BHC	L. Endosulfan II	V. Aroclor-1016	FF. Hexachlorobenzene	PP. Mirex
C. delta-BHC	M. 4,4'-DDD	W. Aroclor-1221	GG. Chlordane	QQ çis-Chlordane
D. gamma-BHC	N. Endosulfan sulfate	X. Aroclor-1232	HH. Chlordane (Technical)	RR. trans-Chlordane
E. Heptachlor	O. 4,4'-DDT	Y. Aroclor-1242	II. Aroclor 1262	SS.
F. Aldrin	P. Methoxychlor	Z. Aroclor-1248	JJ. Aroclor 1268	TT.
G. Heptachlor epoxide	Q. Endrin ketone	AA. Aroclor-1254	KK. Oxychlordane	UU.
H. Endosulfan I	R. Endrin aldehyde	BB. Aroclor-1260	LL. trans-Nonachlor	vv
I. Dieldrin	S. alpha-Chlordane	CC. 2,4'-DDD	MM. cis-Nonachlor	ww.
J. 4,4'-DDE	T. gamma-Chlordane	DD. 2,4'-DDE	NN. cis-Heptachlor epoxide	XX.

Notes:	 	 	

LDC #: 48785 F36

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	of
Reviewer:	JVG
2nd Reviewer:	

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". What type of initial calibration verification calculation was performed? ___%D or ____%R

YN N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y/N/N/A Did the initial calibration verification standards meet the %D / %R validation criteria of <20.0% / 80-120%?

#	Date	Standard ID	Detector/ Column	Compound	%D (Limit ≤ 20.0)	Associated Samples	Qualifications
	07/02/20	SIG0056-SC	V1 1C	BB	21.8	Ail	J/UJ/A
	/ /						(qual BB only)
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II		·					
 							
 							
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LDC#: 48785 F3b

VALIDATION FINDINGS WORKSHEET Internal Standards

Page:_	<u>\</u> of \
Reviewer:_	546
2nd Reviewer:	

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

N/A Were all internal standard area counts within -50 to +100 of the associated calibration standard?

YX	N/A	Were the retention times of	the internal standards	within +/- 30 seconds of the reter	ntion times of the associated calibrati	on standard?
#_	Date	Sample ID	Internal Standard	るR A rea (Limits)	RT (Limits)	Qualifications
	(Not ce	ported) H+ (Pct)	HBB (1c)	49 (50-200)		J/45/P-(qui) BB
		15	HBB (10)	49		J/W/A
		18 1	HBB (4C)	31 V		<u> </u>
			(20)	# P		
L						

BNB = 1-Bromo-2-nitrobenzene HBB = Hexabromobiphenyl LDC #: 48785 F36

VALIDATION FINDINGS WORKSHEET <u>Overall Assessment of Data</u>

Page:	of
Reviewer:	jvg
2nd Reviewer:	

METHOD: GC Pesticides/PCBs (EPA SW846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

<u>Y N N/A</u> Was the overall quality and usability of the data acceptable?

#	Compound Name	Finding	Associated sample	Qualifications
_	AA	> cal range	2	NK /A
	All except AA	dil	3	
	Z, AA	> cal range	4 , 6 , 8	
+	All except Z, AA	dil	5, 7, 9	
	ВВ	1s failure	15 , 18	
-	All except BB	Prof. judgment	16, 19	—
7				

Comments:

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Metals

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0392

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
LDW20-IT301	20F0392-01	Sediment	06/22/20
LDW20-IT302	20F0392-02	Sediment	06/22/20
LDW20-IT306	20F0392-03	Sediment	06/22/20
LDW20-IT309	20F0392-04	Sediment	06/22/20
LDW20-IT312	20F0392-05	Sediment	06/22/20
LDW20-IT316	20F0392-06	Sediment	06/22/20
LDW20-IT320	20F0392-07	Sediment	06/22/20
LDW20-IT323	20F0392-08	Sediment	06/22/20
LDW20-IT308	20F0392-09	Sediment	06/22/20
LDW20-IT401	20F0392-10	Sediment	06/22/20
LDW20-IT406	20F0392-11	Sediment	06/22/20
LDW20-IT411	20F0392-12	Sediment	06/22/20
LDW20-SS411	20F0392-13	Sediment	06/22/20
LDW20-IT411MS	20F0392-12MS	Sediment	06/22/20
LDW20-IT411MSD	20F0392-12MSD	Sediment	06/22/20
LDW20-IT411DUP	20F0392-12DUP	Sediment	06/22/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Arsenic, Cadmium, Chromium, Copper, Lead, Silver, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A Mercury by EPA SW 846 Method 7471B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Chromium	0.27 mg/Kg	LDW20-SS411 LDW20-IT411DUP

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
LDW20-IT411MS/MSD (LDW20-SS411 LDW20-IT411DUP)	Lead	0.148 (75-125)	26.8 (75-125)	J (all detects)	A

For LDW20-IT411MS/MSD, although the percent recoveries were severely low for lead, the associated sample results were qualified as estimated (J/UJ) since the post digestion spike recoveries were within the QC limits for this analyte.

Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
LDW20-IT411DUP (LDW20-SS411 LDW20-IT411DUP)	Lead	60.9 (≤20)	-	J (all detects)	А

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

Raw data were not reviewed for Stage 2B validation.

XIII. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Metals - Data Qualification Summary - SDG 20F0392

Sample	Analyte	Flag	A or P	Reason
LDW20-SS411 LDW20-IT411DUP	Lead	J (all detects)	А	Matrix spike/Matrix spike duplicate (%R)
LDW20-SS411 LDW20-IT411DUP	Lead	J (all detects)	Α	Duplicate sample analysis (RPD)

Duwamish AOC4 Metals - Laboratory Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

Duwamish AOC4
Metals - Field Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785F4a Stage 2B SDG #: 20F0392

Laboratory: Analytical Resources, Inc.

2nd Reviewer

METHOD: Metals (EPA SW 846 Method 6020A/7471B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
	Sample receipt/Technical holding times	AIA	
II.	ICP/MS Tune	Δ	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	Α	
V.	Laboratory Blanks	SW	
VI.	Field Blanks	\sim	
VII.	Matrix Spike/Matrix Spike Duplicates	SW	
VIII.	Duplicate sample analysis	SW	
IX.	Serial Dilution	\mathcal{N}	
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	\mathcal{N}	norreviewed
XIII.	Sample Result Verification	N _	
XIV	Overall Assessment of Data	A	

Note:

A = Acceptable

SW = See worksheet

N = Not provided/applicable

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-IT301	20F0392-01	Sediment	06/22/20
2	LDW20-IT302	20F0392-02	Sediment	06/22/20
3	LDW20-IT306	20F0392-03	Sediment	06/22/20
4	LDW20-IT309	20F0392-04	Sediment	06/22/20
5	LDW20-IT312	20F0392-05	Sediment	06/22/20
6	LDW20-IT316	20F0392-06	Sediment	06/22/20
7	LDW20-IT320	20F0392-07	Sediment	06/22/20
8	LDW20-IT323	20F0392-08	Sediment	06/22/20
9	LDW20-IT308	20F0392-09	Sediment	06/22/20
10_	LDW20-IT401	20F0392-10	Sediment	06/22/20
11	LDW20-IT406	20F0392-11	Sediment	06/22/20
12	LDW20-IT411	20F0392-12	Sediment	06/22/20
13_	LDW20-SS411	20F0392-13	Sediment	06/22/20
4_	LDW20-IT411MS	20F0392-12MS	Sediment	06/22/20
15	LDW20-IT411MSD	20F0392-12MSD	Sediment	06/22/20

SDG Labo	#:48785F4a #:20F0392 ratory: <u>Analytical Resource</u> HOD: Metals (EPA SW 84	Date: Note:			
	•	· · · · · · · · · · · · · · · · · · ·			
	Client ID		Lab ID	Matrix	Date
	<u> </u>	,	Lab ID 20F0392-12DUP	Matrix Sediment	Date 06/22/20
16	Client ID				
16 17 18	Client ID				

LDC #: 48785F4a

ICP ICP-MS

CVAA

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
13	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
1 to 12	As
QC: 14-16	As, Cd, Cr, Cu, Pb, Ag, Zn
	Analysis Method

As, Cd, Cr, Cu, Pb, Ag, Zn

Hg

LDC#: 48785F4a

Laboratory Blank Contamination (PB/ICB/CCB)

Reviewer:CR

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Soil preparation factor applied (if applicable):

Sample Concentration, unless otherwise noted: mg/Kg

Associated Samples: 13, 16

				Sample Identification								
Analyte	PB (mg/Kg)	Maximum ICB/CCB (ug/L)	Action Level	No Qual								
Cr	0.27											

Comments: The listed analyte concentration is the highest ICB or CCB detected in the analysis. The action level, when applicable, is established at 5X the highest ICB, CCB, or PB concentration.

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

MS/MSD analysis was performed by the laboratory. All MS/MSD percent recoveries (%R) and relative percent differences (RPDs) were within the acceptable limits with the following exceptions:

MS/MSD										
D	Matrix			MSD %R		RPD	RPD Limit		Qualification	Det/ND
l4, 15	s	Pb	0.148	26.8	75-125			16, 13	J/UJ/A*	Det
									*(PS=98.3)	
					i					
									<u> </u>	
····										

Comments:

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Laboratory duplicate analysis was performed by the laboratory. All laboratory duplicates were with the relative percent difference (RPD) for samples >5X the reporting limits with the exceptions listed below. If samples were <5X the reporting limits, the difference was within 1X the reporting limit for water samples and within 2X the reporting limit for soil samples for all samples with the exceptions listed below.

Duplicate ID	Matrix	Analyte	RPD	RPD Limit		Difference Limit	Associated Samples	Qualification	Det/ND
16	S	Pb	60.9	20			16. 13	J/UJ/A	Det
									
		†	1						
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		<u> </u>	 						

Comments:

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0392

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-IT301	20F0392-01	Sediment	06/22/20
LDW20-IT302	20F0392-02	Sediment	06/22/20
LDW20-IT306	20F0392-03	Sediment	06/22/20
LDW20-IT309	20F0392-04	Sediment	06/22/20
LDW20-IT312	20F0392-05	Sediment	06/22/20
LDW20-IT316	20F0392-06	Sediment	06/22/20
LDW20-IT320	20F0392-07	Sediment	06/22/20
LDW20-IT323	20F0392-08	Sediment	06/22/20
LDW20-IT308	20F0392-09	Sediment	06/22/20
LDW20-IT401	20F0392-10	Sediment	06/22/20
LDW20-IT406	20F0392-11	Sediment	06/22/20
LDW20-IT411	20F0392-12	Sediment	06/22/20
LDW20-SS411	20F0392-13	Sediment	06/22/20
LDW20-IT306DUP	20F0392-03DUP	Sediment	06/22/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

Total Solids by Standard Method 2540G

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4
Wet Chemistry - Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Field Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Polychlorinated Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0392

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-IT301	20F0392-01	Sediment	06/22/20
LDW20-IT312	20F0392-05	Sediment	06/22/20
LDW20-IT320	20F0392-07	Sediment	06/22/20
LDW20-IT406	20F0392-11	Sediment	06/22/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for High Resolution Superfund Methods Data Review (April 2016). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) Method 1613B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 10.9°C and 20.3°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were within the QC limits for unlabeled compounds and labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
BIG0062-BLK1	07/09/20	1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDD OCDF OCDD	0.0645 ng/Kg 0.319 ng/Kg 0.727 ng/Kg 2.68 ng/Kg	All samples in SDG 20F0392

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
LDW20-IT320	OCDF	2.68 ng/Kg	2.68U ng/Kg

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits.

XI. Compound Quantitation

All compound quantitations were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG 20F0392	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А
All samples in SDG 20F0392	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А
LDW20-IT406	All compounds flagged "X" due to chlorinated diphenyl ether (CDPE) interference.	J (all detects)	Α

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to compounds reported as EMPC and CDPE interference, data were qualified as estimated or not detected in four samples.

Due to laboratory blank contamination, data were qualified as not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 20F0392

Sample	Compound	Flag	A or P	Reason
LDW20-IT301 LDW20-IT312 LDW20-IT320 LDW20-IT406	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А	Compound quantitation (EMPC)
LDW20-IT301 LDW20-IT312 LDW20-IT320 LDW20-IT406	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А	Compound quantitation (EMPC)
LDW20-IT406	All compounds flagged "X" due to chlorinated diphenyl ether (CDPE) interference.	J (all detects)	A	Compound quantitation

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 20F0392

Sample	Compound	Modified Final Concentration	A or P
LDW20-IT320	OCDF	2.68U ng/Kg	

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 20F0392

No Sample Data Qualified in this SDG

SDG #	DC #: 48785F21 VALIDATION COMPLETENESS WORKSHEET DG #: 20F0392 Stage 2B Page: 1 of / Reviewer: 10 / 2nd Reviewer: 2nd Reviewer							
METH	IOD: HRGC/HRMS Polychlorinated Diox	ins/Dibenzo	furans (EP	A N	flethod 1613B)			
	amples listed below were reviewed for eation findings worksheets.	ch of the fo	llowing vali	dati	on areas. Validation	n findings are n	oted in attached	
	Validation Area				Comme	ents		
I.	Sample receipt/Technical holding times	SW/A	Corter	kny	os = 12.7°C, 10.0	100, 20.300	time to cod	
II.	HRGC/HRMS Instrument performance check	A			<u> </u>	·		
III.	Initial calibration/ICV	AIA	19	AL	£ 20/35?	love oc	limits	
IV.	Continuing calibration	A	q	W e	= ac limits			
V.	Laboratory Blanks	ŚW						
VI.	Field blanks	N						
VII.	Matrix spike/Matrix spike duplicates	N						
VIII.	Laboratory control samples	A		L	CS SRM			
IX.	Field duplicates	,7						
Χ.	Labeled Compounds	Α			-			
XI.	Compound quantitation RL/LOQ/LODs	N		E	Impc = Jde-	6 (>RL); L	1 (2RL)	
XII.	Target compound identification	N						
XIII.	System performance	N						
XIV.	Overall assessment of data	A						
lote:	N = Not provided/applicable R = Rir	lo compounds isate ield blank	detected		D = Duplicate TB = Trip blank EB = Equipment blank	SB=Sourc OTHER:	e blank	
	Client ID				Lab ID	Matrix	Date	
1	LDW20-IT301				20F0392-01	Sediment	06/22/20	
2	LDW20-IT312				20F0392-05	Sediment	06/22/20	
3	LDW20-IT320				20F0392-07	Sediment	06/22/20	
4	LDW20-IT406	<u>-</u>		_ :	20F0392-11	Sediment	06/22/20	
5					···			
6								
7								
8								
9								
10								
lotes:								
7	BIG0062 Buki							
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VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:				

LDC #:	487	85	F21
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VALIDATION FINDINGS WORKSHEET Blanks

Page:	of
Reviewer:	ĴVG
2nd Reviewer	·

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A Were all samples associated with a method blank?

Y N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?

Y/ N N/A Was the method blank contaminated?

Blank extraction date: 07/09/20

Blank analysis date: 67/12/20

Associated samples:____AI)____

Conc. units: ng /kg

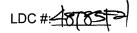
Compound	Blank ID		Sample Identification				
	BIG0062	Buk 1 (5x)	3				
0	BIG0062 0.0645*	0.3225	0. 222)/4				
F	0.319 *	1,595					
Q	0.727 +	3.635	2.68*/U				
G	2.68	13.4					
* EMPC							

Blank extraction date:_____ Blank analysis date:_____
Conc. units: Associated Samples:_____

Compound	Blank ID	Sample Identification					
			_				

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

All contaminants within five times the method blank concentration were qualified as not detected, "U".



VALIDATION FINDINGS WORKSHEET <u>Compound Quantitation and Reported RLs</u>

Page: _	<u></u> {2βf
Reviewer:	
2nd Reviewer:	

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B/SGS AXYS Method MLA-017)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Y N N/A

Were the correct labeled compound, quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and RLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		♦ 1	All results flagged as EMPC		Jdets/A
		4	All results flagged "X" by the lab due to chlorinated		Jdets/A
		·	diphenyl ether (CDPE) interference		

Comments:	See sample calculation verification worksheet for recalculations

LDC #: 48785F6 **VALIDATION COMPLETENESS WORKSHEET**

SDG #: 20F0392

Stage 2B

Laboratory: Analytical Resources, Inc.

2nd Reviewer

METHOD: (Analyte) TOC (EPA SW846 Method 9060A), Total Solids (SM 2540G)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	AA	
11	Initial calibration	A	
111.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N	CS
VII.	Duplicate sample analysis	A	
VIII.	Laboratory control samples	A_	LCS, SOM
IX.	Field duplicates	\mathcal{N}_{\perp}	
X.	Sample result verification	N	
XI	Overall assessment of data	17	

Note:

A = Acceptable N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-IT301	20F0392-01	Sediment	06/22/20
2	LDW20-IT302	20F0392-02	Sediment	06/22/20
3	LDW20-IT306	20F0392-03	Sediment	06/22/20
4	LDW20-IT309	20F0392-04	Sediment	06/22/20
5	LDW20-IT312	20F0392-05	Sediment	06/22/20
6	LDW20-IT316	20F0392-06	Sediment	06/22/20
7	LDW20-IT320	20F0392-07	Sediment	06/22/20
8	LDW20-IT323	20F0392-08	Sediment	06/22/20
9	LDW20-IT308	20F0392-09	Sediment	06/22/20
10	LDW20-IT401	20F0392-10	Sediment	06/22/20
11	LDW20-IT406	20F0392-11	Sediment	06/22/20
12	LDW20-IT411	20F0392-12	Sediment	06/22/20
13	LDW20-SS411	20F0392-13	Sediment	06/22/20
14	LDW20-IT306DUP	20F0392-03DUP	Sediment	06/22/20
15				
16				

Notes:

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 13	Total solids, TOC
QC: 14	TS

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Semivolatiles

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0407

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS306	20F0407-01	Sediment	06/23/20
LDW20-SS308	20F0407-02	Sediment	06/23/20
LDW20-SS401	20F0407-03	Sediment	06/23/20
LDW20-SS406	20F0407-04	Sediment	06/23/20
LDW20-SS415	20F0407-05	Sediment	06/23/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported at 16.0°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4 Semivolatiles - Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4 Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

	#: <u>48785G2a</u> VALIDAT I #: 20F0407		L ETENES age 2B	S WORKSHEET		Date: <u>0%/17/</u> Page:_ <u>\</u> of_[
	ratory: Analytical Resources, Inc.				Rev	/iewer:
MFT	HOD: GC/MS Semivolatiles (EPA SW 8	346 Method 82	270F)		2nd Rev	viewer: <u>[</u>
		7 10 mounda 02	02)			
	samples listed below were reviewed for ation findings worksheets.	each of the fol	llowing valida	tion areas. Validation	on findings are no	ted in attached
	Validation Area			Comm	nents	
1.	Sample receipt/Technical holding times	SW/A	Cooler t		(Insuffi time	clent to cool)
II.	GC/MS Instrument performance check	A				
III.	Initial calibration/ICV	AA	ICAL &	- 20%	IQE ?	<u>چ ک</u>
IV.	Continuing calibration	A		20%		
V.	Laboratory Blanks	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
VI.	Field blanks	N				
VII.	Surrogate spikes	A				
VIII.	Matrix spike/Matrix spike duplicates	N				
IX.	Laboratory control samples	Δ	L	CS SRM		
X.	Field duplicates	4		•		
XI.	Internal standards	A				
XII.	Compound quantitation RL/LOQ/LODs	N				
XIII.	Target compound identification	N				
XIV.	System performance	N				
XV.	Overall assessment of data	A				
Note:	N = Not provided/applicable R =	= No compounds Rinsate = Field blank	detected	D = Duplicate TB = Trip blank EB = Equipment blar	OTHER:	blank
	Client ID			Lab ID	Matrix	Date
1	LDW20-\$S306			20F0407-01	Sediment	06/23/20
2	LDW20-SS308			20F0407-02	Sediment	06/23/20
3	LDW20-SS401		N N N Ompounds detected D = Duplicate TB = Trip blank EB = Equipment blank Lab ID Matrix Date 20F0407-01 Sediment 06/23/20			
4	LDW20-SS406			20F0407-04	Sediment	06/23/20
5	LDW20-SS415			20F0407-05	Sediment	06/23/20
6		-				
7						
8						
9						

Note	s:			
	BIG0210-Bux1			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Semivolatiles

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0407

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS306	20F0407-01	Sediment	06/23/20
LDW20-SS308	20F0407-02	Sediment	06/23/20
LDW20-SS401	20F0407-03	Sediment	06/23/20
LDW20-SS406	20F0407-04	Sediment	06/23/20
LDW20-SS415	20F0407-05	Sediment	06/23/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported at 16.0°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/26/20	N-Nitrosodiphenylamine	41.9	All samples in SDG 20F0407	J (all detects) UJ (all non-detects)	А

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/15/20	Benzyl alcohol	22.0	All samples in SDG 20F0407	J (all detects) UJ (all non-detects)	Α
	Pentachlorophenol	28.7		J (all detects) UJ (all non-detects)	

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D and continuing calibration %D, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles – Data Qualification Summary - SDG 20F0407

Sample	Compound	Flag	A or P	Reason
LDW20-SS306 LDW20-SS308 LDW20-SS401 LDW20-SS406 LDW20-SS415	N-Nitrosodiphenylamine	J (all detects) UJ (all non-detects)	А	Initial calibration verification (%D)
LDW20-SS306 LDW20-SS308 LDW20-SS401 LDW20-SS406 LDW20-SS415	Benzyl alcohol Pentachlorophenol	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)

Duwamish AOC4

Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4

Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

SDG Labor METI The s	#: 48785G2b VALIDATION #: 20F0407 ratory: Analytical Resources, Inc. S V 07 HOD: GC/MS Polynuclear Aromatic Hyderaphes listed below were reviewed for eation findings worksheets.	St rocarbon s (E	age 2B PA SW 846	6 Meth	od 8270E	-SIM)	2nd I	Date: 08/17/ Page: 1 of 1 Reviewer: 34/ Reviewer: 4	
	Validation Area Comments								
I.	Sample receipt/Technical holding times	SW/A	Cooler	temp			Insuff	icient to cool)	
11.	GC/MS Instrument performance check	1 1			•		(1) 114 9	10 300./	
III.	Initial calibration/ICV	AISW	101	LL =	20%	43	la	15 30%	
IV.	Continuing calibration	SW	co	v C	20%				
V.	Laboratory Blanks	1		<u>, -</u>					
VI.	Field blanks								
VII.	Surrogate spikes	1 7							
VIII.	Matrix spike/Matrix spike duplicates								
IX.	Laboratory control samples	1 1		LCS	SK	(1			
X.	Field duplicates	1 7		1		<u> </u>			
XI.	Internal standards	1 1							
XII.	Compound quantitation RL/LOQ/LODs	I N							
		N							
XIII.	Target compound identification								
XIV.	System performance	N							
XV.	Overall assessment of data	<u> </u>							
Note:	N = Not provided/applicable $R = R$	No compounds dinsate Field blank	detected	TB	= Duplicate = Trip blant = Equipme		SB=Sou OTHER:	rce blank	
	Client ID			Lab	ID		Matrix	Date	
1	LDW20-SS306			20F	0407-01		Sediment	06/23/20	
2	LDW20-SS308			20F	0407-02		Sediment	06/23/20	
T	LDW20-SS401			20F	0407-03		Sediment	06/23/20	
4	LDW20-SS406	-		20F	0407-04		Sediment	06/23/20	
	LDW20-SS415			20F	0407-05		Sediment	06/23/20	
6									
7									
8				\top					
9									
lotes:									
	BIGU210-BLKZ								

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG, C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU, Benzo(b) thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

48785626

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Reviewer: 2nd Reviewer:

METHOD: GC/MS SVOA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A

Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Were all %D within the validation criteria of ≤20/30% %D?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%(30%) 41. 9	Associated Samples	Qualifications
	04/26/20	SIF0393-SCV1	QQ	41.9	All (ND + Pet)	Qualifications J/UJ/A
			· · · · · · · · · · · · · · · · · · ·			
	<u> </u>					
					· · · · · · · · · · · · · · · · · · ·	
	l l					

LDC #: 48785 G2b

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Reviewer: 2nd Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270 ← SIM)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YAN N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument? Y N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?

Y/N/N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: <u>></u> 0.05)	Associated Samples	Qualifications
	07/15/20	NT10 20071503		22.0		All (hD +D+)	J/WJ/A
			TT	28.7			
				<u></u>			
		and the second s					
		-					
-							

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Hexachlorobenzene

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0407

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS306	20F0407-01	Sediment	06/23/20
LDW20-SS308	20F0407-02	Sediment	06/23/20
LDW20-SS401	20F0407-03	Sediment	06/23/20
LDW20-SS406	20F0407-04	Sediment	06/23/20
LDW20-SS415	20F0407-05	Sediment	06/23/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Hexachlorobenzene by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported at 16.0°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4 Hexachlorobenzene - Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4 Hexachlorobenzene - Laboratory Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4 Hexachlorobenzene - Field Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785G3a Stage 2B SDG #: 20F0407 Laboratory: Analytical Resources, Inc. Reviewer: カ 2nd Reviewer: METHOD: GC Hexachlorobenzene (EPA SW846 Method 8081B) The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets. Validation Area <u>Comments</u> Fusufficient SW/A 16.00 temp time to cool Sample receipt/Technical holding times II. GC Instrument Performance Check IW= 20% III. Initial calibration/ICV GN E 202 IV. Continuing calibration V. Laboratory Blanks VI. Field blanks Int Stans Surrogate spikes VII. VIII. Matrix spike/Matrix spike duplicates LCS IX. Laboratory control samples X. Field duplicates Compound quantitation/RL/LOQ/LODs Ν XI. XII. Target compound identification Ν XIII. System Performance Ν Overall assessment of data A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank Note: N = Not provided/applicable TB = Trip blank OTHER: R = Rinsate SW = See worksheet FB = Field blank EB = Equipment blank Client ID Lab ID Matrix Date LDW20-SS306 20F0407-01 Sediment 06/23/20 20F0407-02 LDW20-SS308 Sediment 06/23/20 LDW20-SS401 20F0407-03 Sediment 06/23/20 20F0407-04 Sediment 06/23/20 LDW20-SS406 LDW20-SS415 20F0407-05 Sediment 06/23/20 8 10 Notes: BIG0212-BULL

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Polychlorinated Biphenyls

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0407

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS306	20F0407-01	Sediment	06/23/20
LDW20-SS308	20F0407-02	Sediment	06/23/20
LDW20-SS401	20F0407-03	Sediment	06/23/20
LDW20-SS406	20F0407-04	Sediment	06/23/20
LDW20-SS415	20F0407-05	Sediment	06/23/20
LDW20-SS415RE	20F0407-05RE	Sediment	06/23/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported at 16.0°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	%D	Associated Samples	Flag	A or P
07/02/20	SIG0056-SCV1	1C	Aroclor-1260	21.8	All samples in SDG 20F0407	J (all detects)	А

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
LDW20-SS306	Aroclor-1260	40.2	J (all detects)	А
LDW20-SS308	Aroclor-1260	42.8	J (all detects)	А
LDW20-SS401	Aroclor-1254 Aroclor-1260	42 48.8	J (all detects) J (all detects)	А
LDW20-SS406	Aroclor-1242 Aroclor-1254	48.2 40.6	J (all detects) J (all detects)	А

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

In the case where more than one result was reported for an individual sample, the least technically acceptable results were deemed not reportable as follows:

Sample	Compound	Reason	Flag	A or P
LDW20-SS415	Aroclor-1242 Aroclor-1254	Results exceeded calibration range.	Not reportable	-
LDW20-SS415RE	All compounds except Aroclor-1242 Aroclor-1254	Results from undiluted analyses were more usable.	Not reportable	-

Due to ICV %D and RPD between two columns, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Biphenyls - Data Qualification Summary - SDG 20F0407

Sample	Compound	Flag	A or P	Reason
LDW20-SS306 LDW20-SS308 LDW20-SS401 LDW20-SS406 LDW20-SS415	Aroclor-1260	J (all detects)	А	Initial calibration verification (%D)
LDW20-SS306 LDW20-SS308	Aroclor-1260	J (all detects)	A	Compound quantitation (RPD between two columns)
LDW20-SS401	Aroclor-1254 Aroclor-1260	J (all detects) J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS406	Aroclor-1242 Aroclor-1254	J (all detects) J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS415	Aroclor-1242 Aroclor-1254	Not reportable	-	Overall assessment of data
LDW20-SS415RE	All compounds except Aroclor-1242 Aroclor-1254	Not reportable	-	Overall assessment of data

Duwamish AOC4

Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

SDG#	t: 48785G3b #: 20F0407 atory: <u>Analytical Resource</u>			E TENES ge 2B	S WORKSHE	ET	Pag	ate: <u>08 /17 /</u> ge: <u>l</u> of <u>l</u> /er: _ 0 /4 /er: _ (
The sa	IOD: GC Polychlorinated amples listed below were tion findings worksheets.					dation findin	ngs are noted	in attached
	Validation A	Area			Co	mments		
l.	Sample receipt/Technical hol	ding times	SWIA	Coole	r temp =	16.00	(Ensuffice	
II.	Initial calibration/ICV		A SW	ICAL	620%		101 £ 20 %	
III.	Continuing calibration		A	CW	= 20%			
IV.	Laboratory Blanks		À					
V.	Field blanks		l N					
VI.	Surrogate spikes		A/A					
VII.	Matrix spike/Matrix spike dup	licates	N					
VIII.	Laboratory control samples		A		US SRI	4		
IX.	Field duplicates				1			
X.	Compound quantitation/RL/L0	OQ/LODs	SW					
XI.	Target compound identification	on	N					
XII	Overall assessment of data		SW					
Note:	A = Acceptable N = Not provided/applicable SW = See worksheet	R = F	No compounds de Rinsate Field blank	etected	D = Duplicate TB = Trip blank EB = Equipment	blank	SB=Source blanl OTHER:	
	Client ID_				Lab ID	Matri		ate
	_DW20-\$\$306				20F0407-01	Sedir		8/23/20
	_DW20-SS308				20F0407-02	Sedir		8/23/20
	_DW20-SS401				20F0407-03	Sedir		5/23/20
	_DW20-SS406				20F0407-04	Sedir		3/23/20
	_DW20-SS415				20F0407-05	Sedir		3/23/20
	_DW20-SS415RE		<u></u>		20F0407-05RE	Sedir	ment 06	6/23/20
7								
8					+			
9								
10								
11								
12					+			
13 lotes:								
	BIG0214-BUL1							
		1						

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPASW 846 Method 8081/8082)

A. alpha-BHC	K. Endrin	U. Toxaphene	EE. 2,4'-DDT	OO. trans-Heptachlor epoxide
B. beta-BHC	L. Endosulfan II	V. Aroclor-1016	FF. Hexachlorobenzene	PP. Mirex
C. delta-BHC	M. 4,4'-DDD	W. Aroclor-1221	GG. Chlordane	QQ çis-Chlordane
D. gamma-BHC	N. Endosulfan sulfate	X. Aroclor-1232	HH. Chlordane (Technical)	RR. trans-Chlordane
E. Heptachlor	O. 4,4'-DDT	Y. Aroclor-1242	II. Aroclor 1262	SS.
F. Aldrin	P. Methoxychlor	Z. Aroclor-1248	JJ. Aroclor 1268	тт.
G. Heptachlor epoxide	Q. Endrin ketone	AA. Aroclor-1254	KK. Oxychlordane	UU.
H. Endosulfan I	R. Endrin aldehyde	BB. Aroclor-1260	LL. trans-Nonachlor	vv
I. Dieldrin	S. alpha-Chlordane	CC. 2,4'-DDD	MM. cis-Nonachlor	ww.
J. 4,4'-DDE	T. gamma-Chlordane	DD. 2,4'-DDE	NN. cis-Heptachlor epoxide	XX.

Notes:	·····	 	

LDC #: 48 785 636

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	of
Reviewer:	<u>JVG</u>
2nd Reviewer:	

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

#	Date	Standard ID	Detector/ Colump	Compound	%D (Limit ≤ 20.0)	Associated Samples	Qualifications
	07/62/20	SIG0056-SC	V1 1C	88	21.8	All (Det)	JUJA
	'						J/UJ/A (qual BB only)
				·			
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LDC #: 48785 G 36

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page:	01	
Reviewer:	Ĵνç	a
2nd Reviewer		

METHOD: __GC __ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Level IV/D Only

Were CRQLs adjusted for sample dilutions, dry weight factors, etc.?

NNA Did the reported results for detected target compounds agree within 10.0% of the recalculated results?

Did the percent difference of detected compounds between two columns./detectors <40%?

If no, please see findings bellow.

#	Compound Name	Sample ID	%RPD/%D Between Two Columns/Detectors Limit (≤ 40%)	Qualifications
	BB		40.2	J dets/A
	ВВ	2	42.8	
	ÁA	3	42	
	BB		48.8	
	7	4	48.2	
	AA		40.6	<u> </u>
-				
$\parallel + \parallel$				

Comments: See sample calculation verification worksheet for recalculations

LDC #: 48 785 G 3b

VALIDATION FINDINGS WORKSHEET <u>Overall Assessment of Data</u>

Page:	of
Reviewer:	JVG
2nd Reviewer:	

METHOD: GC Pesticides/PCBs (EPA SW846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

YN N/A Was the overall quality and usability of the data acceptable?

#	Compound Name	Finding	Qualifications	
	Y , AA	> cal range	5	NR/A
	All except Y, AA	dil	6	

Comments: _	* **					
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Metals

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0407

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS306	20F0407-01	Sediment	06/23/20
LDW20-SS308	20F0407-02	Sediment	06/23/20
LDW20-SS401	20F0407-03	Sediment	06/23/20
LDW20-SS406	20F0407-04	Sediment	06/23/20
LDW20-SS415	20F0407-05	Sediment	06/23/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Arsenic, Cadmium, Chromium, Copper, Lead, Silver, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A Mercury by EPA SW 846 Method 7471B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Mercury	0.0224 mg/Kg	All samples in SDG 20F0407

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

Raw data were not reviewed for Stage 2B validation.

XIII. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4 Metals - Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4
Metals - Laboratory Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4
Metals - Field Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

SDG i	#:48785G4aVALIDATIO #:20F0407 atory:_Analytical Resources, Inc.		PLETENES: Stage 2B	S WORKSHEE	F	Date:
NETH	IOD: Metals (EPA SW 846 Method 6020	A/7471B)			2110 1	10V10Wor/_
	amples listed below were reviewed for ea tion findings worksheets.	ch of the f	ollowing valida	ition areas. Valida	ation findings are	noted in attache
	Validation Area			Con	nments	
ı.	Sample receipt/Technical holding times	AIA				
II.	ICP/MS Tune	/ <u>A</u>				
III.	Instrument Calibration	A				
IV.	ICP Interference Check Sample (ICS) Analysis	A				
V.	Laboratory Blanks	5				
VI.	Field Blanks	N				
VII.	Matrix Spike/Matrix Spike Duplicates	A	MSI	(30 F(352)	
VIII.	Duplicate sample analysis	A	00	J		
IX.	Serial Dilution	N				
Х.	Laboratory control samples	A	US			
XI.	Field Duplicates	N		1		
XII.	Internal Standard (ICP-MS)	V	الماء رحب	(eval		
XIII.	Sample Result Verification	N				
XIV	Overall Assessment of Data	A				
ote:	N = Not provided/applicable R = Rin	o compounds sate eld blank	s detected	D = Duplicate TB = Trip blank EB = Equipment b	SB=Sour OTHER: lank	ce blank
	Client ID			Lab ID	Matrix	Date
	LDW20-SS306			20F0407-01	Sediment	06/23/20
	LDW20-SS308		production of the state of the	20F0407-02	Sediment	06/23/20
	LDW20-SS401			20F0407-03	Sediment	06/23/20
	LDW20-SS406			20F0407-04	Sediment	06/23/20
	LDW20-SS415			20F0407-05	Sediment	06/23/20
			-			
0						

12

Notes:

LDC #: 48785G4a

ICP-MS

CVAA

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page 1 of 1 Reviewer:CR

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 5	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
	Analysis Method
ICP	

As, Cd, Cr, Cu, Pb, Ag, Zn

Hg

VALIDATION FINDINGS WORKSHEET <u>Laboratory Blank Contamination (PB/ICB/CCB)</u>

Page 1 of 1 Reviewer:CR

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Soil preparation factor applied (if applicable):

Sample Concentration, unless otherwise noted: mg/Kg Associated Samples: All

				Sample Identification									
Analyte	PB (mg/Kg)	Maximum ICB/CCB (ug/L)	Action Level	No quals					·				
Hg	0.0224												

Comments: The listed analyte concentration is the highest ICB or CCB detected in the analysis. The action level, when applicable, is established at 5X the highest ICB, CCB, or PB concentration.

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0407

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS306	20F0407-01	Sediment	06/23/20
LDW20-SS308	20F0407-02	Sediment	06/23/20
LDW20-SS401	20F0407-03	Sediment	06/23/20
LDW20-SS406	20F0407-04	Sediment	06/23/20
LDW20-SS415	20F0407-05	Sediment	06/23/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

Total Solids by Standard Method 2540G

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4
Wet Chemistry - Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Field Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

LDC #: 48785G6 VALIDATION COMPLETENESS WORKSHEET

SDG #: 20F0407

Stage 2B

Page: l of Reviewer: 2nd Reviewer:

Laboratory: <u>Analytical Resources, Inc.</u>

METHOD: (Analyte) TOC (EPA SW846 Method 9060A), Total Solids (SM 2540G)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
1.	Sample receipt/Technical holding times	AA	
- 11	Initial calibration	A	
111.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	\mathcal{N}	
VI.	Matrix Spike/Matrix Spike Duplicates	\mathcal{N}_{\perp}	
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS SRM
IX.	Field duplicates	\mathcal{N}	
X.	Sample result verification	N	
ΧI	Overall assessment of data	A	

Note:

14 15 A = Acceptable

Client ID

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

Lab ID

TB = Trip blank EB = Equipment blank SB=Source blank OTHER:

Date

Matrix

LDW20-SS306 20F0407-01 Sediment 06/23/20 2 20F0407-02 Sediment 06/23/20 LDW20-SS308 3 LDW20-SS401 20F0407-03 Sediment 06/23/20 20F0407-04 Sediment 06/23/20 LDW20-SS406 5 LDW20-SS415 20F0407-05 Sediment 06/23/20

Notes:

LDC #: 48785G6

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page 1 of 1 Reviewer:CR

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 5	Total solids, TOC

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Polychlorinated Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0407

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS406	20F0407-04	Sediment	06/23/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for High Resolution Superfund Methods Data Review (April 2016). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) Method 1613B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported at 16.0°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were within the QC limits for unlabeled compounds and labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
BIG0062-BLK1	07/09/20	1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDD OCDF OCDD	0.0645 ng/Kg 0.319 ng/Kg 0.727 ng/Kg 2.68 ng/Kg	All samples in SDG 20F0407

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits.

XI. Compound Quantitation

All compound quantitations were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG 20F0407	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А

Sample	Compound	Flag	A or P
All samples in SDG 20F0407	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	Α

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to compounds reported as EMPC, data were qualified as estimated or not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 20F0407

Sample	Compound	Flag	A or P	Reason
LDW20-SS406	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А	Compound quantitation (EMPC)
LDW20-SS406	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А	Compound quantitation (EMPC)

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 20F0407

No Sample Data Qualified in this SDG

LDC#	: 48785G21 VALIDATIO	N COMP	LETENES	S WORKSHEET		Date: _{_08} /۱٫۶
	<u> 20F0407</u>	St	tage 2B			Page:of
_abora	atory: <u>Analytical Resources, Inc.</u>					eviewer:
METH	OD: HRGC/HRMS Polychlorinated Dioxi	ins/Dibenzo	ofurans (EPA	Method 1613B)	2na R	eviewer:
	amples listed below were reviewed for ea ion findings worksheets.	ch of the fo	llowing valida	ation areas. Validatior	n findings are r	noted in attached
	Validation Area			Comme		
<u>l.</u>	Sample receipt/Technical holding times	SW/A	Coole1	temp = 16.0°C	(Insuf	ficient to cool)
Н	HRGC/HRMS Instrument performance check	A				
111.	Initial calibration/ICV	A/A	IGAL	4 20 /35 %	100 4	ac limits
IV.	Continuing calibration	A	CW			
V.	Laboratory Blanks	SW				
VI.	Field blanks	L)				·
VII.	Matrix spike/Matrix spike duplicates	N			 	
VIII.	Laboratory control samples	A	1/	CS SRM		
IX.	Field duplicates	N		7.516		
Х.	Labeled Compounds	A				
XI.	Compound quantitation RL/LOQ/LODs	N		EMPC = J.	dots (>PL	1. U(2RL)
XII.	Target compound identification	N			29.77 (*)	///
XIII.	System performance	N				
XIV.	Overall assessment of data	A				
lote:	N = Not provided/applicable R = Rin	lo compounds sate eld blank	detected	D = Duplicate TB = Trip blank EB = Equipment blank	SB=Sourc OTHER:	e blank
	Client ID			Lab ID	Matrix	Date
1 L	.DW20-SS406			20F0407-04	Sediment	06/23/20
2						
3						
4						
5						
6						
7						
8						
9						
10						
lotes:	b = 0.116				_	
+	BIG0062-BLK1					
-						

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:	 	 	

LDC #: 48785621

VALIDATION FINDINGS WORKSHEET Blanks

Page: <u></u> of <u></u>	
Reviewer: JVG	
2nd Reviewer:	

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A Were all samples associated with a method blank?

Y N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?

Y/ N N/A Was the method blank contaminated?

Blank extraction date: 07/09/20 Blank analysis date: 07/13/20 Associated samples: 100/109/20 Conc. units: 100/109/20 Associated samples:

Compound	Blank ID		Sample Identification						
	BIG0062 0.0645 *	B4K1 (5x)							
6	0.0645 *	0.3225							
F	0.319 *	1.595							
Q	0.727 *	3. 435							
G	2.68	13.4							
		Ì							
	* EMPC								
							_		

Blank extraction date:	Biank analysis date:		
Conc. units:		Associated Samples:	

Compound	Blank ID	Sample Identification						

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

All contaminants within five times the method blank concentration were qualified as not detected, "U".

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Polychlorinated Biphenyls

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0437

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SC392	20F0437-01	Sediment	06/24/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported at 14.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	%D	Associated Samples	Flag	A or P
07/17/20	SIG0253-SCV1	1C	Aroclor-1260	27.9	All samples in SDG 20F0437	UJ (all non-detects)	Α

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Biphenyls - Data Qualification Summary - SDG 20F0437

Sample	Compound	Flag	A or P	Reason
LDW20-SC392	Aroclor-1260	UJ (all non-detects)	А	Initial calibration verification (%D)

Duwamish AOC4

Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 20F0437

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 20F0437

No Sample Data Qualified in this SDG

SDG#	±: 48785H3b VALIDATI ±: 20F0437 atory: Analytical Resources, Inc.		ETENESS WORKSHage 2B	F	Date: 08/14/ Page: 1 of 1 Reviewer: 3/44/ Reviewer:
The sa	IOD: GC Polychlorinated Biphenyls (EF amples listed below were reviewed for a				
validat	tion findings worksheets.				
	Validation Area	Ichi h		Comments	afficient time)
<u>l.</u>	Sample receipt/Technical holding times	SAIA	1 CAL & 20% COV = 20%	.4°6 (20)	to COO!
II.	Initial calibration/ICV	A /SW	ICAL & 20%		W= 20b
III.	Continuing calibration	A	CW 20 20 4		
IV.	Laboratory Blanks	A			
V.	Field blanks	\perp			
VI.	Surrogate spikes /IS	A/A			
VII.	Matrix spike/Matrix spike duplicates	N			
VIII.	Laboratory control samples	A	LCS SI	2 M	
IX.	Field duplicates		•		
X.	Compound quantitation/RL/LOQ/LODs	N			
XI.	Target compound identification	Ŋ			
XII	Overall assessment of data				
Note:	N = Not provided/applicable R = I	= No compounds d Rinsate = Field blank	letected D = Duplicate TB = Trip blar EB = Equipment	nk OTHER:	rce blank
	Client ID		Lab ID	Matrix	Date
	LDW20-SC392		20F0437-01	Sediment	06/24/20
2					
3					
4		<u> </u>			
5					
6			,		
7					
8					
9					
10					
11					
12					
Notes:					
-	BI G0259-PULL				

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPASW 846 Method 8081/8082)

A. alpha-BHC	K. Endrin	U. Toxaphene	EE. 2,4'-DDT	OO. trans-Heptachlor epoxide
B. beta-BHC	L. Endosulfan II	V. Aroclor-1016	FF. Hexachlorobenzene	PP. Mirex
C. delta-BHC	M. 4,4'-DDD	W. Aroclor-1221	GG. Chlordane	QQ cis-Chlordane
D. gamma-BHC	N. Endosulfan sulfate	X. Aroclor-1232	HH. Chlordane (Technical)	RR. trans-Chlordane
E. Heptachlor	O. 4,4'-DDT	Y. Aroclor-1242	II. Aroclor 1262	SS.
F. Aldrin	P. Methoxychlor	Z. Aroclor-1248	JJ. Aroclor 1268	тт.
G. Heptachlor epoxide	Q. Endrin ketone	AA. Aroclor-1254	KK. Oxychlordane	UU.
H. Endosulfan I	R. Endrin aldehyde	BB. Aroclor-1260	LL. trans-Nonachlor	vv
I. Dieldrin	S. alpha-Chlordane	CC. 2,4'-DDD	MM. cis-Nonachlor	ww.
J. 4,4'-DDE	T. gamma-Chlordane	DD. 2,4'-DDE	NN. cis-Heptachlor epoxide	XX.

	i i			
Notes:				
110163		 		
	<u> </u>	 		 ***

LDC #: 48785 H36

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	of
Reviewer:_	JVG [']
2nd Reviewer:_	\mathscr{L}

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

ለማስat type of initial calibration verification calculation was performed? __/%D or ___%R

Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y/N)N/A Did the initial calibration verification standards meet the %D / %R validation criteria of ≤20.0% / 80-120%?

#	Date	Standard ID	Detector/ Column	Compound	%D (Limit ≤ 20.0)	Associated Samples	Oveliki esti eve
		Standard ID	Column	Compound			Qualifications
<u> </u>	07/17/20	SIG 0253 - SC	W1 2C	<u>B</u> B	27,9	AII (ND)	J/NJ/A
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	<u>11</u>			<u> </u>			1

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Wet Chemistry

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0437

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date	
LDW20-SC392	20F0437-01	Sediment	06/24/20	
LDW20-SC392DUP	20F0437-01DUP	Sediment	06/24/20	

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

Total Solids by Standard Method 2540G

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4
Wet Chemistry - Data Qualification Summary - SDG 20F0437

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 20F0437

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Field Blank Data Qualification Summary - SDG 20F0437

No Sample Data Qualified in this SDG

LDC #: 48785H6 SDG #: 20F0437	VALIDATION COMPLETENESS WORKSHEET Stage 2B	Date <u>\$19126</u> Page:_\ of _
Laboratory: Analytical Resour	•	Reviewer: 2nd Reviewer:

METHOD: (Analyte) TOC (EPA SW846 Method 9060A), Total Solids (SM 2540G)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	AIA	
11	Initial calibration	A	
111.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N_{-}	
VI.	Matrix Spike/Matrix Spike Duplicates	\mathcal{N}	CS
VII.	Duplicate sample analysis	A_	
VIII.	Laboratory control samples	A	LCS SRM
IX.	Field duplicates	\mathcal{N}_{-}	
X.	Sample result verification	N	
xı	Overall assessment of data	A	

Note: A = Acceptable N = Not provided/applicable ND = No compounds detected R = Rinsate

D = Duplicate TB = Trip blank SB=Source blank OTHER:

SW = See worksheet

FB = Field blank

EB = Equipment blank

Client ID Lab ID Matrix Date LDW20-SC392 Sediment 20F0437-01 06/24/20 2 LDW20-SC392DUP 20F0437-01DUP Sediment 06/24/20 3 5 6 8 9 10 11 12 13 14 15

NOTAC:				
Notes:_				
_			 	

LDC #: 48785H6

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page 1 of 1 Reviewer:CR

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1	Total solids, TOC
QC: 2	TS

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 19, 2020

Parameters: Semivolatiles

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0438

Commis Identification	Laboratory Sample	Maduis	Collection
Sample Identification	Identification	Matrix	Date
LDW20-SS301	20F0438-01	Sediment	06/24/20
LDW20-SS302	20F0438-02	Sediment	06/24/20
LDW20-SS309	20F0438-03	Sediment	06/24/20
LDW20-SS323	20F0438-04	Sediment	06/24/20
LDW20-SS404	20F0438-05	Sediment	06/24/20
LDW20-SS407	20F0438-06	Sediment	06/24/20
LDW20-SS404MS	20F0438-05MS	Sediment	06/24/20
LDW20-SS404MSD	20F0438-05MSD	Sediment	06/24/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 10.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4
Semivolatiles - Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4 Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

SDG # Labora	t: 48785l2a VALIDA t: 20F0438 atory: Analytical Resources, Inc. IOD: GC/MS Semivolatiles (EPA SW	S	LETENESS WORKSHE ltage 2B	Date: 06/(7) Page: 1 of 1 Reviewer: 2 2nd Reviewer: 4
	amples listed below were reviewed for tion findings worksheets.	or each of the fo	ollowing validation areas. Valid	ation findings are noted in attach
	Validation Area		Col	mments
J.	Sample receipt/Technical holding times	SW/ A	cooler temp. = 9.100	10.4°C (Insufficient time to coo
II.	GC/MS Instrument performance check	A	<u> </u>	
III.	Initial calibration/ICV	AIA	1CAL = 20%	104E 30 B
IV.	Continuing calibration	Á	CW & 203	
V.	Laboratory Blanks	A		
VI.	Field blanks	l N		
VII.	Surrogate spikes	A		
VIII.	Matrix spike/Matrix spike duplicates	A		
IX.	Laboratory control samples	A	LCS, SRM	
X.	Field duplicates	2		
XI.	Internal standards	A		
XII.	Compound quantitation RL/LOQ/LODs	N		
XIII.	Target compound identification	N		
XIV.	System performance	N		
XV.	Overall assessment of data	Δ		
Note:	N = Not provided/applicable R	D = No compounds = Rinsate B = Field blank	detected D = Duplicate TB = Trip blank EB = Equipment	SB=Source blank OTHER: blank

Client ID Date Lab ID Matrix LDW20-SS301 20F0438-01 06/24/20 Sediment LDW20-SS302 20F0438-02 Sediment 06/24/20 LDW20-SS309 20F0438-03 Sediment 06/24/20 LDW20-SS323 20F0438-04 Sediment 06/24/20 5 LDW20-SS404 20F0438-05 Sediment 06/24/20 LDW20-SS407 20F0438-06 Sediment 06/24/20 6 LDW20-SS404MS 20F0438-05MS Sediment 06/24/20 LDW20-SS404MSD 20F0438-05MSD 8 Sediment 06/24/20 Notes:

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 20, 2020

Parameters:

Semivolatiles

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0438

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS301	20F0438-01	Sediment	06/24/20
LDW20-SS302	20F0438-02	Sediment	06/24/20
LDW20-SS309	20F0438-03	Sediment	06/24/20
LDW20-SS323	20F0438-04	Sediment	06/24/20
LDW20-SS404	20F0438-05	Sediment	06/24/20
LDW20-SS407	20F0438-06	Sediment	06/24/20
LDW20-SS404MS	20F0438-05MS	Sediment	06/24/20
LDW20-SS404MSD	20F0438-05MSD	Sediment	06/24/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 10.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r²) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/26/20	N-Nitrosodiphenylamine	41.9	All samples in SDG 20F0438	UJ (all non-detects)	А

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/15/20	Benzyl alcohol	22.0	All samples in SDG 20F0438	J (all detects) UJ (all non-detects)	Α
	Pentachlorophenol	28.7		J (all detects) UJ (all non-detects)	

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D and continuing calibration %D, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Semivolatiles – Data Qualification Summary - SDG 20F0438

Sample	Compound	Flag	A or P	Reason
LDW20-SS301 LDW20-SS302 LDW20-SS309 LDW20-SS323 LDW20-SS404 LDW20-SS407	N-Nitrosodiphenylamine	UJ (all non-detects)	Α	Initial calibration verification (%D)
LDW20-SS301 LDW20-SS302 LDW20-SS309 LDW20-SS323 LDW20-SS404 LDW20-SS407	Benzyl alcohol Pentachlorophenol	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Α	Continuing calibration (%D)

Duwamish AOC4

Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4

Semivolatiles - Field Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

SDG : Labor	#:48785l2bVALIDA #:20F0438 atory:_Analytical Resources, Inc. SVOA HOD: GC/MS Polynuclear Aromatic H	St	age 2B		F 2nd F	Date: º४/७// Page: \ of \ Reviewer: \ \ Reviewer: \ \	
	amples listed below were reviewed for tion findings worksheets.	or each of the fo	llowing v	alidation areas. Valida	ation findings are	noted in attache	
	Validation Area			Con	nments		
ı.	Sample receipt/Technical holding times	SW/ A	Cost	er temp. = 9,1°C	10.4°C (In	sufficient)	
II.	GC/MS Instrument performance check	A					
III.	Initial calibration/ICV	AISW	10	AL = 203	t2 100	e 303	
IV.	Continuing calibration	SW	c	AL = 20% CV & 20%			
V.	Laboratory Blanks	A					
VI.	Field blanks	N					
VII.	Surrogate spikes	A					
VIII.	Matrix spike/Matrix spike duplicates	A					
IX.	Laboratory control samples	A		US, SRM			
X.	Field duplicates						
XI.	Internal standards	A					
XII.	Compound quantitation RL/LOQ/LODs	N					
XIII.	Target compound identification	N					
XIV.	System performance	N					
XV.	Overall assessment of data	A					
Note:	N = Not provided/applicable R	D = No compounds = Rinsate B = Field blank	detected	D = Duplicate TB = Trip blank EB = Equipment b	SB=Sour OTHER: blank	ce blank	
	Client ID			Lab ID	Matrix	Date	
1	LDW20-SS301			20F0438-01	Sediment	06/24/20	
	LDW20-SS302			20F0438-02	Sediment	06/24/20	
	LDW20-SS309			20F0438-03	Sediment	06/24/20	
	LDW20-SS323			20F0438-04	Sediment	06/24/20	
	LDW20-SS404	20F0438-05	Sediment	06/24/20			
	LDW20-SS407	20F0438-06	Sediment	06/24/20			
	LDW20-SS404MS	20F0438-05MS	Sediment	06/24/20			
	LDW20-SS404MSD	20F0438-05MSD	Sediment	06/24/20			
g							
Notes:							
	BIG0210-B142						

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichtorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1. Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1. 3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1. o-Toluidine

LDC#: 48785 126

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Reviewer: JVG 2nd Reviewer:

METHOD: GC/MS SVOA (EPA SW 846 Method 8270 ← S/M)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

N/A

Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Were all %D within the validation criteria of ≤20/30% %D?

#	Date	Standard ID	Compound Q.Q	Finding %D (Limit: <20.8%(30%)	Associated Samples	Qualifications
C	06/26/20	SIF0393-SCV1	QQ	41.9	An (ND)	Qualifications J/NJ/A
+						
\dashv						
4						
+						
+						
_						
+						
土						
-						
+				<u> </u>		

LDC #: 48785 I 26

VALIDATION FINDINGS WORKSHEET <u>Continuing Calibration</u>

Page:	of	!
Reviewer:	JVG	
2nd Reviewer:	Z	

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?

N N/A

Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?

Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?

Y(N) N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF?

#		Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	07/15/20	NT 1026715035	baa	22.0 28.7		All (NP + Det)	J/UJ/A
			17	28.7			
			·7				

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Hexachlorobenzene

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0438

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS301	20F0438-01	Sediment	06/24/20
LDW20-SS302	20F0438-02	Sediment	06/24/20
LDW20-SS309	20F0438-03	Sediment	06/24/20
LDW20-SS323	20F0438-04	Sediment	06/24/20
LDW20-SS404	20F0438-05	Sediment	06/24/20
LDW20-SS407	20F0438-06	Sediment	06/24/20
LDW20-SS404MS	20F0438-05MS	Sediment	06/24/20
LDW20-SS404MSD	20F0438-05MSD	Sediment	06/24/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Hexachlorobenzene by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 10.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4

Hexachlorobenzene - Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Laboratory Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4

Hexachlorobenzene - Field Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

SDG # Labora	t: 4878513a VALIDATIO t: 20F0438 atory: Analytical Resources, Inc. OD: GC Hexachlorobenzene (EPA SW	St	age 2B	S WORKSHEET	R	Date: <u>% /17</u> Page: lof / Reviewer: 1 Reviewer: 1
	amples listed below were reviewed for eation findings worksheets.	ach of the fo	llowing valid	lation areas. Validatio	on findings are r	noted in attached
	Validation Area			Comm		
l.	Sample receipt/Technical holding times	SW A	Cooler	temp. = 9.1°C,	10,4%	insufficient) Hime to cool)
II.	GC Instrument Performance Check	N		<u>_</u>		
Ш.	Initial calibration/ICV	AA	ICA	HL & 20%	Ku	£ 20 %
IV.	Continuing calibration	A	Cu	HL & 20%		
V.	Laboratory Blanks	A				
VI.	Field blanks	N				
VII.	Surrogate spikes / (5	A/A				
VIII.	Matrix spike/Matrix spike duplicates	A				
IX.	Laboratory control samples	A	1	LS.		
X.	Field duplicates	The last of the la				
XI.	Compound quantitation/RL/LOQ/LODs	N				
XII.	Target compound identification	N				
XIII.	System Performance	N				
XIV	Overall assessment of data	A				
Note:	N = Not provided/applicable R = Ri	No compounds nsate Field blank	detected	D = Duplicate TB = Trip blank EB = Equipment blan	SB=Sourc OTHER: k	ce blank
	Client ID			Lab ID	Matrix	Date
1 L	DW20-SS301			20F0438-01	Sediment	06/24/20
Į.	_DW20-SS302			20F0438-02	Sediment	06/24/20
	_DW20-SS309			20F0438-03	Sediment	06/24/20
4 L	_DW20-SS323			20F0438-04	Sediment	06/24/20
	_DW20-SS404			20F0438-05	Sediment	06/24/20
	.DW20-SS407			20F0438-06	Sediment	06/24/20
	.DW20-SS404MS	20F0438-05MS	Sediment	06/24/20		
	LDW20-SS404MSD			20F0438-05MSD	Sediment	06/24/20
9						
10_						
11						
lotes:						
	BI G0212-134K1					

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

September 1, 2020

Parameters:

Polychlorinated Biphenyls

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0438

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS301	20F0438-01	Sediment	06/24/20
LDW20-SS302	20F0438-02	Sediment	06/24/20
LDW20-SS309	20F0438-03	Sediment	06/24/20
LDW20-SS323	20F0438-04	Sediment	06/24/20
LDW20-SS404	20F0438-05	Sediment	06/24/20
LDW20-SS407	20F0438-06	Sediment	06/24/20
LDW20-SS404MS	20F0438-05MS	Sediment	06/24/20
LDW20-SS404MSD	20F0438-05MSD	Sediment	06/24/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperatures for samples in this SDG were reported between 9.1°C and 10.4°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	%D	Associated Samples	Flag	A or P
07/02/20	SIG0056-SCV1	1C	Aroclor-1260	21.8	All samples in SDG 20F0438	J (all detects) UJ (all non-detects)	A

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
LDW20-SS302	Aroclor-1248 Aroclor-1260	53.7 71.1	J (all detects) J (all detects)	А
LDW20-SS309	Aroclor-1260	50.8	J (all detects)	А
LDW20-SS323	Aroclor-1254 Aroclor-1260	42.6 45.2	J (all detects) J (all detects)	А

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D and RPD between two columns, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.	

Duwamish AOC4 Polychlorinated Biphenyls - Data Qualification Summary - SDG 20F0438

Sample	Compound	Flag	A or P	Reason
LDW20-SS301 LDW20-SS302 LDW20-SS309 LDW20-SS323 LDW20-SS404 LDW20-SS407	Aroclor-1260	J (all detects) UJ (all non-detects)	Α	Initial calibration verification (%D)
LDW20-SS302	Aroclor-1248 Aroclor-1260	J (all detects) J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS309	Aroclor-1260	J (all detects)	А	Compound quantitation (RPD between two columns)
LDW20-SS323	Aroclor-1254 Aroclor-1260	J (all detects) J (all detects)	А	Compound quantitation (RPD between two columns)

Duwamish AOC4

Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

_DC #: <u>48785l3b</u>	VALIDATION COMPLETENESS WORKSH
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SDG #: 20F0438 Stage 2B

HEET Date: <u>⁰8/17 //</u>
Page: <u>1 of //</u>
Reviewer: <u>14/</u>
2nd Reviewer: _______

Laboratory: Analytical Resources, Inc.

METHOD: GC Polychlorinated Biphenyls (EPA SW846 Method 8082A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments	
l.	Sample receipt/Technical holding times	SWIA	Cooler temp = 9.1°C, 10.4°C	(Insufficient, time to cool
II.	Initial calibration/ICV	A/SW		
111.	Continuing calibration	I A	ICAL & 20?	WE 20%
IV.	Laboratory Blanks	Á	av a 20%	
V.	Field blanks	<u> </u>		
VI.	Surrogate spikes	A		
VII.	Matrix spike/Matrix spike duplicates	A		
VIII.	Laboratory control samples	A	LCS SRM	
IX.	Field duplicates	Li Li		
X.	Compound quantitation/RL/LOQ/LODs	ÇM		
XI.	Target compound identification	N		
XII	Overall assessment of data	I A		

Note: A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank
EB = Equipment blank

SB=Source blank OTHER:

Client ID Lab ID Matrix Date LDW20-SS301 20F0438-01 Sediment 06/24/20 LDW20-SS302 06/24/20 20F0438-02 Sediment LDW20-SS309 20F0438-03 Sediment 06/24/20 LDW20-SS323 20F0438-04 Sediment 06/24/20 LDW20-SS404 20F0438-05 Sediment 06/24/20 LDW20-SS407 20F0438-06 Sediment 06/24/20 Sediment LDW20-SS404MS 20F0438-05MS 06/24/20 LDW20-SS404MSD 20F0438-05MSD Sediment 06/24/20 10 11 12 Notes:

BIG0214-BK1			
, we			

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPASW 846 Method 8081/8082)

A. alpha-BHC	K. Endrin	U. Toxaphene	EE. 2,4'-DDT	OO. trans-Heptachlor epoxide
B. beta-BHC	L. Endosulfan II	V. Aroclor-1016	FF. Hexachlorobenzene	PP. Mirex
C. delta-BHC	M. 4,4'-DDD	W. Aroclor-1221	GG. Chlordane	QQ çis-Chlordane
D. gamma-BHC	N. Endosulfan sulfate	X. Aroclor-1232	HH. Chlordane (Technical)	RR. trans-Chlordane
E. Heptachlor	O. 4,4'-DDT	Y. Aroclor-1242	II. Aroclor 1262	SS.
F. Aldrin	P. Methoxychlor	Z. Aroclor-1248	JJ. Aroclor 1268	тт.
G. Heptachlor epoxide	Q. Endrin ketone	AA. Aroclor-1254	KK. Oxychlordane	UU.
H. Endosulfan I	R. Endrin aldehyde	BB. Aroclor-1260	LL. trans-Nonachlor	vv
I. Dieldrin	S. alpha-Chlordane	CC. 2,4'-DDD	MM. cis-Nonachlor	ww.
J. 4,4'-DDE	T. gamma-Chlordane	DD. 2,4'-DDE	NN. cis-Heptachlor epoxide	xx.

Notes:	 	

LDC#: 48785836

VALIDATION FINDINGS WORKSHEET Initial Calibration Verification

Page:_	of/_
Reviewer:_	JУG
2nd Reviewer:	4

METHOD: GC Pesticides/PCBs (EPA SW 846 Method 8081/8082)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

What type of initial calibration verification calculation was performed? ___%D or ___%R

N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y(N)N/A Did the initial calibration verification standards meet the %D / %R validation criteria of ≤20.0% / 80-120%?

#	Date	Standard ID	Detector/ Column	Compound	%D (Limit ≤ 20.0)	Associated Samples	Qualifications
	07/02/20	SIG 0056-50	vi 1c	BB	Z1.8	All (ND + Det)	JMJ/A
							J/UJ/A (gual BB only)
				·			(* 37

LDC #:	48785 I 36
	10 03 7 7

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported RLs

Page:	1_of	
Reviewer:	JVG	
nd Reviewer		

METHOD: GC

Were the relative percent difference of detected compounds between two columns <40%?

<u> </u>	N/A Were the relative percent difference of detected compounds between two columns <40%?					
#	Sample ID	Compound Name	%RPD Between Two Columns (Limit < 40%)	Qualifications		
	2	2	53.7	Tack A		
		500	7.(1		
	3	88	50,8			
			r			
	iL	AA	42.6			
	1	BB	45,2	5/		
				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		
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		With allow and the second and the se				
		400-3-3-3-40				
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-						

Comments: _	See sample calculation verification worksheet for recalculations		
_			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Metals

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0438

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS301	20F0438-01	Sediment	06/24/20
LDW20-SS302	20F0438-02	Sediment	06/24/20
LDW20-SS309	20F0438-03	Sediment	06/24/20
LDW20-SS323	20F0438-04	Sediment	06/24/20
LDW20-SS404	20F0438-05	Sediment	06/24/20
LDW20-SS407	20F0438-06	Sediment	06/24/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Arsenic, Cadmium, Chromium, Copper, Lead, Silver, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A Mercury by EPA SW 846 Method 7471B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Chromium	0.27 mg/Kg	All samples in SDG 20F0438

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
LDW20-IT411MS/MSD (All samples in SDG 20F0438)	Lead	0.148 (75-125)	26.8 (75-125)	J (all detects)	А

For LDW20-IT411MS/MSD (from SDG 20F0392), although the percent recoveries were severely low for lead, the associated sample results were qualified as estimated (J/UJ) since the post digestion spike recoveries were within the QC limits for this analyte.

Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
LDW20-IT411DUP (All samples in SDG 20F0438)	Lead	60.9 (≤20)	-	J (all detects)	А

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

Raw data were not reviewed for Stage 2B validation.

XIII. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Metals - Data Qualification Summary - SDG 20F0438

Sample	Analyte	Flag	A or P	Reason
LDW20-SS301 LDW20-SS302 LDW20-SS309 LDW20-SS323 LDW20-SS404 LDW20-SS407	Lead	J (all detects)	А	Matrix spike/Matrix spike duplicate (%R)
LDW20-SS301 LDW20-SS302 LDW20-SS309 LDW20-SS323 LDW20-SS404 LDW20-SS407	Lead	J (all detects)	А	Duplicate sample analysis (RPD)

Duwamish AOC4

Metals - Laboratory Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4

Metals - Field Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 48785I4a SDG #: 20F0438

Stage 2B

Date: <u>\$19/2</u> 0
Page: <u> </u> of <u> </u>
Reviewer:
2nd Reviewer:/

Laboratory: Analytical Resources, Inc.

METHOD: Metals (EPA SW 846 Method 6020A/7471B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	AA	
II	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	Sv/	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	SW	ms (2070392)
VIII.	Duplicate sample analysis	SW,	DUR ,
IX.	Serial Dilution	\mathcal{N}	•
X.	Laboratory control samples	A	405
XI.	Field Duplicates	\mathcal{N}	
XII.	Internal Standard (ICP-MS)	\mathcal{N}	not reviewed
XIII.	Sample Result Verification	N	/
XIV	Overall Assessment of Data	LA_	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1	LDW20-SS301	20F0438-01	Sediment	06/24/20
2	LDW20-SS302	20F0438-02	Sediment	06/24/20
3	LDW20-SS309	20F0438-03	Sediment	06/24/20
4	LDW20-SS323	20F0438-04	Sediment	06/24/20
5	LDW20-SS404	20F0438-05	Sediment	06/24/20
6	LDW20-SS407	20F0438-06	Sediment	06/24/20
7				
8				
9				
10				
11				
12				
13				

Notes:	 		

ICP-MS

CVAA

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
1 to 6	As, Cd, Cr, Cu, Pb, Ag, Zn, Hg
	Analysis Method
ICP	

As, Cd, Cr, Cu, Pb, Ag, Zn

Hg

VALIDATION FINDINGS WORKSHEET <u>Laboratory Blank Contamination (PB/ICB/CCB)</u>

Page 1 of 1 Reviewer:CR

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Soil preparation factor applied (if applicable):

Sample Concentration, unless otherwise noted: mg/Kg Asso

Associated Samples: All

							Samp	le Ider	tificat	ion			
Analyte	PB (mg/Kg)	Maximum ICB/CCB (ug/L)	Action Level	No quals									
Cr	0.27												

Comments: The listed analyte concentration is the highest ICB or CCB detected in the analysis. The action level, when applicable, is established at 5X the highest ICB, CCB, or PB concentration.

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

MS/MSD analysis was performed by the laboratory. All MS/MSD percent recoveries (%R) and relative percent differences (RPDs) were within the acceptable limits with the following exceptions:

MS/MSD ID	Matrix	Analyte	MS %R	MSD %R	%R Limit	RPD	RPD Limit	Associated Samples	Qualification	Det/ND
LDW20-IT411MS/MSD	s	Pb	0.148		75-125			All	J/UJ/A*	Det
(SDG: 20F0392)									*PS = 98.3	
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	- 						<u> </u>			
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		<u> </u>		L		L		<u></u>		<u> </u>

Comments:

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)

Laboratory duplicate analysis was performed by the laboratory. All laboratory duplicates were with the relative percent difference (RPD) for samples >5X the reporting limits with the exceptions listed below. If samples were <5X the reporting limits, the difference was within 1X the reporting limit for water samples and within 2X the reporting limit for soil samples for all samples with the exceptions listed below.

Duplicate ID	Matrix	Analyte	RPD	RPD Limit	Difference (units)	Difference Limit	Associated Samples	Qualification	Det/ND
	s	Pb	60.9	20			All	J/UJ/A	Det
(SDG: 20F0392)									
					N.				
	1								
	1								
	 		1						

Comments:

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Duwamish AOC4

LDC Report Date: August 20, 2020

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0438

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS301	20F0438-01	Sediment	06/24/20
LDW20-SS302	20F0438-02	Sediment	06/24/20
LDW20-SS309	20F0438-03	Sediment	06/24/20
LDW20-SS323	20F0438-04	Sediment	06/24/20
LDW20-SS404	20F0438-05	Sediment	06/24/20
LDW20-SS407	20F0438-06	Sediment	06/24/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

Total Solids by Standard Method 2540G

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

Duwamish AOC4
Wet Chemistry - Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4
Wet Chemistry - Field Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

SDG#	:48785l6VALIDATIC t:20F0438 atory:_Analytical Resources, Inc.		PLETENES: Stage 2B	S WORKSHEE		Date: 897 Page: of beviewer:
METH e	OD: (Analyte) TOC (EPA SW846 Methamples listed below were reviewed for elion findings worksheets.				2nd R	deviewer:
	Validation Area			Comi	nents	
I.	Sample receipt/Technical holding times	A-A				
11	Initial calibration	LA				
111.	Calibration verification	A				
IV	Laboratory Blanks	A				
V	Field blanks	<i>N</i> .				
VI.	Matrix Spike/Matrix Spike Duplicates	\mathcal{N}	CS			
VII.	Duplicate sample analysis	N	j			
VIII.	Laboratory control samples	I A	LCS.	SOM		
IX.	Field duplicates	$\perp \mathcal{N}$				
X	Sample result verification	N				
XI_	Overall assessment of data	10				
Note:	N = Not provided/applicable R = R	No compound insate Field blank	ds detected	D = Duplicate TB = Trip blank EB = Equipment bla	SB=Sourd OTHER: ank	ce blank
	Client ID	_		Lab ID	Matrix	Date
1 L	.DW20-SS301			20F0438-01	Sediment	06/24/20
	.DW20-SS302			20F0438-02	Sediment	06/24/20
	.DW20-SS309			20F0438-03	Sediment	06/24/20
- 1	.DW20-SS323			20F0438-04	Sediment	06/24/20
	.DW20-SS404	· · · · · · · · · · · · · · · · · · ·		20F0438-05	Sediment	06/24/20
- 1	DW20-SS407			20F0438-06	Sediment	06/24/20
7		· · · · · · · · · · · · · · · · · · ·				
8						
9		_				
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12						
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Notes:

14 15

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

All elements are applicable to each sample as noted below.

Sample ID	Target Analyte List
All	Total solids, TOC

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Duwamish AOC4

LDC Report Date:

August 19, 2020

Parameters:

Polychlorinated Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

Analytical Resources, Inc.

Sample Delivery Group (SDG): 20F0438

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
LDW20-SS301	20F0438-01	Sediment	06/24/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Lower Duwamish Waterway Quality Assurance Project Plan for Remedial Design of Upper Reach: Pre-Design Investigation (May 2020) and a modified outline of the USEPA National Functional Guidelines (NFG) for High Resolution Superfund Methods Data Review (April 2016). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) Method 1613B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to nonconformances discovered during data validation.
- U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.
- R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

The chain-of-custodies were reviewed for documentation of cooler temperatures. Cooler temperature for samples in this SDG was reported at 9.1°C upon receipt by the laboratory. Since the samples were received the same day that they were collected, time did not allow for sufficient cooling of the samples, therefore no data were qualified.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were within the QC limits for unlabeled compounds and labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
BIG0062-BLK1	07/09/20	1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDD OCDF OCDD	0.0645 ng/Kg 0.319 ng/Kg 0.727 ng/Kg 2.68 ng/Kg	All samples in SDG 20F0438

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the method. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits.

XI. Compound Quantitation

All compound quantitations were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG 20F0438	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	А

Sample	Compound	Flag	A or P
All samples in SDG 20F0438	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	Α

Sample	Compound	Finding	Criteria	Flag	A or P
All samples in SDG 20F0438	OCDD	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

Raw data were not reviewed for Stage 2B validation.

XII. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to compounds reported as EMPC and results exceeding calibration range, data were qualified as estimated or not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

Duwamish AOC4 Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 20F0438

Sample	Compound	Flag	A or P	Reason
LDW20-SS301	All compounds reported as estimated maximum possible concentration (EMPC) and greater than the reporting limit.	J (all detects)	A	Compound quantitation (EMPC)
LDW20-SS301	All compounds reported as estimated maximum possible concentration (EMPC) and less than the reporting limit.	U (all non-detects)	А	Compound quantitation (EMPC)
LDW20-SS301	OCDD	J (all detects)	Р	Compound quantitation (exceeded range)

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

Duwamish AOC4

Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 20F0438

No Sample Data Qualified in this SDG

SDG#	t: 48785l21 VALIDATION #: 20F0438 Atory: Analytical Resources, Inc.		LETENES: tage 2B	S WORKSHEET	F	Date: 68/17 / Page:
	OD: HRGC/HRMS Polychlorinated Dio		·	·		
	tion findings worksheets.	Jack of the lo	mowning valida	ation areas. Validati	on manys are	noted in attached
	Validation Area	SW/A	Cooler.	<u>Comr</u> temp, = 9.1°C	nents	Insufficient
<u>l.</u>	Sample receipt/Technical holding times	- 1 2W/ Ft	COUCH	10.7,	10	time to cool
<u>II.</u>	HRGC/HRMS Instrument performance check	1 1 1	IcA.	1 20/257	10160	C limits
111.	Initial calibration/ICV	A/A		£ 20/35 %	10056	C IIMITS
IV.	Continuing calibration	1 1	Cay	e ac limits		
V.	Laboratory Blanks	SW		· · · · · · · · · · · · · · · · · · ·		
VI.	Field blanks	1 1				
VII.	Matrix spike/Matrix spike duplicates	N N		_		
VIII.	Laboratory control samples	<u>A</u>		LCS, SRM		
IX.	Field duplicates	l N				
X.	Labeled Compounds	I A				4
XI.	Compound quantitation RL/LOQ/LODs	MS		F > calib	dets (ZRL)	; 4 (2RL)
XII.	Target compound identification	N	<u> </u>	=> calib	range	<u></u>
XIII.	System performance	N				
XIV.	Overall assessment of data	8A				
lote:	N = Not provided/applicable R = R	No compounds linsate Field blank	detected	D = Duplicate TB = Trip blank EB = Equipment bla	SB=Sour OTHER: nk	ce blank
(Client ID			Lab ID	Matrix	Date
1 <u>L</u>	DW20-SS301			20F0438-01	Sediment	06/24/20
2						
3						
4						
5				-		
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otes:						
	BI 60062-BUK1		- T - T		T	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:				

LDC #:	48785	I2
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VALIDATION FINDINGS WORKSHEET Blanks

Page:_	<u>_</u> _of	1
Reviewer:_	JVĢ	
2nd Reviewer:_	-X	

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all samples associated with a method blank?

Y N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?

Y/N N/A Was the method blank contaminated?

Blank extraction date: 07/09/20 Blank analysis date: 07/13/20 Associated samples: All

Compound	Blank ID		Sample Identification						
	BI60062-	BULL (X)							
0	0.0645 *	0.3275							
F	0.319*	1, 595							
Q	0.727 ¥	3.635							
G	2.68	13,4							
	+ EMPC								

Blank extraction date:_____Blank analysis date:____
Conc. units:______Associated Samples:______

Compound Blank ID Sample Identification

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

All contaminants within five times the method blank concentration were qualified as not detected, "U".