ATTACHMENT 3

Data Validation Reports

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Windward Environmental, LLC
200 West Mercer Street, Suite 401
Seattle, WA 98119
ATTN: Ms. Marina Mitchell

April 30, 2010

SUBJECT: Lower Duwamish Waterway Group, Data Validation

Dear Ms. Mitchell,

Enclosed are the revised validation reports for the fractions listed below. These SDGs were received on January 15, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 22400:

SDG #	Fraction
QB98/QC15, QC19 QB99	Semivolatiles, Polychlorinated Biphenyls, Metals, Wet Chemistry

The data validation was performed under EPA Level III & IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005
- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005, Dioxin/Furan Addendum, December 2009
- USEPA, Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008
- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
- 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

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

Sincerely,

Stella S. Cuenco
Data Validation Operations Manager/Senior Chemist

Attachment 1

EDD	LDC #22400 (Windward Environmental, LLC - Seattle WA / Lower Duwamish Waterway Group)																																			
LDC	SDG#	DATE REC'D	(3) DATE DUE	SVOA (8270D)		PCBs (8082)		Metals (200.8 /7000)		TOC (Plumb)		% Solids (160.3)		Part. Size (PSEP)																							
Matrix:	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	
A	QB98/QC15	01/15/10	02/05/10	-	-	-	-	-	-	0	24	0	24	0	24																					
B	QC19	01/15/10	02/05/10	1	0	1	0	1	0	0	6	0	6	0	6																					
C	QB99	01/15/10	02/05/10	-	-	-	-	-	-	0	12	0	12	0	12																					
Total	T/SC			1	0	1	0	1	0	0	42	0	42	0	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	129

Shaded cells indicate Level IV validation (all other cells are Level II validation). These sample counts do not include MS/MSD, and DUPs

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22400

Semivolatiles

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Lower Duwamish Waterway Group

Collection Date: December 17, 2009

LDC Report Date: April 29, 2010

Matrix: Water

Parameters: Semivolatiles

Validation Level: EPA Level III

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): QC19

Sample Identification

LDW-SS527-RB
LDW-SS527-RBRE

Introduction

This data review covers 2 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8270D for Semivolatiles.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (June 2008) as there are no current guidelines for the method stated above.

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XVI.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met with the following exceptions:

Sample	Compound	Total Days From Sample Collection Until Extraction	Required Holding Time (in Days) From Sample Collection Until Extraction	Flag	A or P
LDW-SS527-RBRE	All TCL compounds	11	7	J (all detects) UJ (all non-detects)	A

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. GC/MS Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration

Initial calibration was performed using required standard concentrations.

Percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where %RSD was greater than 15.0%, the laboratory used a calibration curve to evaluate the compound. All coefficients of determination (r^2) were greater than or equal to 0.990 .

For the purposes of technical evaluation, all compounds were evaluated against the 30.0% (%RSD) National Functional Guideline criteria. Unless noted above, all compounds were within the validation criteria.

Average relative response factors (RRF) for all semivolatile target compounds and system performance check compounds (SPCCs) were greater than or equal to 0.05 as required.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

Percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were within the method criteria of less than or equal to 20.0% for calibration check compounds (CCCs).

For the purposes of technical evaluation, all compounds were evaluated against the 25.0% (%D) National Functional Guideline criteria. Unless noted above, all compounds were within the validation criteria with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/24/09	2,4-Dinitrophenol 4-Nitrophenol N-Nitrosodiphenylamine 4-Bromophenyl-phenyl ether	33.3 29.8 33.6 32.8	LDW-SS527-RB MB-122309	J (all detects) UJ (all non-detects)	A
12/29/09	Dibenz(a,h)anthracene	25.8	LDW-SS527-RBRE MB-122809	J (all detects) UJ (all non-detects)	A

All of the continuing calibration RRF values were greater than or equal to 0.05 .

V. Blanks

Method blanks were reviewed for each matrix as applicable. No semivolatile contaminants were found in the method blanks.

VI. Surrogate Spikes

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries (%R) 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 (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
LCS/D-122309 (LDW-SS527-RB MB-122309)	Aniline	-	0 (28-126)	200 (≤40)	J (all detects) R (all non-detects)	P
LCS/D-122309 (LDW-SS527-RB MB-122309)	N-Nitrosodimethylamine	-	-	47.9 (≤40)	J (all detects) UJ (all non-detects)	P

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

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

XI. Target Compound Identifications

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and CRQLs

Raw data were not reviewed for this SDG.

XIII. Tentatively Identified Compounds (TICs)

Raw data were not reviewed for this SDG.

XIV. System Performance

Raw data were not reviewed for this SDG.

XV. Overall Assessment

The overall assessment of data was acceptable. In the case where more than one result was reported for an individual sample, the least technically acceptable results were rejected as follows:

Sample	Compound	Flag	A or P
LDW-SS527-RB	Benzyl alcohol 4-Chloroaniline 3-Nitroaniline Aniline N-Nitrosodimethylamine	R R R R R	A
LDW-SS527-RBRE	All TCL compounds except Benzyl alcohol 4-Chloroaniline 3-Nitroaniline Aniline N-Nitrosodimethylamine	R	A

Data flags are summarized at the end of this report if data has been qualified.

XVI. Field Duplicates

No field duplicates were identified in this SDG.

XVII. Field Blanks

Sample LDW-SS527-RB was identified as a rinsate blank. No semivolatile contaminants were found in this blank with the following exceptions:

Rinsate ID	Compound	Concentration (ug/L)
LDW-SS527-RB	Benzyl alcohol	8.0
	4-Chloroaniline	60
	3-Nitroaniline	16
	Aniline	55
	N-Nitrosodimethylamine	6.4

Lower Duwamish Waterway Group
Semivolatiles - Data Qualification Summary - SDG QC19

SDG	Sample	Compound	Flag	A or P	Reason
QC19	LDW-SS527-RBRE	All TCL compounds	J (all detects) UJ (all non-detects)	A	Technical holding times
QC19	LDW-SS527-RB	2,4-Dinitrophenol 4-Nitrophenol N-Nitrosodiphenylamine 4-Bromophenyl-phenyl ether	J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
QC19	LDW-SS527-RBRE	Dibenz(a,h)anthracene	J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
QC19	LDW-SS527-RB	Aniline	J (all detects) R (all non-detects)	P	Laboratory control samples (%R)(RPD)
QC19	LDW-SS527-RB	N-Nitrosodimethylamine	J (all detects) UJ (all non-detects)	P	Laboratory control samples (RPD)
QC19	LDW-SS527-RB	Benzyl alcohol 4-Chloroaniline 3-Nitroaniline Aniline N-Nitrosodimethylamine	R R R R R	A	Overall assessment of data
QC19	LDW-SS527-RBRE	All TCL compounds except Benzyl alcohol 4-Chloroaniline 3-Nitroaniline Aniline N-Nitrosodimethylamine	R	A	Overall assessment of data

Lower Duwamish Waterway Group
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG QC19

No Sample Data Qualified in this SDG

LDC #: 22400B2 **VALIDATION COMPLETENESS WORKSHEET** Date: 2/1/10
SDG #: QC19 Level ~~IV~~ III Page: 1 of 1
Laboratory: Analytical Resources, Inc. Reviewer: F7
2nd Reviewer: KC

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

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.	Technical holding times	SW	Sampling dates: 12/17/09
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	%RSD, r^2
IV.	Continuing calibration/ICV	SW	ICV ≤ 25
V.	Blanks	A	
VI.	Surrogate spikes	SW	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
VIII.	Laboratory control samples	SW	LCS/D
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	N	
XII.	Compound quantitation/CRQLs	N	
XIII.	Tentatively identified compounds (TICs)	~~N~~ N	
XIV.	System performance	N	
XV.	Overall assessment of data	SW	
XVI.	Field duplicates	D	
XVII.	Field blanks	SW	RB = 1

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

Validated Samples: water

1	LDW-SS527-RB	11	MB - 122309	21		31	
2	#1 RE	12	MB - 122809	22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

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

A. Phenol**	P. Bis(2-chloroethoxy)methane	EE. 2,6-Dinitrotoluene	TT. Pentachlorophenol**	III. Benzo(a)pyrene**
B. Bis (2-chloroethyl) ether	Q. 2,4-Dichlorophenol**	FF. 3-Nitroaniline	UU. Phenanthrene	JJJ. Indeno(1,2,3-cd)pyrene
C. 2-Chlorophenol	R. 1,2,4-Trichlorobenzene	GG. Acenaphthene**	VV. Anthracene	KKK. Dibenz(a,h)anthracene
D. 1,3-Dichlorobenzene	S. Naphthalene	HH. 2,4-Dinitrophenol*	WW. Carbazole	LLL. Benzo(g,h,i)perylene
E. 1,4-Dichlorobenzene**	T. 4-Chloroaniline	II. 4-Nitrophenol*	XX. Di-n-butylphthalate	MMM. Bis(2-Chloroisopropyl)ether
F. 1,2-Dichlorobenzene	U. Hexachlorobutadiene**	JJ. Dibenzofuran	YY. Fluoranthene**	NNN. Aniline
G. 2-Methylphenol	V. 4-Chloro-3-methylphenol**	KK. 2,4-Dinitrotoluene	ZZ. Pyrene	OOO. N-Nitrosodimethylamine
H. 2,2'-Oxybis(1-chloropropane)	W. 2-Methylnaphthalene	LL. Diethylphthalate	AAA. Butylbenzylphthalate	PPP. Benzoic Acid
I. 4-Methylphenol	X. Hexachlorocyclopentadiene*	MM. 4-Chlorophenyl-phenyl ether	BBB. 3,3'-Dichlorobenzidine	QQQ. Benzyl alcohol
J. N-Nitroso-di-n-propylamine*	Y. 2,4,6-Trichlorophenol**	NN. Fluorene	CCC. Benzo(a)anthracene	RRR. Pyridine
K. Hexachloroethane	Z. 2,4,5-Trichlorophenol	OO. 4-Nitroaniline	DDD. Chrysene	SSS. Benzidine
L. Nitrobenzene	AA. 2-Chloronaphthalene	PP. 4,6-Dinitro-2-methylphenol	EEE. Bis(2-ethylhexyl)phthalate	TTT.
M. Isophorone	BB. 2-Nitroaniline	QQ. N-Nitrosodiphenylamine (1)**	FFF. Di-n-octylphthalate**	UUU.
N. 2-Nitrophenol**	CC. Dimethylphthalate	RR. 4-Bromophenyl-phenylether	GGG. Benzo(b)fluoranthene	VVV.
O. 2,4-Dimethylphenol	DD. Acenaphthylene	SS. Hexachlorobenzene	HHH. Benzo(k)fluoranthene	WWW.

SDG #: 809

Technical Holding Times

Reviewer: [illegible]
2nd Reviewer: [illegible]

All circled dates have exceeded the technical holding times.
(Y) N N/A Were all cooler temperatures within validation criteria?

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

Sample ID	Matrix	Preserved	Sampling Date	Extraction date	Analysis date	Total # of Days	Qualifier
2	water		12/17/09	12/28/09	12/29/09	11	J/UJ/A

TECHNICAL HOLDING TIME CRITERIA

Water: Extracted within 7 days, analyzed within 40 days.
Soil: Extracted within 14 days, analyzed within 40 days.

LDC #: 22T0052

SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: Ft
2nd Reviewer: A

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 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 ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤25 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤25.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	12/24/09	CCV	HH	33.3		MB - 122309, 1	J/UJ/A
	0758		II	29.8		↓	↓
-			QQ	33.6			
			RR	32.8			
			~~SSS~~	~~54.6~~			
	12/29/09	CCV	KKK	25.8		MB - 122809, 2	J/UJ/A
	1156		~~SSS~~	~~36.8~~		↓	↓

SDG #: All Cores

Surrogate Recovery

Page: 1 of 1
Reviewer: FZ
2nd Reviewer: A

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

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

Y (N) N/A Were percent recoveries (%R) for surrogates within QC limits?

Y N (N/A) If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?

Y N (N/A) If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Date	Sample ID	Surrogate	%R (Limits)	Qualifications
		1	TPH	144 (11-132)	no qual
			PHL	~~38.4~~ (10-102)	↓
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

* QC limits are advisory	QC Limits (Soil)	QC Limits (Water)
S1 (NBZ) = Nitrobenzene-d5	23-120	35-114
S2 (FBP) = 2-Fluorobiphenyl	30-115	43-116
S3 (TPH) = Terphenyl-d14	18-137	33-141
S4 (PHL) = Phenol-d5	24-113	10-94
S5 (2FP) = 2-Fluorophenol	25-121	21-100
S6 (TBP) = 2,4,6-Tribromophenol	19-122	10-123
S7 (2CP) = 2-Chlorophenol-d4	20-130*	33-110*
S8 (DCB) = 1,2-Dichlorobenzene-d4	20-130*	16-110*

LDC #: 22400B2
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Reviewer: Ft
2nd Reviewer: A

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 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?

#	Date	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		LCS/D-122309	NNN	( )	0 (28-126)	200 (≤ 40)	MB-122309, 1	J/R/P
			~~OOO~~	( )	( )	47.9 (≤ 40)		J/UJ P
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

SDG #: ee cross

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

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 (compd)	Finding	Associated Samples	Qualifications
		AAA, T, FF, NNN, OOO	possible false detect	1	R/A
		All except above	extracted outside H.T.	2	R/A
		— — — —			

Comments: _____

OVR.2S

LDC #: [illegible]
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: BP
2nd Reviewer: M

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

Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target compounds detected in the field blanks?

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/11/09
Field blank type: (circle one) Field Blank / Rinsate / Other: RB Associated Samples: 1

Compound	Blank ID	Sample Identification								
	1									
~~Diethylphthalate~~ QQQ	8.0									
Di-n-butylphthalate T	60									
~~Bis(2-ethylhexyl)phthalate~~ FF	16									
NNN	55									
OOO	6.4									
CRQL										

Blank not associated with any samples

Blank units: _____ **Associated sample units:** _____
Sampling date: _____
Field blank type: (circle one) Field Blank / Rinsate / Other: _____ Associated Samples: _____

Compound	Blank ID	Sample Identification								
Diethylphthalate										
Di-n-butylphthalate										
Bis(2-ethylhexyl)phthalate										
CRQL										

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 field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22400

Polychlorinated Biphenyls

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Lower Duwamish Waterway Group

Collection Date: December 17, 2009

LDC Report Date: April 29, 2010

Matrix: Water

Parameters: Polychlorinated Biphenyls

Validation Level: EPA Level III

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): QC19

Sample Identification

LDW-SS527-RB

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8082 for Polychlorinated Biphenyls.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (June 2008) as there are no current guidelines for the method stated above.

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.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. GC/ECD Instrument Performance Check

Instrument performance was acceptable unless noted otherwise under initial calibration and continuing calibration sections.

III. Initial Calibration

Initial calibration of multicomponent compounds was performed for the primary (quantitation) column as required by the method.

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

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) of calibration factors in continuing standard mixtures were within the 20.0% QC limits.

The percent difference (%D) of the second source calibration standard were less than or equal to 20.0% for all compounds.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated biphenyl contaminants were found in the method blanks.

VI. Surrogate Spikes and Internal Standards

Surrogates were added to all samples and blanks 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 (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Pesticide Cleanup Checks

a. Florisil Cartridge Check

Florisil cleanup was not required and therefore not performed in this SDG.

b. GPC Calibration

GPC cleanup was not required and therefore not performed.

XI. Target Compound Identification

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and CRQLs

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

Sample LDW-SS527-RB was identified as a rinsate blank. No polychlorinated biphenyl contaminants were found in this blank.

Lower Duwamish Waterway Group
Polychlorinated Biphenyls - Data Qualification Summary - SDG QC19

No Sample Data Qualified in this SDG

Lower Duwamish Waterway Group
Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG QC19

No Sample Data Qualified in this SDG

LDC #: 22400B3b

VALIDATION COMPLETENESS WORKSHEET

Date: 2/1/10

SDG #: QC19

Level IV TN

Page: 1 of 1

Laboratory: Analytical Resources, Inc.

Reviewer: F

2nd Reviewer: K

METHOD: GC Polychlorinated Biphenyls (EPA SW 846 Method 8082)

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.	Technical holding times	A	Sampling dates: 12/17/09
II.	GC/ECD Instrument Performance Check	NA	
III.	Initial calibration	A	
IV.	Continuing calibration/ICV	A	ICV ≤ 20
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
VIII.	Laboratory control samples	A	LCS ID
IX.	Regional quality assurance and quality control	N	
Xa.	Florisil cartridge check	N	
Xb.	GPC Calibration	N	
XI.	Target compound identification	N	
XII.	Compound quantitation and reported CRQLs	N	
XIII.	Overall assessment of data	A	Acceptable Internal stand.
XIV.	Field duplicates	N	
XV.	Field blanks	ND	RB = 1

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

Validated Samples: Water

1	LDW-SS527-RB	11	MB-122209	21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22400

Metals

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 17, 2009
LDC Report Date:	April 29, 2010
Matrix:	Water
Parameters:	Metals
Validation Level:	EPA Level III
Laboratory:	Analytical Resources, Inc.
Sample Delivery Group (SDG):	QC19

Sample Identification

LDW-SS527-RB
LDW-SS527-RBMS
LDW-SS527-RBDUP

Introduction

This data review covers 3 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 and EPA SW 846 Method 7000 for Metals. The metals analyzed were Antimony, Arsenic, Cadmium, Chromium, Cobalt, Copper, Lead, Molybdenum, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, and Zinc.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a 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.

Blanks are summarized in Section IV.

Field duplicates are summarized in Section XIV.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

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. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks.

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VIII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

IX. Internal Standards

All internal standard percent recoveries (%R) were within QC limits.

X. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

XI. ICP Serial Dilution

ICP serial dilution was not performed for this SDG.

XII. Sample Result Verification

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

Sample LDW-SS527-RB was identified as a rinsate blank. No metal contaminants were found in this blank.

Lower Duwamish Waterway Group
Metals - Data Qualification Summary - SDG QC19

No Sample Data Qualified in this SDG

Lower Duwamish Waterway Group
Metals - Laboratory Blank Data Qualification Summary - SDG QC19

No Sample Data Qualified in this SDG

LDC #: 22400B4 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-25-10

SDG #: QC19 Level ~~IV~~ III Page: 1 of 1

Laboratory: Analytical Resources, Inc. 9m4 Reviewer: MG

2nd Reviewer: V

METHOD: Metals (EPA Method 200.8, EPA SW 846 Method 7000)

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.	Technical holding times	A	Sampling dates: 12-17-09
II.	ICP/MS Tune	A	
III.	Calibration	A	(CRDL std 70-130)
IV.	Blanks	A	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS
VII.	Duplicate Sample Analysis	A	DUP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	
X.	Furnace Atomic Absorption QC	N	not utilized
XI.	ICP Serial Dilution	N	not performed
XII.	Sample Result Verification	N	
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	N	
XV	Field Blanks	ND	RB = 1

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

Validated Samples: water

1	LDW-SS527-RB	11		21		31	
2	LDW-SS527-RBMS	12		22		32	
3	LDW-SS527-RBDUP	13		23		33	
4	PBW	14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

LDC #: 22400B4
SDG #: QC19

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: L

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
QC 2,3	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
ICP Trace		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,

Comments: Mercury by CVAA if performed

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22400

Wet Chemistry

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 15 through December 17, 2009
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Wet Chemistry
Validation Level:	EPA Level III
Laboratory:	Analytical Resources, Inc.
Sample Delivery Groups (SDG):	QB98/QC15

Sample Identification

LDW-SS508-010
LDW-SS523-010
LDW-SS601-010
LDW-SS530-010
LDW-SS509-010
LDW-SS501-010
LDW-SS504-010
LDW-SS505-010
LDW-SS506-010
LDW-SS507-010
LDW-SS510-010
LDW-SS512-010
LDW-SS511-010
LDW-SS513-010
LDW-SS524-010
LDW-SS527-010
LDW-SS532-010
LDW-SS534-010
LDW-SS535-010
LDW-SS536-010
LDW-SS537-010
LDW-SS538-010
LDW-SS539-010
LDW-SS540-010
LDW-SS508-010MS
LDW-SS508-010DUP
LDW-SS504-010DUP
LDW-SS504-010TRP
LDW-SS511-010DUP
LDW-SS511-010TRP
LDW-SS527-010DUP
LDW-SS508-010TRP
LDW-SS527-010TRP

Introduction

This data review covers 33 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per the Plumb Method for Total Organic Carbon, PSEP Method for Particle Size, and EPA Method 160.3 for Percent Solids.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a 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.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

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

b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

V. Duplicates/Triplicates

Duplicate (DUP) and triplicate (TRP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

IX. Field Duplicates

Samples LDW-SS523-010 and LDW-SS601-010, samples LDW-SS507-010 and LDW-SS602-010 (from SDG QB99), and samples LDW-SS527-010 and LDW-SS603-010 (from SDG QC19) were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration (%)		RPD
	LDW-SS523-010	LDW-SS601-010	
Total solids	76.70	77.80	1
Total organic carbon	0.982	0.906	8

Phi Size	% Finer		RPD
	LDW-SS601-010	LDW-SS523-010	
-2	96.8	97.7	1
-1	91.3	93.2	2
0	85.6	88.1	3
1	68.3	70.9	4
2	39.4	41.5	5
3	22.2	24.0	8
4	12.3	13.8	11
5	8.4	8.5	1
6	6.6	6.7	2
7	4.9	5.0	2
8	3.4	3.7	8
9	2.2	2.4	9
10	1.1	1.3	17

Analyte	Concentration (%)		RPD
	LDW-SS507-010	LDW-SS602-010	
Total solids	47.20	47.00	0
Total organic carbon	1.79	1.97	10

Phi Size	% Finer		RPD
	LDW-SS602-010	LDW-SS507-010	
-1	100.0	99.6	0
0	98.5	99.0	1
1	96.6	97.9	1
2	94.1	96.4	2
3	90.3	93.2	3
4	84.1	87.1	4
5	75.8	76.6	1
6	62.1	63.8	3
7	45.4	47.4	4
8	31.0	32.6	5
9	20.1	22.2	10
10	12.6	13.8	9

Analyte	Concentration (%)		RPD
	LDW-SS527-010	LDW-SS603-010	
Total solids	46.60	47.40	2
Total organic carbon	2.35	2.43	3

Phi Size	% Finer		RPD
	LDW-SS603-010	LDW-SS527-010	
-1	99.6	98.9	1
0	96.8	98.7	2
1	94.8	97.7	3
2	92.3	96.4	4
3	87.8	94.2	7
4	74.9	85.3	13
5	57.9	67.1	15

Phi Size	% Finer		RPD
	LDW-SS603-010	LDW-SS527-010	
6	39.8	43.9	10
7	23.9	25.2	5
8	13.8	13.7	1
9	9.3	8.7	7
10	6.3	6.1	3

X. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Wet Chemistry - Data Qualification Summary - SDG QB98/QC15

No Sample Data Qualified in this SDG

Lower Duwamish Waterway Group
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG QB98/QC15

No Sample Data Qualified in this SDG

LDC #: 22400A6 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-25-10

SDG #: QB98/QC15 Level ~~IV~~ III Page: 1 of 1

Laboratory: Analytical Resources, Inc. 9m4 Reviewer: MG

2nd Reviewer: ✓

METHOD: TOC (Plumb Method), Particle Size (PSEP Method), Percent Solids (EPA Method 160.3)

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.	Technical holding times	A	Sampling dates: 12-15-09 through 12-17-09
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IV	Matrix Spike/Matrix Spike Duplicates	A	MS
V	Duplicates	A	DUP/TRP
VI.	Laboratory control samples	A	LCS
VII.	Sample result verification	N	(SDG: QB99)
VIII.	Overall assessment of data	A	D = 10 + LDW-SS602-010
IX.	Field duplicates	SW	D = 2+3, D = 16 + LDW-SS603-010
X	Field blanks	N	(SDG: QC19)

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

Validated Samples: all sediment

1	LDW-SS508-010	11	LDW-SS510-010	21	LDW-SS537-010	31	LDW-SS527-010DUP
2	LDW-SS523-010	12	LDW-SS512-010	22	LDW-SS538-010	32	LDW-SS508-010 TRP
3	LDW-SS601-010	13	LDW-SS511-010	23	LDW-SS539-010	33	LDW-SS527-010 TRP
4	LDW-SS530-010	14	LDW-SS513-010	24	LDW-SS540-010	34	PBS1
5	LDW-SS509-010	15	LDW-SS524-010	25	LDW-SS508-010MS	35	PBS2
6	LDW-SS501-010	16	LDW-SS527-010	26	LDW-SS508-010DUP	36	PBS3
7	LDW-SS504-010	17	LDW-SS532-010	27	LDW-SS504-010DUP	37	
8	LDW-SS505-010	18	LDW-SS534-010	28	LDW-SS504-010TRP	38	
9	LDW-SS506-010	19	LDW-SS535-010	29	LDW-SS511-010DUP	39	
10	LDW-SS507-010	20	LDW-SS536-010	30	LDW-SS511-010TRP	40	

Notes: _____

SDG #: QB98/QC15

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG

2nd reviewer: W

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1 → 24	sed	pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
QC 25, 26, 31 → 33	↓	pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
1 → 24		Moisture Density Porosity Organic Solids Gravity Particle size % solid
QC 26, 31 → 33		Moisture Density Porosity Organic Solids Gravity Particle size % solid
↓ 27 → 30	↓	Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size

Circled methods: TOC (rows 1 and 2); Particle size and % solid (row "1 → 24" of the lower section); % solid (row "QC 26, 31 → 33"); Particle size (row "27 → 30").

Comments:

SDG #: QB98/QC15

Field Duplicates

Reviewer: MG
2nd reviewer: ~

METHOD: Inorganics, Method See cover

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (%)		RPD (Limit)	Difference (Limit)	Qualifier
	2	3			
Total Solids	76.70	77.80	1		
TOC	0.982	0.906	8		

Analyte	Concentration (%)		RPD (Limit)	Difference (Limit)	Qualifier
	10	LDW-SS603-010			
Total Solids	47.20	47.00	0		
TOC	1.79	1.97	10		

Analyte	Concentration (%)		RPD (Limit)	Difference (Limit)	Qualifier
	16	LDW-SS603-010			
Total Solids	46.60	47.40	2		
TOC	2.35	2.43	3		

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

LDC#: 22400A6
SDG#: QB98/ QC15

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: W

Grain Size, Method PSEP

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

Phi Size	% Finer (%)		RPD	
	3	2		
-2	96.8	97.7	1	
-1	91.3	93.2	2	
0	85.6	88.1	3	
1	68.3	70.9	4	
2	39.4	41.5	5	
3	22.2	24.0	8	
4	12.3	13.8	11	
5	8.4	8.5	1	
6	6.6	6.7	2	
7	4.9	5.0	2	
8	3.4	3.7	8	
9	2.2	2.4	9	
10	1.1	1.3	17	

V:\FIELD DUPLICATES\FD_inorganic\22400A6.wpd

Phi Size	% Finer (%)		RPD	
	LDW-SS602-010	10		
-1	100.0	99.6	0	
0	98.5	99.0	1	
1	96.6	97.9	1	

LDC#: 22400A6
SDG#: 0B98/0C15

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer:

Grain Size, Method PSEP

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

Phi Size	% Finer (%)		RPD	
	LDW-SS602-010	10		
2	94.1	96.4	2	
3	90.3	93.2	3	
4	84.1	87.1	4	
5	75.8	76.6	1	
6	62.1	63.8	3	
7	45.4	47.4	4	
8	31.0	32.6	5	
9	20.1	22.2	10	
10	12.6	13.8	9	

V:\FIELD DUPLICATES\FD_inorganic\22400A6.wpd

Phi Size	% Finer (%)		RPD	
	LDW-SS603-010	16		
-1	99.6	98.9	1	
0	96.8	98.7	2	
1	94.8	97.7	3	
2	92.3	96.4	4	
3	87.8	94.2	7	
4	74.9	85.3	13	
5	57.9	67.1	15	

LDC#: 22400A6
SDG#: QB98/QC15

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: V

Grain Size, Method PSEP

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

Phi Size	% Finer (%)		RPD	
	LDW-SS603-010	16		
6	39.8	43.9	10	
7	23.9	25.2	5	
8	13.8	13.7	1	
9	9.3	8.7	7	
10	6.3	6.1	3	

V:\FIELD DUPLICATES\FD_inorganic\22400A6.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 17, 2009
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Wet Chemistry
Validation Level:	EPA Level IV
Laboratory:	Analytical Resources, Inc.
Sample Delivery Groups (SDG):	QC19

Sample Identification

LDW-SS541-010
LDW-SS542-010
LDW-SS543-010
LDW-SS545-010
LDW-SS546-010
LDW-SS603-010

Introduction

This data review covers 6 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per the Plumb Method for Total Organic Carbon, PSEP Method for Particle Size, and EPA Method 160.3 for Percent Solids.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a 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.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

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

b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

V. Duplicates/Triplicates

Duplicate (DUP) and triplicate (TRP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VII. Sample Result Verification

All sample result verifications were acceptable.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

IX. Field Duplicates

Samples LDW-SS603-010 and LDW-SS527-010 (from SDG QB98/QC15) were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration (%)		RPD
	LDW-SS603-010	LDW-SS527-010	
Total solids	47.40	46.60	2
Total organic carbon	2.43	2.35	3

Phi Size	% Finer		RPD
	LDW-SS603-010	LDW-SS527-010	
-1	99.6	98.9	1
0	96.8	98.7	2
1	94.8	97.7	3
2	92.3	96.4	4
3	87.8	94.2	7
4	74.9	85.3	13
5	57.9	67.1	15
6	39.8	43.9	10
7	23.9	25.2	5
8	13.8	13.7	1
9	9.3	8.7	7
10	6.3	6.1	3

X. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Wet Chemistry - Data Qualification Summary - SDG QC19

No Sample Data Qualified in this SDG

Lower Duwamish Waterway Group
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG QC19

No Sample Data Qualified in this SDG

LDC #: 22400B6 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-25-10
SDG #: QC19 Level IV Page: 1 of 1
Laboratory: Analytical Resources, Inc. Reviewer: MG
2nd Reviewer: V

METHOD: TOC (Plumb Method), Particle Size (PSEP Method), Percent Solids (EPA Method 160.3)

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.	Technical holding times	A	Sampling dates: 12-17-09
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IV	Matrix Spike/Matrix Spike Duplicates	N	not required
V	Duplicates	A	DUP/TRP (SDG: QC15)
VI.	Laboratory control samples	A	LCS
VII.	Sample result verification	A	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D=6 + LDW-SS527-010 (SDG: QB98/QC15)
X.	Field blanks	N	

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

Validated Samples: all sediment

1	LDW-SS541-010	11		21		31	
2	LDW-SS542-010	12		22		32	
3	LDW-SS543-010	13		23		33	
4	LDW-SS545-010	14		24		34	
5	LDW-SS546-010	15		25		35	
6	LDW-SS603-010	16		26		36	
NA 7	~~LDW-SS545-010DUP~~	17		27		37	
8	PBS	18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 22400B6
SDG #: QC19

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: VC

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. (Soil) Water.		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 22400B6
SDG #: QC19

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: W

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

SDG #: QC19

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: ✓

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→6	sed	pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 **TOC** CN NH_3 TKN CEC S Cr^{6+}
	↓	pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
1→6	↓	Moisture Density Porosity Organic Solids Gravity **Particle size** **% solid**
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size

Comments:

LDC #:_____ VALIDATION FINDINGS WORKSHEET Page: 1 of 1

SDG #: QC19 **Field Duplicates** Reviewer: MG

2nd reviewer: ✓

METHOD: Inorganics, Method See cover

(Y) N N/A Were field duplicate pairs identified in this SDG?

(Y) N N/A Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (%)		RPD (Limit)	Difference (Limit)	Qualifier
	6	LDW-SS527-010			
Total Solids	47.40	46.60	2		
TOC	2.43	2.35	3		

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

LDC#: 22400B6
SDG#: QC19

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: ✓

Grain Size, Method PSEP

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

Phi Size	% Finer (%)		RPD	
	6	LDW-SS527-010		
-1	99.6	98.9	1	
0	96.8	98.7	2	
1	94.8	97.7	3	
2	92.3	96.4	4	
3	87.8	94.2	7	
4	74.9	85.3	13	
5	57.9	67.1	15	
6	39.8	43.9	10	
7	23.9	25.2	5	
8	13.8	13.7	1	
9	9.3	8.7	7	
10	6.3	6.1	3	

LDC #: 22400B6
SDG #: QC19

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of TOC was recalculated. Calibration date: 1-4-10

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found x 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte		mass C (units)	Area (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	TOC	Blank	0 (ug)	58147	r^2=0.99965	r^2=0.99943	Y
Calibration verification		Standard 1	8 (	1770583			
		Standard 2	20 (	4611982			
		Standard 3	40 (	9454085			
		Standard 4	100 (	24563398			
		Standard 5	-	-			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	TOC	ICV	1014. (mg/L)	1000. (mg/L)	101.4	101.40	
Calibration verification	TOC	CCV1	983. (mg/L)	1000. (mg/L)	98.3	98.30	
Calibration verification	-	-	-	-	-	-	-

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22400B6
SDG #: QC19

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

RPD = |S-D| / (S+D)/2 x 100 Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD		Acceptable (Y/N)
LCS	Laboratory control sample	TOC	0.1014 (%)	0.100 (%)	101.4	101.0		Y
—	Matrix spike sample	—	(SSR-SR) —	—	—	—		—
LD W-SS527-010	Duplicate sample	Total Solids	Trip1 46.60 (%)	Trip2 47.50 (%)	Trip3 47.30 (%)	RSD re-calc 1.0	RSD reported 1.0	Y

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22400B6
SDG #: QC19

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: V

METHOD: Inorganics, Method See cover

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

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments?
(Y) N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, TOC reported with a positive detect were recalculated and verified using the following equation:

Concentration =

$y = mx + b$

where $m = 246372$

$b = -186465$ (but zero is used)

dil = 1x w/ 2.3 mg burn wt.

Recalculation:

$6078512 = 246372(x\ \mu gC) + 0$

$24.672\ \mu gC = x$ (dry wt)

then $\frac{24.672\ mg}{0.0023\ g} = 10727\ \mu g/g$ or mg/kg or 1.07

#	Sample ID	Analyte	Reported Concentration (%)	Calculated Concentration (%)	Acceptable (Y/N)
1	1	Total Solids	69.90	69.91	Y
		TOC	1.10	1.07	
		Particle Size	% finer	% finer	
		4750.(μm)	100.0	100.0	
		2000. ( )	99.9	99.9	
		1000. ( )	99.7	99.7	
		500. ( )	98.3	98.3	
		250. ( )	78.9	78.9	
		125. ( )	30.4	30.4	
		63. ( )	21.3	21.3	
		31.0 ( )	14.2	14.2	
		15.6 ( )	10.3	10.3	
		7.8 ( )	7.0	7.0	
		3.9 ( )	4.6	4.6	
		2.0 ( )	3.4	3.5	
		1.0 ( )	2.5	2.5	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 16, 2009
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Wet Chemistry
Validation Level:	EPA Level III
Laboratory:	Analytical Resources, Inc.
Sample Delivery Groups (SDG):	QB99

Sample Identification

LDW-SS514-010
LDW-SS515-010
LDW-SS516-010
LDW-SS517-010
LDW-SS518-010
LDW-SS519-010
LDW-SS521-010
LDW-SS522-010
LDW-SS525-010
LDW-SS526-010
LDW-SS528-010
LDW-SS602-010
LDW-SS525-010MS
LDW-SS525-010DUP
LDW-SS602-010DUP
LDW-SS602-010TRP
LDW-SS525-010TRP

Introduction

This data review covers 17 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per the Plumb Method for Total Organic Carbon, PSEP Method for Particle Size, and EPA Method 160.3 for Percent Solids.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a 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.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

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

b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

V. Duplicates/Triplicates

Duplicate (DUP) and triplicate (TRP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

IX. Field Duplicates

Samples LDW-SS602-010 and LDW-SS507-010 (from SDG QB98/QC15) were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration (%)		RPD
	LDW-SS602-010	LDW-SS507-010	
Total solids	47.00	47.20	0
Total organic carbon	1.97	1.79	10

Analyte	% Finer		RPD
	LDW-SS602-010	LDW-SS507-010	
-1	100.0	99.6	0
0	98.5	99.0	1
1	96.6	97.9	1
2	94.1	96.4	2
3	90.3	93.2	3
4	84.1	87.1	4
5	75.8	76.6	1
6	62.1	63.8	3
7	45.4	47.4	4
8	31.0	32.6	5
9	20.1	22.2	10
10	12.6	13.8	9

X. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Wet Chemistry - Data Qualification Summary - SDG QB99

No Sample Data Qualified in this SDG

Lower Duwamish Waterway Group
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG QB99

No Sample Data Qualified in this SDG

LDC #: 22400C6 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-25-10

SDG #: QB99 Level ~~IV~~ III Page: 1 of 1

Laboratory: Analytical Resources, Inc. Reviewer: MG

2nd Reviewer:

METHOD: TOC (Plumb Method), Particle Size (PSEP Method), Percent Solids (EPA Method 160.3)

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.	Technical holding times	A	Sampling dates: 12-16-09
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IV	Matrix Spike/Matrix Spike Duplicates	A	MS
V	Duplicates	A	DUP/TRP
VI.	Laboratory control samples	A	LCS
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D = 12 + LDW-SS507-010 (SDG: QB98/QC 15)
X	Field blanks	N	

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

Validated Samples: all sediment

1	LDW-SS514-010	11	LDW-SS528-010	21		31	
2	LDW-SS515-010	12	LDW-SS602-010	22		32	
3	LDW-SS516-010	13	LDW-SS525-010MS	23		33	
4	LDW-SS517-010	14	LDW-SS525-010DUP	24		34	
5	LDW-SS518-010	15	LDW-SS602-010DUP	25		35	
6	LDW-SS519-010	16	LDW-SS602-010TRP	26		36	
7	LDW-SS521-010	17	LDW-SS525-010TRP	27		37	
8	LDW-SS522-010	18	PBS	28		38	
9	LDW-SS525-010	19		29		39	
10	LDW-SS526-010	20		30		40	

Notes:

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

SDG #: QB99

Reviewer: MG
2nd reviewer: [signature]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1 → 12	sed	pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 (TOC) CN NH_3 TKN CEC S Cr^{6+}
QC 13	↓	pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 (TOC) CN NH_3 TKN CEC S Cr^{6+}
↓ 14,17		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 (TOC) CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
1 → 12		Moisture Density Porosity Organic Solids Gravity (Particle size) (% solid)
QC 14,17		Moisture Density Porosity Organic Solids Gravity Particle size (% solid)
↓ 15,16	↓	Moisture Density Porosity Organic Solids Gravity (Particle size)
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size

Comments:

LDC #: _____

SDG #: QB99

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Page: 1 of 1

Reviewer: MG

2nd reviewer: [signature]

METHOD: Inorganics, Method See cover

(Y) N N/A Were field duplicate pairs identified in this SDG?

(Y) N N/A Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (%)		RPD (Limit)	Difference (Limit)	Qualifier
	12	LDW-SS507-010			
Total Solids	47.00	47.20	0		
TOC	1.97	1.79	10		

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

LDC#: 22400C6
SDG#: QB79

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [signature]

Grain Size, Method PSEP

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

Phi Size	% Finer (%)		RPD	
	12	LDW-SS507-010		
-1	100.0	99.6	0	
0	98.5	99.0	1	
1	96.6	97.9	1	
2	94.1	96.4	2	
3	90.3	93.2	3	
4	84.1	87.1	4	
5	75.8	76.6	1	
6	62.1	63.8	3	
7	45.4	47.4	4	
8	31.0	32.6	5	
9	20.1	22.2	10	
10	12.6	13.8	9	

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Windward Environmental, LLC
200 West Mercer Street, Suite 401
Seattle, WA 98119
ATTN: Ms. Marina Mitchell

April 30, 2010

SUBJECT: Lower Duwamish Waterway Group, Data Validation

Dear Ms. Mitchell,

Enclosed are the revised validation reports for the fraction listed below. These SDGs were received on February 5, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 22536:

SDG #	Fraction
DPWG31717/WG31355 DPWG31752/WG31593	Dioxins/Dibenzofurans

The data validation was performed under EPA Level IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005
- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005, Dioxin/Furan Addendum, December 2009
- EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin(PCDD) and Polychlorinated Dibenzofuran(PCDF) Data, Revision 2.0, January 1996
- USEPA, Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Diobenzofurans Data Review, September 2005

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

Sincerely,

Stella S. Cuenco
Data Validation Operations Manager/Senior Chemist

Attachment 1

EDD	LDC #22536 (Windward Environmental, LLC - Seattle WA / Lower Duwamish Waterway Group)																																			PO# Axys07-04
LDC	SDG#	DATE REC'D	(3) DATE DUE	Dioxins (8290)																																
Matrix: 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	W	S
A	DPWG31717/WG31355	02/05/10	03/01/10	0	17																															
B	DPWG31752/WG31593	02/09/10	03/01/10	0	10																															
Total	T/SC			0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27

Shaded cells indicate Level IV validation (all other cells are Level II validation). These sample counts do not include MS/MSD, and DUPs

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22536

Dioxins/Dibenzofurans

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Lower Duwamish Waterway Group

Collection Date: December 16 through December 17, 2009

LDC Report Date: April 29, 2010

Matrix: Sediment

Parameters: Dioxins/Dibenzofurans

Validation Level: EPA Level IV

Laboratory: AXYS Analytical Services Ltd.

Sample Delivery Group (SDG): DPWG31717/WG31355

Sample Identification

LDW-SS526-010
LDW-SS528-010
LDW-SS511-010
LDW-SS513-010
LDW-SS524-010
LDW-SS527-010
LDW-SS532-010
LDW-SS535-010
LDW-SS536-010
LDW-SS537-010
LDW-SS538-010
LDW-SS539-010
LDW-SS540-010
LDW-SS542-010
LDW-SS543-010
LDW-SS545-010
LDW-SS546-010
LDW-SS536-010DUP

Introduction

This data review covers 18 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 1613B for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data (Revision 2.0, January 31, 1996) and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005) as there are no current guidelines for the method stated above.

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

J1 Blank Contamination: Indicates possible high bias and/or false positives.

J2 Calibration Range exceeded: Indicates possible low bias.

J3 Holding times not met: Indicates low bias for most analytes.

J4 Other QC parameters outside control limits: bias not readily determined.

J5 Other QC parameters outside control limits. The reported results appear to be biased high. The actual value of target compound in the sample may be lower than the value reported by the laboratory.

J6 Other QC parameters outside control limits. The reported results appear to be biased low. The actual value of target compound in the sample may be higher than the value reported by the laboratory.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between ^{13}C-2,3,7,8-TCDD and ^{13}C-1,2,3,4-TCDD was less than or equal to 25%.

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

III. Initial Calibration

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

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for all native compounds and less than or equal to 35.0% for all labeled compounds.

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

The minimum S/N ratio was technically acceptable.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration concentrations were within the QC limits.

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks.

Method blank results flagged "K" by the laboratory as estimated maximum possible concentration (EMPC) were considered not detected.

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.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VII. Ongoing Precision & Recovery (OPR) and Standard Reference Material (SRM) Samples

Percent recoveries (%R) of the ongoing precision and recovery samples were within QC limits.

Standard reference material samples were analyzed at the required frequency.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

All target compound identifications were within validation criteria.

XI. Compound Quantitation and CRQLs

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG DPWG31717/WG31355	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A

XII. System Performance

The system performance was acceptable.

XIII. Overall Assessment of Data

The overall assessment of data was acceptable. In the case where more than one result was reported for an individual sample, the least technically acceptable results were rejected as follows:

Sample	Compound	Flag	A or P
All samples in SDG DPWG31717/WG31355	2,3,7,8-TCDF (from DB-5)	R	A

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG31717/WG31355

SDG	Sample	Compound	Flag	A or P	Reason
DPWG31717/ WG31355	LDW-SS526-010 LDW-SS528-010 LDW-SS511-010 LDW-SS513-010 LDW-SS524-010 LDW-SS527-010 LDW-SS532-010 LDW-SS535-010 LDW-SS536-010 LDW-SS537-010 LDW-SS538-010 LDW-SS539-010 LDW-SS540-010 LDW-SS542-010 LDW-SS543-010 LDW-SS545-010 LDW-SS546-010 LDW-SS536-010DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and CRQLs (EMPC)
DPWG31717/ WG31355	LDW-SS526-010 LDW-SS528-010 LDW-SS511-010 LDW-SS513-010 LDW-SS524-010 LDW-SS527-010 LDW-SS532-010 LDW-SS535-010 LDW-SS536-010 LDW-SS537-010 LDW-SS538-010 LDW-SS539-010 LDW-SS540-010 LDW-SS542-010 LDW-SS543-010 LDW-SS545-010 LDW-SS546-010 LDW-SS536-010DUP	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

Lower Duwamish Waterway Group
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG31717/WG31355

No Sample Data Qualified in this SDG

LDC #: 22536A21 **VALIDATION COMPLETENESS WORKSHEET** Date: 3/10/10
SDG #: DPWG31717/WG31355 Level IV Page: 1 of 1
Laboratory: AXYS Analytical Services Ltd. Reviewer: 9
2nd Reviewer: N

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

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.	Technical holding times	A	Sampling dates: 12/16-17/09
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	20/35%
IV.	Routine calibration	A	QC limits
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates ~~MS~~ DUP	N/A	<10DL.
VII.	Laboratory control samples	A	OPR. CRM
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	A	
XIII.	Overall assessment of data	SW	
XIV.	Field duplicates	N	~~D=6~~
XV.	Field blanks	N	

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

Validated Samples:
MS seds

1 1	LDW-SS526-010	11 3	LDW-SS538-010	21	WG31355-10 1	31	
2 1	LDW-SS528-010	12 4	LDW-SS539-010	22		32	
3 1	LDW-SS511-010	13 5	LDW-SS540-010	23		33	
4 2	LDW-SS513-010	14 5	LDW-SS542-010	24		34	
5 1	LDW-SS524-010	15 4	LDW-SS543-010	25		35	
6 1	LDW-SS527-010	16 6	LDW-SS545-010	26		36	
7 1	LDW-SS532-010	17 5	LDW-SS546-010	27		37	
8 3	LDW-SS535-010	18 4	LDW-SS536-010DUP	28		38	
9 3	LDW-SS536-010	19		29		39	
10 4	LDW-SS537-010	20		30		40	

Notes: _____

DC #: 225364/
DG #: See Cover

VALIDATION FINDINGS CHECKLIST

Reviewer: 9
2nd Reviewer: dc

Method: Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?	✓			
Were the retention time windows established for all homologues?	✓			
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?	✓			
Is the static resolving power at least 10,000 (10% valley definition)?	✓			
Was the mass resolution adequately check with PFK?	✓			
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?	✓			
III. Initial calibration				
Was the initial calibration performed at 5 concentration levels?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?	✓			
Did all calibration standards meet the Ion Abundance Ratio criteria?	✓			
Was the signal to noise ratio for each target compound ≥ 2.5 and for each recovery and internal standard ≥ 10?	✓			
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?	✓			
Were all ~~percent differences (%D) ≤ 20%~~ meet QC limits for unlabeled standards and ~~≤ 30%~~ for labeled standards?	✓			
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	✓			
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank performed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.		✓		DUP < 10x DL
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			

DC #: 225364/
DG #: See cover

VALIDATION FINDINGS CHECKLIST

Reviewer: Q
2nd Reviewer: V

Validation Area	Yes	No	NA	Findings/Comments
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
IX. Internal standards				
Were internal standard recoveries within the 40-135% criteria?	✓			
Was the minimum S/N ratio of all internal standard peaks $\geq$ 10?	✓			
X. Target compound identification				
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?	✓			
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?	✓			
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?	✓			
Did compound spectra contain all characteristic ions listed in the table attached?	✓			
Was the Ion Abundance Ratio for the two quantitation ions within criteria?	✓			
Was the signal to noise ratio for each target compound and labeled standard $\geq$ 2.5?	✓			
Does the maximum intensity of each specified characteristic ion coincide within $\pm$ 2 seconds (includes labeled standards)?	✓			
For PCDF identification, was any signal (S/N $\geq$ 2.5, at $\pm$ seconds RT) detected in the corresponding PCDPE channel?			✓	
Was an acceptable lock mass recorded and monitored?	✓			
XI. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XII. System performance				
System performance was found to be acceptable.	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		

Validation Area	Yes	No	NA	Findings/Comments
Target compounds were detected in the field duplicates.			✓	
XV. Field blanks				
Field blanks were identified in this SDG.		✓		
Target compounds were detected in the field blanks.			✓	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans ~~(EPA SW 846 Method 8290)~~

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 #: 22536A2/1
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: 9
2nd Reviewer: [illegible]

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method ~~8290~~ 1613)

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 analyzed for each matrix?
(Y) N N/A Was the blank contaminated? If yes, please see qualification below.

Blank extraction date: 1/4/10 **Blank analysis date:** 1/15/10
Conc. units: pg/kg Associated Samples: All

Compound	Blank ID	Sample Identification								
	MB 31355-10 1									
4	EMPC results qual U									

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".

LDC #: 22536A2/
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 4

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~/613)

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

(Y) N N/A Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound?
(Y) N N/A Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		All	2MPC results		U
		~~#~~	~~#~~		

Comments: See sample calculation verification worksheet for recalculations

LDC #: 22536A21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Page: 1 of 1
Reviewer: 9
2nd Reviewer: M

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

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	Finding	Associated Samples	Qualifications
		All	H on OB-5	All	R/A

Comments: _____

SDG #: See Cover

Initial Calibration Calculation Verification

Page: 2 of 2
Reviewer: 9
2nd Reviewer: 1

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
$\%RSD = 100 * (S/X)$

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	1CAL	11/19/09	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	0.83	0.83	0.83	2.19	2.31
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	0.87	0.84	0.84	4.39	4.26
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	0.79	0.78	0.78	1.51	1.45
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	1.07	1.13	1.13	3.27	3.52
			OCDF (^{13}C-OCDD)	0.78	0.78	0.75	0.75	19.8	20.0
2	1CAL	12/23/09	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	0.92	0.91	0.91	4.69	4.56
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: [illegible]
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: Q
2nd Reviewer: ✓

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290)~~ 1613)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	DXOM_001	1/15/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.5	10.5		
	S=11		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	10.3	10.3		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	54.0	53.8		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	45.3	45.4		
			OCDF (^{13}C-OCDD)	0.78	121	121		
2	DXOM_010	1/25/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.4	10.4		
	S:3		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	10.0	10.0		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	53.0	52.8		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	44.8	44.9		
			OCDF (^{13}C-OCDD)	0.78	120	120		
3	DXOM_009	1/21/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.6	10.6		
	S=8		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	10.2	10.2		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	54.8	54.5		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	45.0	45.2		
			OCDF (^{13}C-OCDD)	0.78	120	119		

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22536A7
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: 9
2nd Reviewer: 4

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for th compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	DX0M_007 S=1	1/15/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.5	10.5		
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	10.1	10.1		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	54.9	54.5		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	44.9	45.1		
			OCDF (^{13}C-OCDD)	0.78	121	120		
2	DB0B_020 S=3	1/20/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	12.1	12.2		
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
3	DX0M_008 S=1	1/20/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.4	10.4		
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.85	10.3	10.2		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	55.5	55.1		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	44.1	44.4		
			OCDF (^{13}C-OCDD)	0.78	120	120		

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22536A21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: 9
2nd Reviewer: V

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~) 1613)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	DXCM_015	1/26/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
	S=1		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)	0.78	11.9	11.9		
2	DB0B_015	1/14/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	11.0	11.1		
	S=2		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
3	DB0B_21	1/20/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	12.4	12.5		
	S=2		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22548B21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: Q
2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for th compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	DX0M_009	1/21/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.5	10.5		
	S=1		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.85	10.2	10.2		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	54.4	53.9		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	44.5	44.5		
			OCDF (^{13}C-OCDD)	0.78	121	120		
2			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: ~~22536A1~~
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: 9
2nd Reviewer: M

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = | LCS - LCSD | * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: WG31355-102

Compound	Spike Added (ng/mL)		Spiked Sample Concentration (ng/mL)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	10.0	NA	9.93	NA	99.3	99.3				
1,2,3,7,8-PeCDD	52.0	↓	52.8	↓	102	102				
1,2,3,4,7,8-HxCDD	56.5		53.7		95.1	95.0				
1,2,3,4,7,8,9-HpCDF	50.0		46.5		93.1	93.0				
OCDF	104	↓	115	↓	110	111				

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

Descriptor	Accurate mass[a]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 22536A21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: a

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

RRF = Relative Response Factor (average) from the initial calibration

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

Example:

Sample I.D. 1 , A :

Conc. = $\frac{(3.9\text{E}3)(2000)(\quad)}{(1.65\text{E}6)(0.87)(10.5)(\quad)}$

= 0.523 ng/g

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 15 through December 17, 2009
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Dioxins/Dibenzofurans
Validation Level:	EPA Level IV
Laboratory:	AXYS Analytical Services Ltd.
Sample Delivery Group (SDG):	DPWG31752/WG31593

Sample Identification

LDW-SS508-010
LDW-SS504-010
LDW-SS506-010
LDW-SS512-010
LDW-SS518-010
LDW-SS519-010
LDW-SS521-010
LDW-SS522-010
LDW-SS534-010
LDW-SS541-010
LDW-SS534-010DUP

Introduction

This data review covers 11 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 1613B for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data (Revision 2.0, January 31, 1996) and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005) as there are no current guidelines for the method stated above.

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

- J1 Blank Contamination: Indicates possible high bias and/or false positives.
- J2 Calibration Range exceeded: Indicates possible low bias.
- J3 Holding times not met: Indicates low bias for most analytes.
- J4 Other QC parameters outside control limits: bias not readily determined.
- J5 Other QC parameters outside control limits. The reported results appear to be biased high. The actual value of target compound in the sample may be lower than the value reported by the laboratory.
- J6 Other QC parameters outside control limits. The reported results appear to be biased low. The actual value of target compound in the sample may be higher than the value reported by the laboratory.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between ^{13}C-2,3,7,8-TCDD and ^{13}C-1,2,3,4-TCDD was less than or equal to 25%.

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

III. Initial Calibration

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

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for all native compounds and less than or equal to 35.0% for all labeled compounds.

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

The minimum S/N ratio was technically acceptable.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration concentrations were within the QC limits.

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
WG31593-101	1/25/10	1,2,3,4,6,7,8-HpCDD OCDD Total HpCDD	0.059 ng/Kg 0.080 ng/Kg 0.059 ng/Kg	All samples in SDG DPWG31752/WG31593

Sample concentrations were compared to concentrations detected in the method blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks.

Method blank results flagged "K" by the laboratory as estimated maximum possible concentration (EMPC) were considered not detected.

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.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
LDW-SS534-010DUP (LDW-SS534-010 LDW-SS534-010DUP)	1,2,3,4,7,8-HxCDF	55.4 (≤50)	J (all detects)	A

VII. Ongoing Precision & Recovery (OPR) and Standard Reference Material (SRM) Samples

Percent recoveries (%R) of the ongoing precision and recovery samples were within QC limits.

Standard reference material samples were analyzed at the required frequency.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

All target compound identifications were within validation criteria.

XI. Compound Quantitation and CRQLs

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG DPWG31752/WG31593	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A

XII. System Performance

The system performance was acceptable.

XIII. Overall Assessment of Data

The overall assessment of data was acceptable. In the case where more than one result was reported for an individual sample, the least technically acceptable results were rejected as follows:

Sample	Compound	Flag	A or P
LDW-SS504-010 LDW-SS506-010 LDW-SS512-010 LDW-SS518-010 LDW-SS519-010 LDW-SS521-010 LDW-SS522-010 LDW-SS534-010 LDW-SS541-010 LDW-SS534-010DUP	2,3,7,8-TCDF (from DB-5)	R	A

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG31752/WG31593

SDG	Sample	Compound	Flag	A or P	Reason
DPWG31752/ WG31593	LDW-SS534-010 LDW-SS534-010DUP	1,2,3,4,7,8-HxCDF	J (all detects)	A	Duplicate sample analysis (RPD)
DPWG31752/ WG31593	LDW-SS508-010 LDW-SS504-010 LDW-SS506-010 LDW-SS512-010 LDW-SS518-010 LDW-SS519-010 LDW-SS521-010 LDW-SS522-010 LDW-SS534-010 LDW-SS541-010 LDW-SS534-010DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and CRQLs (EMPC)
DPWG31752/ WG31593	LDW-SS504-010 LDW-SS506-010 LDW-SS512-010 LDW-SS518-010 LDW-SS519-010 LDW-SS521-010 LDW-SS522-010 LDW-SS534-010 LDW-SS541-010 LDW-SS534-010DUP	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

Lower Duwamish Waterway Group
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG31752/WG31593

No Sample Data Qualified in this SDG

LDC #: 22536B21 **VALIDATION COMPLETENESS WORKSHEET** Date: 2/10/10
SDG #: DPWG31752/WG31593 Level IV Page: 1 of 1
Laboratory: AXYS Analytical Services Ltd. Reviewer: A
2nd Reviewer: [illegible]

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

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.	Technical holding times	A	Sampling dates: 12/15-17/09
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	20/35%
IV.	Routine calibration	A	QC limits.
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates /Dup	N/SW	
VII.	Laboratory control samples	A	OPR. CRM
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	A	
XIII.	Overall assessment of data	SW	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

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

Validated Samples:
MS sds

1	LDW-SS508-010	11	LDW-SS534-010DUP	21	WF31593-10	31	
2	LDW-SS504-010	12		22		32	
3	LDW-SS506-010	13		23		33	
4	LDW-SS512-010	14		24		34	
5	LDW-SS518-010	15		25		35	
6	LDW-SS519-010	16		26		36	
7	LDW-SS521-010	17		27		37	
8	LDW-SS522-010	18		28		38	
9	LDW-SS534-010	19		29		39	
10	LDW-SS541-010	20		30		40	

Notes: _____

DC #: 22536B2/
DG #: see cover

VALIDATION FINDINGS CHECKLIST

Reviewer: Q
2nd Reviewer: N

Method: Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?	✓			
Were the retention time windows established for all homologues?	✓			
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?	✓			
Is the static resolving power at least 10,000 (10% valley definition)?	✓			
Was the mass resolution adequately check with PFK?	✓			
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?	✓			
III. Initial calibration				
Was the initial calibration performed at 5 concentration levels?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% ~~for~~ 35% for unlabeled standards and ≤ 30% for labeled standards?	✓			
Did all calibration standards meet the Ion Abundance Ratio criteria?	✓			
Was the signal to noise ratio for each target compound ≥ 2.5 and for each recovery and internal standard ≥ 10?	✓			
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?	✓			
Were ~~all percent differences (%D) ≤ 20%~~ conc for unlabeled standards and ~~≤ 30% for~~ labeled standards meet QC limits ?	✓			
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	✓			
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank performed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.		✓		DUP
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			

)C #: 225367
)G #: Secondary

VALIDATION FINDINGS CHECKLIST

Reviewer: 4
2nd Reviewer: M

Validation Area	Yes	No	NA	Findings/Comments
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
IX. Internal standards				
Were internal standard recoveries within the 40-135% criteria?	✓			
Was the minimum S/N ratio of all internal standard peaks $\geq$ 10?	✓			
X. Target compound identification				
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?	✓			
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?	✓			
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?	✓			
Did compound spectra contain all characteristic ions listed in the table attached?	✓			
Was the Ion Abundance Ratio for the two quantitation ions within criteria?	✓			
Was the signal to noise ratio for each target compound and labeled standard $\geq$ 2.5?	✓			
Does the maximum intensity of each specified characteristic ion coincide within $\pm$ 2 seconds (includes labeled standards)?	✓			
For PCDF identification, was any signal (S/N $\geq$ 2.5, at $\pm$ seconds RT) detected in the corresponding PCDPE channel?			✓	
Was an acceptable lock mass recorded and monitored?	✓			
XI. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XII. System performance				
System performance was found to be acceptable.	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		

)C #: 22536B2
)G #: See cover

VALIDATION FINDINGS CHECKLIST

Reviewer: Q
2nd Reviewer: M

Validation Area	Yes	No	NA	Findings/Comments
Target compounds were detected in the field duplicates.			✓	
XV. Field blanks				
Field blanks were identified in this SDG.		✓		
Target compounds were detected in the field blanks.			✓	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans ~~(EPA SW-846 Method 8290)~~

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 #: 22536B2
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: q
2nd Reviewer: r

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method ~~8290)~~ 1613)
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 analyzed for each matrix?
(Y) N N/A Was the blank contaminated? If yes, please see qualification below.

Blank extraction date: 1/25/10 **Blank analysis date:** 1/29/10
Conc. units: ng/Kg Associated Samples: All (>5X)

Compound	Blank ID	Sample Identification								
	WG315931-101									
F	0.059									
G	0.080									
U	0.059									

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".

)C #: 225362/
)G #: See cover

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: 9
2nd Reviewer: K

ETHOD: ___ GC ___ HPLC (EPA Method 1613)

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

N N/A Was a duplicate sample analyzed for each matrix in this SDG?

N N/A Were all duplicate sample relative percent differences (RPD) ≤ 50? (conc > 10x RDL)

EVEL IV ONLY:

N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Compound	RPD (Limits)	Associated Samples	Qualifications
		11	Sed	K	55.4	9, 11	Data/A
				~~P~~	~~13.9~~		~~P~~

omments:

V:\Validation Worksheets\GC\DUP GC

LDC #: 22536B2/
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

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

Y N N/A Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound?
Y N N/A Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		all	EMPC results	all	U

Comments: See sample calculation verification worksheet for recalculations

LDC #: 20956D4
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Page: 1 of 1
Reviewer: 9
2nd Reviewer: M

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

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	Finding	Associated Samples	Qualifications
		2-11	Hom DB-5	2-11	R/A

Comments: _____

C:\WPDOCS\WRK\DIOXIN90\OVR90.21

SDG #: see cover

Initial Calibration Calculation Verification

Reviewer: 9
2nd Reviewer: K

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound,
C_x = Concentration of compound,
S = Standard deviation of the RRFs,

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	ICAL	11/19/09	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.85	0.83	0.83	0.83	2.19	2.31
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	0.87	0.84	0.84	4.39	4.26
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	0.79	0.78	0.78	1.51	1.45
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	1.07	1.13	1.13	3.27	3.52
			OCDF (^{13}C-OCDD)	0.78	0.78	0.75	0.75	19.8	20.0
2	ICAL	12/23/09	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	0.92	0.91	0.91	4.69	4.56
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: [illegible]
SDG #: Second

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: K

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	DXOM_012	1/28/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.3	10.4		
	S=1		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.85	10.3	10.3		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	54.3	54.1		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	44.6	44.8		
			OCDF (^{13}C-OCDD)	0.78	118	118		
2	DB0B031A		2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	11.7	11.7		
	S=2		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
3	DXOM_102	1/29/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.6	10.6		
	S=12		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	10.2	10.1		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	54.2	53.7		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	44.5	44.6		
			OCDF (^{13}C-OCDD)	0.78	117	117		

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22536B2
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: 9
2nd Reviewer: K

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~/1613)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for th compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	DXOM-013 S=1	2/1/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.1	10.2		
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	10.0	10.0		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	54.6	54.2		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	43.3	43.3		
			OCDF (^{13}C-OCDD)	0.78	11T	11T		
2			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 25xxxD7
SDG #: See cover

Page: 1 of 1
Reviewer: Q
2nd Reviewer: K

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA   Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCS - LCSD I * 2/(LCS + LCSD)   LCS = Laboraotry control sample percent recovery   LCSD = Laboratory control sample duplicate percent recovery

LCS ID: WG31593-10 (OPR)

Compound	Spike Added (ug/mL)		Spiked Sample Concentration (ug/mL)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	10.6	NA	9.72	NA	91.7	91.7				
1,2,3,7,8-PeCDD	56.6		49.6		87.6	87.6				
1,2,3,4,7,8-HxCDD	59.2		52.4		88.5	88.5				
1,2,3,4,7,8,9-HpCDF	50.0		44.2		88.4	88.4				
OCDF	109		118		109	108				

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

Descriptor	Accurate mass[a]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 22536B1
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: A

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

RRF = Relative Response Factor (average) from the initial calibration

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

Example:

Sample I.D. 1 , F :

Conc. = $\frac{(3.7\text{E}3)(2000)(\quad)}{(4.4\text{E}5)(1.0\text{T})(10.6)(\quad)}$

= 1.48 ng/kg.

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Windward Environmental, LLC
200 West Mercer Street, Suite 401
Seattle, WA 98119
ATTN: Ms. Marina Mitchell

April 30, 2010

SUBJECT: Lower Duwamish Waterway Group, Data Validation

Dear Ms. Mitchell,

Enclosed are the revised validation reports for the fractions listed below. These SDGs were received on February 10, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 22575:

SDG #	Fraction
QF92, QG62	Semivolatiles, Polynuclear Aromatic Hydrocarbons, Polychlorinated Biphenyls, Metals, Wet Chemistry

The data validation was performed under EPA Level III & IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005
- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005, Dioxin/Furan Addendum, December 2009
- USEPA, Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008
- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
- 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

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

Sincerely,

Stella S. Cuenco
Data Validation Operations Manager/Senior Chemist

Attachment 1

EDD	LDC #22575 (Windward Environmental, LLC - Seattle WA / Lower Duwamish Waterway Group)																																			
LDC	SDG#	DATE REC'D	(3) DATE DUE	SVOA (8270D)		SVOA (8270D-SIM)		PAH (8270D-SIM)		PCBs (8082)		Metals (SW846)		As (200.8)		TOC (Plumb)		Total Solids (160.3)		Part. Size (PSEP)															
Matrix:	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	W	S
A	QF92	02/10/10	03/04/10	-	-	-	-	-	-	-	-	-	-	-	-	0	8	0	8	0	8																
B	QG62	02/10/10	03/04/10	0	2	0	2	0	12	0	12	0	2	0	10	-	-	-	-	-	-																
B	QG62	02/10/10	03/04/10	0	1	0	1	0	3	0	3	0	1	0	2	-	-	-	-	-	-																
Total	A/SC			0	3	0	3	0	15	0	15	0	3	0	10	0	8	0	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73

Shaded cells indicate Level IV validation (all other cells are Level II validation). These sample counts do not include MS/MSD, and DUPs

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22575

Semivolatiles

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 17, 2009 through January 11, 2010
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Semivolatiles
Validation Level:	EPA Level III & IV
Laboratory:	Analytical Resources, Inc.
Sample Delivery Group (SDG):	QG62

Sample Identification

LDW-SS502-010-comp
LDW-SS527-010**
LDW-SS603-010

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 3 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8270D for Semivolatiles.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (June 2008).

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XVI.

Samples indicated by a double asterisk on the front cover underwent EPA Level IV review. EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by EPA Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. GC/MS Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration

Initial calibration was performed using required standard concentrations.

Percent relative standard deviations (%RSD) were less than or equal to 30.0% for all compounds.

In the case where %RSD was greater than 15.0%, the laboratory used a calibration curve to evaluate the compound. All coefficients of determination (r^2) were greater than or equal to 0.990 .

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

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

Percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were within the method criteria of less than or equal to 20.0% for calibration check compounds (CCCs) and 25.0% for all other compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
1/28/10	Hexachlorocyclopentadiene	26.0	All samples in SDG QG62	J (all detects) UJ (all non-detects)	A
	2,4-Dinitrophenol	31.2		J (all detects) UJ (all non-detects)	

The percent differences (%D) of the second source calibration standard were less than or equal to 25.0% for all compounds.

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No semivolatile contaminants were found in the method blanks.

VI. Surrogate Spikes

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries (%R) 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 (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Flag	A or P
LCS/LCSD-012610 (All samples in SDG QG62)	4-Chloroaniline 3,3'-Dichlorobenzidine Aniline	32.7 (40-130) 38.4 (40-130) 25.2 (40-130)	- - -	54.7 (≤50) - 57.6 (≤50)	J (all detects) UJ (all non-detects)	P

Standard reference material was analyzed at the required frequency.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

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

XI. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

XII. Compound Quantitation and CRQLs

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Flag	A or P
All samples in SDG QG62	Benzo(b)fluoranthene Benzo(k)fluoranthene	Due to lack of resolution between these compounds in the samples, the laboratory performed the quantitation using the total peak area and reported the average concentration for both compounds.	J (all detects) J (all detects)	A

The actual values of these compounds may be lower or higher than the values reported by the laboratory.

Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

XIII. Tentatively Identified Compounds (TICs)

Tentatively identified compounds were not reported by the laboratory.

XIV. System Performance

The system performance was acceptable for samples on which EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XV. Overall Assessment

Data flags are summarized at the end of this report if data has been qualified.

XVI. Field Duplicates

Samples LDW-SS527-010** and LDW-SS603-010 were identified as field duplicates. No semivolatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/Kg)		RPD
	LDW-SS527-010**	LDW-SS603-010	
Phenol	21	20	5
Benzoic acid	48	62	25
Acenaphthene	11	11	0
Fluorene	11	11	0
Phenanthrene	67	94	34

Compound	Concentration (ug/Kg)		RPD
	LDW-SS527-010**	LDW-SS603-010	
Anthracene	30	31	3
Di-n-butylphthalate	20	37	60
Fluoranthene	190	230	19
Pyrene	170	170	0
Benzo(a)anthracene	94	90	4
Bis(2-ethylhexyl)phthalate	320	230	33
Chrysene	150	140	7
Benzo(b)fluoranthene	87	94	8
Benzo(k)fluoranthene	87	94	8
Benzo(a)pyrene	86	94	9
Indeno(1,2,3-cd)pyrene	50	45	11
Dibenz(a,h)anthracene	26	22	17
Benzo(g,h,i)perylene	54	46	16
Dimethylphthalate	20U	180	200
Dibenzofuran	20U	11	200
Carbazole	20U	11	200

XVII. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Semivolatiles - Data Qualification Summary - SDG QG62

SDG	Sample	Compound	Flag	A or P	Reason
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010	Hexachlorocyclopentadiene 2,4-Dinitrophenol	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010	4-Chloroaniline Aniline	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Laboratory control samples (%R)(RPD)
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010	3,3'-Dichlorobenzidine	J (all detects) UJ (all non-detects)	P	Laboratory control samples (%R)
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010	Benzo(b)fluoranthene Benzo(k)fluoranthene	J (all detects) J (all detects)	A	Compound quantitation and CRQLs (peak resolution)

Lower Duwamish Waterway Group
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG QG62

No Sample Data Qualified in this SDG

LDC #: 22575B2a **VALIDATION COMPLETENESS WORKSHEET** Date: 2/25/10
SDG #: QG62 Level ~~IV~~ III/IV Page: 1 of 1
Laboratory: Analytical Resources, Inc. Reviewer: 9
2nd Reviewer: N

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

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.	Technical holding times	A	Sampling dates: 1/11/10, 12/17/09
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	RSD. ≤ 2
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 25/0
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
VIII.	Laboratory control samples	SW	LCS/D ; SPK
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	A	
XII.	Compound quantitation/CRQLs	SW	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	A	
XV.	Overall assessment of data	A	
XVI.	Field duplicates	SW	D = 2+3
XVII.	Field blanks	N	

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

Validated Samples: for level IV

1	LDW-SS502-010-comp sed	11	MB-012610	21		31	
2	LDW-SS527-010 ↓	12		22		32	
3	LDW-SS603-010	13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

LDC #: 22575B2a1
SDG #: [illegible]

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: 9
2nd Reviewer: 1

Method: Semivolatiles (EPA SW 846 Method 8270C)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
III. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation?	✓			
Did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30% and relative response factors (RRF) > 0.05?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 25% and relative response factors (RRF) ≥ 0.05?		✓		
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Surrogate spikes				
Were all surrogate %R within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any %R was less than 10 percent, was a reanalysis performed to confirm %R?			✓	
VII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.		✓		
Was a MS/MSD analyzed every 20 samples of each matrix?		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VIII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			

LDC #: 225TSB29
SDG #: Recover

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: 4
2nd Reviewer: M

Validation Area	Yes	No	NA	Findings/Comments
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
IX. Additional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Internal standards				
Were internal standard area counts within -50% or +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds from the associated calibration standard?	✓			
XI. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XII. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Tentatively identified compounds (TICs)				
Were the major ions (> 10 percent relative intensity) in the reference spectrum evaluated in sample spectrum?			✓	
Were relative intensities of the major ions within ± 20% between the sample and the reference spectra?			✓	
Did the raw data indicate that the laboratory performed a library search for all required peaks in the chromatograms (samples and blanks)?		✓		
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XVI. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target compounds were detected in the field duplicates.	✓			
XVII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target compounds were detected in the field blanks.			✓	

VALIDATION FINDINGS WORKSHEET

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

A. Phenol**	P. Bis(2-chloroethoxy)methane	EE. 2,6-Dinitrotoluene	TT. Pentachlorophenol**	III. Benzo(a)pyrene**
B. Bis (2-chloroethyl) ether	Q. 2,4-Dichlorophenol**	FF. 3-Nitroaniline	UU. Phenanthrene	JJJ. Indeno(1,2,3-cd)pyrene
C. 2-Chlorophenol	R. 1,2,4-Trichlorobenzene	GG. Acenaphthene**	VV. Anthracene	KKK. Dibenz(a,h)anthracene
D. 1,3-Dichlorobenzene	S. Naphthalene	HH. 2,4-Dinitrophenol*	WW. Carbazole	LLL. Benzo(g,h,i)perylene
E. 1,4-Dichlorobenzene**	T. 4-Chloroaniline	II. 4-Nitrophenol*	XX. Di-n-butylphthalate	MMM. Bis(2-Chloroisopropyl)ether
F. 1,2-Dichlorobenzene	U. Hexachlorobutadiene**	JJ. Dibenzofuran	YY. Fluoranthene**	NNN. Aniline
G. 2-Methylphenol	V. 4-Chloro-3-methylphenol**	KK. 2,4-Dinitrotoluene	ZZ. Pyrene	OOO. N-Nitrosodimethylamine
H. 2,2'-Oxybis(1-chloropropane)	W. 2-Methylnaphthalene	LL. Diethylphthalate	AAA. Butylbenzylphthalate	PPP. Benzoic Acid
I. 4-Methylphenol	X. Hexachlorocyclopentadiene*	MM. 4-Chlorophenyl-phenyl ether	BBB. 3,3'-Dichlorobenzidine	QQQ. Benzyl alcohol
J. N-Nitroso-di-n-propylamine*	Y. 2,4,6-Trichlorophenol**	NN. Fluorene	CCC. Benzo(a)anthracene	RRR. Pyridine
K. Hexachloroethane	Z. 2,4,5-Trichlorophenol	OO. 4-Nitroaniline	DDD. Chrysene	SSS. Benzidine
L. Nitrobenzene	AA. 2-Chloronaphthalene	PP. 4,6-Dinitro-2-methylphenol	EEE. Bis(2-ethylhexyl)phthalate	TTT.
M. Isophorone	BB. 2-Nitroaniline	QQ. N-Nitrosodiphenylamine (1)**	FFF. Di-n-octylphthalate**	UUU.
N. 2-Nitrophenol**	CC. Dimethylphthalate	RR. 4-Bromophenyl-phenylether	GGG. Benzo(b)fluoranthene	VVV.
O. 2,4-Dimethylphenol	DD. Acenaphthylene	SS. Hexachlorobenzene	HHH. Benzo(k)fluoranthene	WWW.

LDC #: 22573B2a
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: Q
2nd Reviewer: L

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 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 ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤25 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤25.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	1/28/10	01281001	X	26.0		All + Bk	J/UJ/A
			HH	31.2			↓

LDC #: 22575B2a
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: Q
2nd Reviewer: R

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?

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

#	Date	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		LCS/-013610	T	32.T (40-130)	( )	54.T (≤50)	All + Bk	J/UJ/P
		/LCSD	BBB	38.4 (↓)	( )	( )		↓
			NNN	25.2 (↓)	( )	57.6 (↓)		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 25[BB]9
SDG #: Second

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: K

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 Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?

Y N N/A Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		All	~~TCC~~ and HHH were quan using same peak, and reported results were ½ of total conc in each cpds (peak could separated)	all	Idets/A

Comments: See sample calculation verification worksheet for recalculations

LDC#:22575B2a
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: Q
2nd Reviewer: M

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

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

Compound	Concentration (ug/Kg)		RPD	Qualifications (Parent Only)
	2	3		
A	21	20	5	
PPP	48	62	25	
GG	11	11	0	
NN	11	11	0	
UU	67	94	34	
VV	30	31	3	
XX	20	37	60	
YY	190	230	19	
ZZ	170	170	0	
CCC	94	90	4	
EEE	320	230	33	
DDD	150	140	7	
GGG	87	94	8	
HHH	87	94	8	
III	86	94	9	
JJJ	50	45	11	
KKK	26	22	17	
LLL	54	46	16	
CC	20U	180	200	
JJ	20U	11	200	
WW	20U	11	200	

LDC #: 22953B24
SDG #: Selected

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: A

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

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (25 std)	Recalculated RRF (25 std)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL	1/11/10	Phenol (1st internal standard)	1.6T486	1.6T486	1.5552G	1.5552G	8.369TT	8.3698
			Naphthalene (2nd internal standard)	1.00450	1.00450	0.9T5T4	0.9T5T4	14.9T889	14.9T91
			Fluorene (3rd internal standard)	1.3403	1.3403	1.200T0	1.200T0	18.115T6	18.1158
			~~Pentachlorophenol~~ (4th internal standard) UU	1.03205	1.03205	1.04156	1.04156	16.993T	16.993T
			~~Bis(2-ethylhexyl)phthalate~~ (5th internal standard) DDD	1.10626	1.10626	1.09288	1.09288	14.30332	14.3034
			Benzo(a)pyrene (6th internal standard)	0.99604	0.99604	0.994T6	0.994T6	14.16T69	14.16T6
2			~~Phenol~~ (1st internal standard) EEE	0.5T66T	0.5T66T	0.5660I	0.5660I	10.912TI	10.91256
			Naphthalene (2nd internal standard)						
			Fluorene (3rd internal standard)						
			Pentachlorophenol (4th internal standard)						
			Bis(2-ethylhexyl)phthalate (5th internal standard)						
			Benzo(a)pyrene (6th internal standard)						
3			Phenol (1st internal standard)						
			Naphthalene (2nd internal standard)						
			Fluorene (3rd internal standard)						
			Pentachlorophenol (4th internal standard)						
			Bis(2-ethylhexyl)phthalate (5th internal standard)						
			Benzo(a)pyrene (6th internal standard)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22573B2a
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: K

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

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	012810O1	1/28/10	Phenol (1st internal standard)	1.55536	1.45406	1.45406	6.5	6.5
			Naphthalene (2nd internal standard)	0.97574	0.98156	0.98156	0.6	0.6
			Fluorene (3rd internal standard)	1.20070	1.26120	1.26120	5.1	5.0
			~~Pentachlorophenol~~ (4th internal standard) UU	1.04156	1.00348	1.00348	3.7	3.7
			~~Bis(2-ethylhexyl)phthalate~~ (5th internal standard) PDP	1.09288	1.08766	1.08766	0.4	0.5
			Benzo(a)pyrene (6th internal standard)	0.99476	1.01416	1.01416	1.9	1.9
2			~~Phenol~~ (1st internal standard) ZH ZZ	0.56601	0.60740	0.60740	7.2	7.3
			Naphthalene (2nd internal standard)					
			Fluorene (3rd internal standard)					
			Pentachlorophenol (4th internal standard)					
			Bis(2-ethylhexyl)phthalate (5th internal standard)					
			Benzo(a)pyrene (6th internal standard)					
3			Phenol (1st internal standard)					
			Naphthalene (2nd internal standard)					
			Fluorene (3rd internal standard)					
			Pentachlorophenol (4th internal standard)					
			Bis(2-ethylhexyl)phthalate (5th internal standard)					
			Benzo(a)pyrene (6th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22595B29
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: K

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

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	25.0	15.2379	60.8	60.9	0.2
2-Fluorobiphenyl	↓	18.1424	72.4	72.6	↓
Terphenyl-d14	↓	19.4222	77.6	77.7	0.1
Phenol-d5	37.5	30.2986	80.8	80.8	0
2-Fluorophenol	↓	23.8397	63.5	63.6	0.1
2,4,6-Tribromophenol	↓	33.8326	90.1	90.2	0.1
2-Chlorophenol-d4	↓	24.8059	66.1	66.1	0
1,2-Dichlorobenzene-d4	25.0	15.3466	61.2	61.4	0.2

Sample ID: _____

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID: _____

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: ~~22763-a~~
SDG #: ~~See cover~~

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Page: 1 of 1
Reviewer: Q
2nd Reviewer: K

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

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS-012610 / D

Compound	Spike Added (~~ug/kg~~)		Spike Concentration (~~ug/kg~~)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	500	500	275	289	55.0	55.0	57.8	57.8	5.0	5.0
N-Nitroso-di-n-propylamine	↓	↓	278	298	55.6	55.6	59.6	59.6	6.9	6.9
4-Chloro-3-methylphenol			349	344	69.8	69.8	68.8	68.8	1.4	1.4
Acenaphthene			317	332	63.4	63.4	66.4	66.4	4.6	4.6
Pentachlorophenol			283	240	56.6	56.6	48.0	48.0	16.4	16.4
Pyrene		↓	373	389	74.6	74.6	77.8	77.8	4.2	4.2

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575B29
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: [illegible]
2nd reviewer: [illegible]

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

(Y) N N/A Were all reported results recalculated and verified for all level IV samples?
(Y) N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

V_i = Volume of extract injected in microliters (ul)

V_t = Volume of the concentrated extract in microliters (ul)

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

2.0 = Factor of 2 to account for GPC cleanup

Example:

Sample I.D. 2 , A :

Conc. = $\frac{(30343)(20.0)(500)(1)(\quad)}{(36930)(1.5552)(1)(25.1)(\quad)}$

= 21.0 ug/Kg

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 17, 2009 through January 11, 2010
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Semivolatiles
Validation Level:	EPA Level III & IV
Laboratory:	Analytical Resources, Inc.
Sample Delivery Group (SDG):	QG62

Sample Identification

LDW-SS502-010-comp
LDW-SS527-010**
LDW-SS603-010
LDW-SS502-010-compMS
LDW-SS502-010-compMSD

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 5 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per a modification of EPA SW 846 Method 8270D using Selected Ion Monitoring (SIM) for Semivolatiles.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (June 2008).

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XVI.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. GC/MS Instrument Performance Check

Instrument performance was checked at 12 hour intervals. All ion abundance requirements were met.

III. Initial Calibration

Initial calibration was performed using required standard concentrations.

Percent relative standard deviations (%RSD) were less than or equal to 30.0% for compounds.

In the case where %RSD was greater than 15.0%, the laboratory used a calibration curve to evaluate the compound. All coefficients of determination (r^2) were greater than or equal to 0.990 .

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

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 25.0% with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
1/29/10	Hexachlorobenzene	36.3	All samples in SDG QG62	J (all detects) UJ (all non-detects)	A

The percent differences (%D) of the second source calibration standard were less than or equal to 25.0% for all compounds.

Date	Compound	%D	Associated Samples	Flag	A or P
1/5/10	N-Nitrosodiphenylamine	31.94	All samples in SDG QG62	J (all detects) UJ (all non-detects)	A

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No semivolatile contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound TIC (RT in minutes)	Concentration	Associated Samples
MB-012610	1/26/10	Diethylphthalate	19 ug/Kg	All samples in SDG QG62

Sample concentrations were compared to concentrations detected in the method blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated method blanks.

VI. Surrogate Spikes

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

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
LDW-SS502-010-compMS/MSD (LDW-SS502-010-comp)	Hexachlorobenzene	133 (40-130)	131 (40-130)	-	J (all detects)	A

VIII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
LCS-012610	Benzyl alcohol	0 (40-130)	All samples in SDG QG62	J (all detects) UJ (all non-detects)	P

Although the percent recovery for benzyl alcohol was severely low, using professional judgement, the associated results were qualified as estimated (J/UJ) since the MS/MSD percent recoveries were within the QC limits.

Standard reference material was analyzed at the required frequency.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

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

XI. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XII. Compound Quantitation and CRQLs

All compound quantitation and CRQLs were within validation criteria for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XIII. Tentatively Identified Compounds (TICs)

Tentatively identified compounds were not reported by the laboratory.

XIV. System Performance

The system performance was acceptable for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XV. Overall Assessment

Data flags are summarized at the end of this report if data has been qualified.

XVI. Field Duplicates

Samples LDW-SS527-010** and LDW-SS603-010 were identified as field duplicates. No semivolatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/Kg)		RPD
	LDW-SS527-010**	LDW-SS603-010	
Butylbenzylphthalate	22	22	0

Lower Duwamish Waterway Group
Semivolatiles - Data Qualification Summary - SDG QG62

SDG	Sample	Compound	Flag	A or P	Reason
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010	Hexachlorobenzene	J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010	N-Nitrosodiphenylamine	J (all detects) UJ (all non-detects)	A	Continuing calibration (ICV %D)
QG62	LDW-SS502-010-comp	Hexachlorobenzene	J (all detects)	A	Matrix spike/Matrix spike duplicates (%R)
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010	Benzyl alcohol	J (all detects) UJ (all non-detects)	P	Laboratory control samples (%R)

Lower Duwamish Waterway Group
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG QG62

No Sample Data Qualified in this SDG

CLDC #: 22575B2b
SDG #: QG62
Laboratory: Analytical Resources, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level ~~IV~~ III/IV

Date: 2/25/10
Page: 1 of 1
Reviewer: Q
2nd Reviewer: N

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D-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
I.	Technical holding times	A	Sampling dates: 12/17/09 - 1/11/10
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	RSD. r²
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 25%
V.	Blanks	SW	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	SW	
VIII.	Laboratory control samples	SW	LCS. SRM
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	A	
XII.	Compound quantitation/CRQLs	A	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	A	
XV.	Overall assessment of data	A	
XVI.	Field duplicates	SW	D = 2+3
XVII.	Field blanks	N	

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

Validated Samples: ** Level IV
MS Soils

1	LDW-SS502-010-comp	11	MB-012610	21		31	
2	LDW-SS527-010 **	12		22		32	
3	LDW-SS603-010	13		23		33	
4	LDW-SS502-010-compMS	14		24		34	
5	LDW-SS502-010-compMSD	15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

LDC #: 22575B36
SDG #: 280000

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: 9
2nd Reviewer: K

Method: Semivolatiles (EPA SW 846 Method 8270C)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
III. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation?	✓			
Did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30% and relative response factors (RRF) > 0.05?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 25% and relative response factors (RRF) ≥ 0.05?		✓		
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	✓			
VI. Surrogate spikes				
Were all surrogate %R within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any %R was less than 10 percent, was a reanalysis performed to confirm %R?			✓	
VII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
VIII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			

LDC #: 22575B2b
SDG #: Soil Cover

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field/Rinse Blanks				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
XI. Internal standards				
Were internal standard area counts within -50% or +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds from the associated calibration standard?	✓			
XII. [illegible]				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIII. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIV. Tentatively identified compounds (TICs)				
Were the major ions (> 10 percent relative intensity) in the reference spectrum evaluated in sample spectrum?			✓	
Were relative intensities of the major ions within ± 20% between the sample and the reference spectra?			✓	
Did the raw data indicate that the laboratory performed a library search for all required peaks in the chromatograms (samples and blanks)?		✓		
XV. System performance				
System performance was found to be acceptable.	✓			
XVI. Overall assessment of [illegible]				
Overall assessment of data was found to be acceptable.	✓			
XVI. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target compounds were detected in the field duplicates.	✓			
XVII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target compounds were detected in the field blanks.			✓	

VALIDATION FINDINGS WORKSHEET

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

A. Phenol**	P. Bis(2-chloroethoxy)methane	EE. 2,6-Dinitrotoluene	TT. Pentachlorophenol**	III. Benzo(a)pyrene**
B. Bis (2-chloroethyl) ether	Q. 2,4-Dichlorophenol**	FF. 3-Nitroaniline	UU. Phenanthrene	JJJ. Indeno(1,2,3-cd)pyrene
C. 2-Chlorophenol	R. 1,2,4-Trichlorobenzene	GG. Acenaphthene**	VV. Anthracene	KKK. Dibenz(a,h)anthracene
D. 1,3-Dichlorobenzene	S. Naphthalene	HH. 2,4-Dinitrophenol*	WW. Carbazole	LLL. Benzo(g,h,i)perylene
E. 1,4-Dichlorobenzene**	T. 4-Chloroaniline	II. 4-Nitrophenol*	XX. Di-n-butylphthalate	MMM. Bis(2-Chloroisopropyl)ether
F. 1,2-Dichlorobenzene	U. Hexachlorobutadiene**	JJ. Dibenzofuran	YY. Fluoranthene**	NNN. Aniline
G. 2-Methylphenol	V. 4-Chloro-3-methylphenol**	KK. 2,4-Dinitrotoluene	ZZ. Pyrene	OOO. N-Nitrosodimethylamine
H. 2,2'-Oxybis(1-chloropropane)	W. 2-Methylnaphthalene	LL. Diethylphthalate	AAA. Butylbenzylphthalate	PPP. Benzoic Acid
I. 4-Methylphenol	X. Hexachlorocyclopentadiene*	MM. 4-Chlorophenyl-phenyl ether	BBB. 3,3'-Dichlorobenzidine	QQQ. Benzyl alcohol
J. N-Nitroso-di-n-propylamine*	Y. 2,4,6-Trichlorophenol**	NN. Fluorene	CCC. Benzo(a)anthracene	RRR. Pyridine
K. Hexachloroethane	Z. 2,4,5-Trichlorophenol	OO. 4-Nitroaniline	DDD. Chrysene	SSS. Benzidine
L. Nitrobenzene	AA. 2-Chloronaphthalene	PP. 4,6-Dinitro-2-methylphenol	EEE. Bis(2-ethylhexyl)phthalate	TTT.
M. Isophorone	BB. 2-Nitroaniline	QQ. N-Nitrosodiphenylamine (1)**	FFF. Di-n-octylphthalate**	UUU.
N. 2-Nitrophenol**	CC. Dimethylphthalate	RR. 4-Bromophenyl-phenylether	GGG. Benzo(b)fluoranthene	VVV.
O. 2,4-Dimethylphenol	DD. Acenaphthylene	SS. Hexachlorobenzene	HHH. Benzo(k)fluoranthene	WWW.

LDC #: 22573B-b
SDG #: See cover
METHOD: GC/MS BNA (EPA SW 846 Method 8270)

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: J
2nd Reviewer: R

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

(Y) 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 ?
Y (N) N/A Were all %D and RRFs within the validation criteria of ≤25 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤25.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	1/5/10	IC010507 (ICV)	QQ	31.94		All + Bk	J/UJ/A
	1/29/10	CC0129	SS	36.3		All + Bk	J/UJ/A

CONCAL.2S

LDC #: 22575B26
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: 9
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".

Y N N/A Was a method blank analyzed for each matrix?
Y N N/A Was a method blank analyzed for each concentration preparation level?
Y N N/A Was a method blank associated with every sample?
Y N N/A Was the blank contaminated? If yes, please see qualification below.

Blank extraction date: 1/26/10 **Blank analysis date:** 1/29/10
Conc. units: ug/kg Associated Samples: all

Compound	Blank ID	Sample Identification								
MB	012610									
LL	19									

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:
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 #: [illegible]
SDG #: [illegible]

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: a
2nd Reviewer: a

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 Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

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

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		1/S	SS	133 (40-130)	131 (40-130)	( )	1	1 dets/A
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

	Compound	QC Limits (Soil)	RPD (Soil)	QC Limits (Water)	RPD (Water)		Compound	QC Limits (Soil)	RPD (Soil)	QC Limits (Water)	RPD (Water)
A.	Phenol	26-90%	≤ 35%	12-110%	≤ 42%	GG.	Acenaphthene	31-137%	≤ 19%	46-118%	≤ 31%
C.	2-Chlorophenol	25-102%	≤ 50%	27-123%	≤ 40%	II.	4-Nitrophenol	11-114%	≤ 50%	10-80%	≤ 50%
E.	1,4-Dichlorobenzene	28-104%	≤ 27%	36-97%	≤ 28%	KK.	2,4-Dinitrotoluene	28-89%	≤ 47%	24-96%	≤ 38%
J.	N-Nitroso-di-n-propylamine	41-126%	≤ 38%	41-116%	≤ 38%	TT.	Pentachlorophenol	17-109%	≤ 47%	9-103%	≤ 50%
R.	1,2,4-Trichlorobenzene	38-107%	≤ 23%	39-98%	≤ 28%	ZZ.	Pyrene	35-142%	≤ 36%	26-127%	≤ 31%
V.	4-Chloro-3-methylphenol	26-103%	≤ 33%	23-97%	≤ 42%						

MSD.qs

LDC #: 22575B3b
SDG #: see cover

Reviewer: q
2nd Reviewer: A

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

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?

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

#	Date	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		LCS-012610	RRR	0 (40-130)	( )	( )	All + ~~Bk~~	J/UJ/P *
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )	* ~~due to~~	MS/MSD in
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

SDG #: See cover

Field Duplicates

Reviewer: 9
2nd reviewer: N

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

Y N N/A Were field duplicate pairs identified in this SDG?
Y N N/A Were target compounds identified in the field duplicate pairs?

Compound	Concentration (ug/kg)		RPD
	2	3	
AAA	22	22	0

Compound	Concentration ( )		RPD

Compound	Concentration ( )		RPD

Compound	Concentration ( )		RPD

LDC #: 29509V
SDG #: Set equal

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: K

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

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (2.5 std)	Recalculated RRF (2.5 std)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL	1/5/10	~~Phenol~~ (1st internal standard) J	1.39959	1.39959	1.41012	1.41012	2.55958	2.5596
			~~Naphthalene~~ (2nd internal standard) R	0.27095	0.27095	0.28212	0.28212	4.42310	4.4235
			~~Fluorene~~ (3rd internal standard) LL	1.5031T	1.5031T	1.50245	1.50245	3.00941	3.0095
			~~Pentachlorophenol~~ (4th internal standard) SS	0.18204	0.18204	0.18973	0.18973	4.71510	4.7150
			~~Bis(2-ethylhexyl)phthalate~~ (5th internal standard) AAA	0.81195	0.81195	0.78222	0.78222	4.50549	4.5056
			Benzo(a)pyrene (6th internal standard)						
2			Phenol (1st internal standard)						
			Naphthalene (2nd internal standard)						
			Fluorene (3rd internal standard)						
			Pentachlorophenol (4th internal standard)						
			Bis(2-ethylhexyl)phthalate (5th internal standard)						
			Benzo(a)pyrene (6th internal standard)						
3			Phenol (1st internal standard)						
			Naphthalene (2nd internal standard)						
			Fluorene (3rd internal standard)						
			Pentachlorophenol (4th internal standard)						
			Bis(2-ethylhexyl)phthalate (5th internal standard)						
			Benzo(a)pyrene (6th internal standard)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22375b
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: a
2nd Reviewer:

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

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CC029	1/29/10	~~Phenol~~ (1st internal standard) J	1.41012	1.32392	1.32392	6.1	6.1
			~~Naphthalene~~ (2nd internal standard) R	0.28212	0.32291	0.32291	14.5	14.5
			~~Fluorene~~ (3rd internal standard) LL	1.50245	1.T5T3	1.T5T3	16.T	16.T
			Pentachlorophenol (4th internal standard) SS	0.189T3	0.25930	0.25930	36.3	36.T
			~~Bis(2-ethylhexyl)phthalate~~ (5th internal standard) AAA	0.T8222	0.94423	0.94423	20.T	20.T
			~~Benzo(a)pyrene~~ (6th internal standard)					
2			Phenol (1st internal standard)					
			Naphthalene (2nd internal standard)					
			Fluorene (3rd internal standard)					
			Pentachlorophenol (4th internal standard)					
			Bis(2-ethylhexyl)phthalate (5th internal standard)					
			Benzo(a)pyrene (6th internal standard)					
3			Phenol (1st internal standard)					
			Naphthalene (2nd internal standard)					
			Fluorene (3rd internal standard)					
			Pentachlorophenol (4th internal standard)					
			Bis(2-ethylhexyl)phthalate (5th internal standard)					
			Benzo(a)pyrene (6th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22515B2b
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: [illegible]
2nd reviewer: [illegible]

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

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	2.50	1.46654	58.8	58.7	0.1
2-Fluorobiphenyl	↓	1.86182	74.4	74.5	↓
Terphenyl-d14	↓	1.82824	73.2	73.1	↓
Phenol-d5	3.75	2.18075	58.1	58.2	↓
2-Fluorophenol	↓	1.81533	48.5	48.4	↓
2,4,6-Tribromophenol	↓	3.00306	80.0	80.1	↓
2-Chlorophenol-d4	↓	1.95118	52.0	52.0	0
1,2-Dichlorobenzene-d4	2.50	1.47885	59.2	59.2	↓

Sample ID: _____

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID: _____

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 22575B30
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: 9
2nd Reviewer: 1R

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

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA

Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC)

MSC = Matrix spike concentration; MSDC = Matrix spike duplicate concentration

MS/MSD samples: 4/5

Compound	Spike Added (ug/kg)		Sample Concentration (ug/kg)	Spiked Sample Concentration (ug/kg)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol											
N-Nitroso-di-n-propylamine	151	152	ND	115	115	76.2	76.2	75.7	75.7	0.0	0.0
4-Chloro-3-methylphenol											
Acenaphthene											
Pentachlorophenol	151	152	ND	133	131	88.1	88.1	86.2	86.2	1.5	1.5
Pyrene											

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22573B2b
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1C

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

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS-012610

Compound	Spike Added (ug/L)		Spike Concentration (ug/kg)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol										
N-Nitroso-di-n-propylamine	156	NA	116	NA	74.4	74.4				
4-Chloro-3-methylphenol										
Acenaphthene										
Pentachlorophenol	156	NA	108	NA	69.2	69.2				
Pyrene										

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575B7b
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 4
2nd reviewer: N

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

(Y) N N/A Were all reported results recalculated and verified for all level IV samples?
(Y) N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

V_i = Volume of extract injected in microliters (ul)

V_t = Volume of the concentrated extract in microliters (ul)

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

2.0 = Factor of 2 to account for GPC cleanup

Example:

Sample I.D. 2 , AAA :

Conc. = $\frac{(29502)(2.0)(1000)(1)(\quad)}{(209888)(0.78222)(1)(16.2)(\quad)}$

= 22.18 µg/Kg

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22575

Polynuclear Aromatic Hydrocarbons

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Lower Duwmaish Waterway Group

Collection Date: December 15, 2009 through January 12, 2010

LDC Report Date: April 29, 2010

Matrix: Sediment

Parameters: Polynuclear Aromatic Hydrocarbons

Validation Level: EPA Level III & IV

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): QG62

Sample Identification

LDW-SS503-043-comp
LDW-SS503-043-compDL
LDW-SS508-010**
LDW-SS509-010**
LDW-SS509-010DL**
LDW-SS523-010**
LDW-SS525-010
LDW-SS526-010
LDW-SS526-010DL
LDW-SS529-041-comp
LDW-SS529-041-compDL
LDW-SS530-010
LDW-SS530-010DL
LDW-SS531-010-comp
LDW-SS533-043-comp
LDW-SS544-010-comp
LDW-SS547-010
LDW-SS601-010
LDW-SS601-010MS
LDW-SS601-010MSD

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 20 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per a modification of EPA SW 846 Method 8270D using Selected Ion Monitoring (SIM) for Polynuclear Aromatic Hydrocarbons.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (June 2008).

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XVI.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. The cooler temperature for samples LDW-SS525-010, LDW-SS526-010 and LDW-SS526-010DL was reported at 10.6°C upon receipt by the laboratory. Using professional judgment, associated results were not qualified as estimated since polynuclear aromatic hydrocarbons are not expected to degrade significantly during transport.

All other cooler temperatures met validation criteria.

II. GC/MS Instrument Performance Check

Instrument performance was checked at 12 hour intervals. All ion abundance requirements were met.

III. Initial Calibration

Initial calibration was performed using required standard concentrations.

Percent relative standard deviations (%RSD) were less than or equal to 30.0% for all compounds.

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

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 25.0% .

The percent differences (%D) of the second source calibration standard were less than or equal to 25.0% for all compounds.

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polynuclear aromatic hydrocarbon contaminants were found in the method blanks.

VI. Surrogate Spikes

Surrogates were added to all samples and blanks as required by the method. Surrogate recoveries (%R) were not within QC limits for LDW-SS529-041-compDL and LDW-SS530-010DL . Since the samples were diluted out, no data were qualified.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
LDW-SS601-010MS/MSD (LDW-SS601-010)	Fluoranthene	154 (40-130)	-	-	J (all detects)	A

VIII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

Standard reference material was analyzed at the required frequency.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

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

XI. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XII. Compound Quantitation and CRQLs

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
LDW-SS503-043-comp	Fluoranthene Pyrene	Sample result exceeded calibration range.	Reported result should be within calibration range.	NA	-
LDW-SS509-010**	Phenanthrene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene	Sample result exceeded calibration range.	Reported result should be within calibration range.	NA	-
LDW-SS526-010	Fluoranthene Pyrene Chrysene	Sample result exceeded calibration range.	Reported result should be within calibration range.	NA	-
LDW-SS529-041-comp	Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	Sample result exceeded calibration range.	Reported result should be within calibration range.	NA	-
LDW-SS530-010	Naphthalene 2-Methylnaphthalene 1-Methylnaphthalene Acenaphthene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	Sample result exceeded calibration range.	Reported result should be within calibration range.	NA	-

N/A = Not applicable

For the results above flagged "Not applicable", the affected compound results in the associated samples were deemed unusable and did not warrant qualification of the data.

Sample	Compound	Finding	Flag	A or P
LDW-SS503-043-comp LDW-SS508-010** LDW-SS509-010** LDW-SS509-010DL** LDW-SS523-010** LDW-SS525-010 LDW-SS526-010 LDW-SS526-010DL LDW-SS529-041-comp LDW-SS529-041-compDL LDW-SS530-010 LDW-SS530-010DL LDW-SS531-010-comp LDW-SS533-043-comp LDW-SS544-010-comp LDW-SS547-010 LDW-SS601-010	Benzo(b)fluoranthene Benzo(k)fluoranthene	Due to lack of resolution between these compounds in the samples, the laboratory performed the quantitation using the total peak area and reported the average concentration for both compounds.	J (all detects) J (all detects)	A

The actual values of these compounds may be lower or higher than the values reported by the laboratory.

Raw data were not evaluated for the samples reviewed by Level III criteria.

XIII. Tentatively Identified Compounds (TICs)

Tentatively identified compounds were not reported by the laboratory.

XIV. System Performance

The system performance was acceptable for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XV. Overall Assessment

The overall assessment of data was acceptable. In the case where more than one result was reported for an individual sample, the least technically acceptable results were rejected as follows:

Sample	Compound	Flag	A or P
LDW-SS503-043-comp	Fluoranthene Pyrene	R R	A
LDW-SS503-043-compDL	All TCL compounds except Fluoranthene Pyrene	R	A

Sample	Compound	Flag	A or P
LDW-SS509-010**	Phenanthrene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene	R R R R R R R R	A
LDW-SS509-010DL**	All TCL compounds except Phenanthrene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene	R	A
LDW-SS526-010	Fluoranthene Pyrene Chrysene	R R R	A
LDW-SS526-010DL	All TCL compounds except Fluoranthene Pyrene Chrysene	R	A
LDW-SS529-041-comp	Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	R R R R R R R R R R R R	A
LDW-SS529-041-compDL	All TCL compounds except Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	R	A

Sample	Compound	Flag	A or P
LDW-SS530-010	Naphthalene	R	A
	2-Methylnaphthalene	R	
	1-Methylnaphthalene	R	
	Acenaphthene	R	
	Fluorene	R	
	Phenanthrene	R	
	Anthracene	R	
	Fluoranthene	R	
	Pyrene	R	
	Benzo(a)anthracene	R	
	Chrysene	R	
	Benzo(b)fluoranthene	R	
	Benzo(k)fluoranthene	R	
	Benzo(a)pyrene	R	
	Indeno(1,2,3-cd)pyrene	R	
	Dibenz(a,h)anthracene	R	
	Benzo(g,h,i)perylene	R	
LDW-SS530-010DL	All TCL compounds except	R	A
	Naphthalene		
	2-Methylnaphthalene		
	1-Methylnaphthalene		
	Acenaphthene		
	Fluorene		
	Phenanthrene		
	Anthracene		
	Fluoranthene		
	Pyrene		
	Benzo(a)anthracene		
	Chrysene		
	Benzo(b)fluoranthene		
	Benzo(k)fluoranthene		
	Benzo(a)pyrene		
	Indeno(1,2,3-cd)pyrene		
	Dibenz(a,h)anthracene		
	Benzo(g,h,i)perylene		

Data flags are summarized at the end of this report if data has been qualified.

XVI. Field Duplicates

Samples LDW-SS523-010** and LDW-SS601-010 were identified as field duplicates. No polynuclear aromatic hydrocarbons were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/Kg)		RPD
	LDW-SS523-010**	LDW-SS601-010	
Naphthalene	5.7	4.8U	200
Acenaphthylene	9.5	10	5
Acenaphthene	4.8	6.3	27
Fluorene	6.2	6.3	2
Phenanthrene	42	81	63

Compound	Concentration (ug/Kg)		RPD
	LDW-SS523-010**	LDW-SS601-010	
Anthracene	22	32	37
Fluoranthene	150	230	42
Pyrene	90	150	50
Benzo(a)anthracene	65	94	36
Chrysene	150	180	18
Benzo(b)fluoranthene	85	110	26
Benzo(k)fluoranthene	85	110	26
Benzo(a)pyrene	72	110	42
Indeno(1,2,3-cd)pyrene	49	68	32
Dibenz(a,h)anthracene	17	26	42
Benzo(g,h,i)perylene	66	81	20

XVII. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG QG62

SDG	Sample	Compound	Flag	A or P	Reason
QG62	LDW-SS601-010	Fluoranthene	J (all detects)	A	Matrix spike/Matrix spike duplicates (%R)
QG62	LDW-SS503-043-comp LDW-SS508-010** LDW-SS509-010** LDW-SS509-010DL** LDW-SS523-010** LDW-SS525-010 LDW-SS526-010 LDW-SS526-010DL LDW-SS529-041-comp LDW-SS529-041-compDL LDW-SS530-010 LDW-SS530-010DL LDW-SS531-010-comp LDW-SS533-043-comp LDW-SS544-010-comp LDW-SS547-010 LDW-SS601-010	Benzo(b)fluoranthene Benzo(k)fluoranthene	J (all detects) J (all detects)	A	Compound quantitation and CRQLs (peak resolution)
QG62	LDW-SS503-043-comp	Fluoranthene Pyrene	R R	A	Overall assessment of data
QG62	LDW-SS503-043-compDL	All TCL compounds except Fluoranthene Pyrene	R	A	Overall assessment of data
QG62	LDW-SS509-010**	Phenanthrene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene	R R R R R R R R	A	Overall assessment of data
QG62	LDW-SS509-010DL**	All TCL compounds except Phenanthrene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene	R	A	Overall assessment of data
QG62	LDW-SS526-010	Fluoranthene Pyrene Chrysene	R R R	A	Overall assessment of data
QG62	LDW-SS526-010DL	All TCL compounds except Fluoranthene Pyrene Chrysene	R	A	Overall assessment of data

SDG	Sample	Compound	Flag	A or P	Reason
QG62	LDW-SS529-041-comp	Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	R R R R R R R R R R R R	A	Overall assessment of data
QG62	LDW-SS529-041-compDL	All TCL compounds except Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	R	A	Overall assessment of data
QG62	LDW-SS530-010	Naphthalene 2-Methylnaphthalene 1-Methylnaphthalene Acenaphthene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	R R R R R R R R R R R R R R R R R	A	Overall assessment of data
QG62	LDW-SS530-010DL	All TCL compounds except Naphthalene 2-Methylnaphthalene 1-Methylnaphthalene Acenaphthene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	R	A	Overall assessment of data

Lower Duwamish Waterway Group
Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG QG62

No Sample Data Qualified in this SDG

CLDC #: 22575B2c
SDG #: QG62
Laboratory: Analytical Resources, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level ~~IV~~ III/IV

Date: ~~2/5/10~~ 2/5/10
Page: 1 of 1
Reviewer: A
2nd Reviewer: MC

METHOD: GC/MS Polynuclear Aromatic Hydrocarbons (EPA SW 846 Method 8270D-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
I.	Technical holding times	SW	Sampling dates: 12/15/09 - 1/12/10
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Continuing calibration/ICV	A	ICV/CCV ≤ 20%
V.	Blanks	A	
VI.	Surrogate spikes	SW	
VII.	Matrix spike/Matrix spike duplicates	SW	
VIII.	Laboratory control samples	~~SW~~ A	LCS, SRM
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	A	
XII.	Compound quantitation/CRQLs	SW	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	A	
XV.	Overall assessment of data	SW	
XVI.	Field duplicates	SW	D = 6+18
XVII.	Field blanks	N	

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

Validated Samples: ** level IV
MI Soils

1	LDW-SS503-043-comp	11	LDW-SS529-041-compDL	21	MB-012610	31	
2	LDW-SS503-043-compDL	12	LDW-SS530-010	22		32	
3	LDW-SS508-010 **	13	LDW-SS530-010DL	23		33	
4	LDW-SS509-010 **	14	LDW-SS531-010-comp	24		34	
5	LDW-SS509-010DL **	15	LDW-SS533-043-comp	25		35	
6	LDW-SS523-010 **	16	LDW-SS544-010-comp	26		36	
7	LDW-SS525-010	17	LDW-SS547-010	27		37	
8	LDW-SS526-010	18	LDW-SS601-010-~~010~~-	28		38	
9	LDW-SS526-010DL	19	LDW-SS601-010-~~010~~MS	29		39	
10	LDW-SS529-041-comp	20	LDW-SS601-010-~~010~~MSD	30		40	

LDC #: 22575B2C
SDG #: See cover

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: Q
2nd Reviewer: M

Method: Semivolatiles (EPA SW 846 Method 8270C)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.		✓		
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
III. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation?		✓	✓	
Did the initial calibration meet the curve fit acceptance criteria of $\geq$ 0.990?				
Were all percent relative standard deviations (%RSD) $\leq$ 30% and relative response factors (RRF) > 0.05?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) $\leq$ 25% and relative response factors (RRF) $\geq$ 0.05?	✓			
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Surrogate spikes				
Were all surrogate %R within QC limits?		✓		
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any %R was less than 10 percent, was a reanalysis performed to confirm %R?			✓	
VII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
VIII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			

VALIDATION FINDINGS WORKSHEET

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

A. Phenol**	P. Bis(2-chloroethoxy)methane	EE. 2,6-Dinitrotoluene	TT. Pentachlorophenol**	III. Benzo(a)pyrene**
B. Bis (2-chloroethyl) ether	Q. 2,4-Dichlorophenol**	FF. 3-Nitroaniline	UU. Phenanthrene	JJJ. Indeno(1,2,3-cd)pyrene
C. 2-Chlorophenol	R. 1,2,4-Trichlorobenzene	GG. Acenaphthene**	VV. Anthracene	KKK. Dibenz(a,h)anthracene
D. 1,3-Dichlorobenzene	S. Naphthalene	HH. 2,4-Dinitrophenol*	WW. Carbazole	LLL. Benzo(g,h,i)perylene
E. 1,4-Dichlorobenzene**	T. 4-Chloroaniline	II. 4-Nitrophenol*	XX. Di-n-butylphthalate	MMM. Bis(2-Chloroisopropyl)ether
F. 1,2-Dichlorobenzene	U. Hexachlorobutadiene**	JJ. Dibenzofuran	YY. Fluoranthene**	NNN. Aniline
G. 2-Methylphenol	V. 4-Chloro-3-methylphenol**	KK. 2,4-Dinitrotoluene	ZZ. Pyrene	OOO. N-Nitrosodimethylamine
H. 2,2'-Oxybis(1-chloropropane)	W. 2-Methylnaphthalene	LL. Diethylphthalate	AAA. Butylbenzylphthalate	PPP. Benzoic Acid
I. 4-Methylphenol	X. Hexachlorocyclopentadiene*	MM. 4-Chlorophenyl-phenyl ether	BBB. 3,3'-Dichlorobenzidine	QQQ. Benzyl alcohol
J. N-Nitroso-di-n-propylamine*	Y. 2,4,6-Trichlorophenol**	NN. Fluorene	CCC. Benzo(a)anthracene	RRR. Pyridine
K. Hexachloroethane	Z. 2,4,5-Trichlorophenol	OO. 4-Nitroaniline	DDD. Chrysene	SSS. Benzidine
L. Nitrobenzene	AA. 2-Chloronaphthalene	PP. 4,6-Dinitro-2-methylphenol	EEE. Bis(2-ethylhexyl)phthalate	TTT. 1-Methylnaphthalene
M. Isophorone	BB. 2-Nitroaniline	QQ. N-Nitrosodiphenylamine (1)**	FFF. Di-n-octylphthalate**	UUU.
N. 2-Nitrophenol**	CC. Dimethylphthalate	RR. 4-Bromophenyl-phenylether	GGG. Benzo(b)fluoranthene	VVV.
O. 2,4-Dimethylphenol	DD. Acenaphthylene	SS. Hexachlorobenzene	HHH. Benzo(k)fluoranthene	WWW.

LDC #: 22573B2C
SDG #: See Cover

VALIDATION FINDINGS CHECKLIST

Reviewer: D
2nd Reviewer: A

Validation Area	Yes	No	NA	Findings/Comments
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
[illegible]				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
[illegible]				
Were internal standard area counts within -50% or +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds from the associated calibration standard?	✓			
[illegible]				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
[illegible]				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
[illegible]				
Were the major ions (> 10 percent relative intensity) in the reference spectrum evaluated in sample spectrum?			✓	
Were relative intensities of the major ions within ± 20% between the sample and the reference spectra?			✓	
Did the raw data indicate that the laboratory performed a library search for all required peaks in the chromatograms (samples and blanks)?		✓		
[illegible]				
System performance was found to be acceptable.	✓			
[illegible]				
Overall assessment of data was found to be acceptable.				
[illegible]				
Field duplicate pairs were identified in this SDG.	✓			
Target compounds were detected in the field duplicates.	✓			
[illegible]				
Field blanks were identified in this SDG.		✓		
Target compounds were detected in the field blanks.			✓	

LDC #: 22576B2c
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Page: 1 of 1
Reviewer: 9
2nd Reviewer: N

All circled dates have exceeded the technical holding times.
Y (N) N/A Were all cooler temperatures within validation criteria?

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

Sample ID	Matrix	Preserved	Sampling Date	Extraction date	Analysis date	Total # of Days	Qualifier
T-9		Temp	(10.6)				Text

ECHNICAL HOLDING TIME CRITERIA

/ater: Extracted within 7 days, analyzed within 40 days.
oil: Extracted within 14 days, analyzed within 40 days.

LDC #: 20493c
SDG #: Second

VALIDATION FINDINGS WORKSHEET
Surrogate Recovery

Page: 1 of 1
Reviewer: 9
2nd Reviewer: K

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

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

Y (N) N/A Were percent recoveries (%R) for surrogates within QC limits?
Y N (N/A) If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?
Y N (N/A) If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Date	Sample ID	Surrogate	%R (Limits)	Qualifications
		13 (50x)	All	00 (-)	No Cmpd
			↓	( )	↓
		11 (50x)	↓	(-)	↓
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

* QC limits are advisory	QC Limits (Soil)	QC Limits (Water)		QC Limits (Soil)	QC Limits (Water)
S1 (NBZ) = Nitrobenzene-d5	23-120	35-114	S5 (2FP)= 2-Fluorophenol	25-121	21-100
S2 (FBP) = 2-Fluorobiphenyl	30-115	43-116	S6 (TBP) = 2,4,6-Tribromophenol	19-122	10-123
S3 (TPH) = Terphenyl-d14	18-137	33-141	S7 (2CP) = 2-Chlorophenol-d4	20-130*	33-110*
S4 (PHL) = Phenol-d5	24-113	10-94	S8 (DCB) = 1,2-Dichlorobenzene-d4	20-130*	16-110*

LDC #: 22573B2c
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: 9
2nd Reviewer: M

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 Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

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

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		19/20	YY	154 (40-130)	( )	( )	18	Dets/A
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

	Compound	QC Limits (Soil)	RPD (Soil)	QC Limits (Water)	RPD (Water)		Compound	QC Limits (Soil)	RPD (Soil)	QC Limits (Water)	RPD (Water)
A.	Phenol	26-90%	≤ 35%	12-110%	≤ 42%	GG.	Acenaphthene	31-137%	≤ 19%	46-118%	≤ 31%
C.	2-Chlorophenol	25-102%	≤ 50%	27-123%	≤ 40%	II.	4-Nitrophenol	11-114%	≤ 50%	10-80%	≤ 50%
E.	1,4-Dichlorobenzene	28-104%	≤ 27%	36-97%	≤ 28%	KK.	2,4-Dinitrotoluene	28-89%	≤ 47%	24-96%	≤ 38%
J.	N-Nitroso-di-n-propylamine	41-126%	≤ 38%	41-116%	≤ 38%	TT.	Pentachlorophenol	17-109%	≤ 47%	9-103%	≤ 50%
R.	1,2,4-Trichlorobenzene	38-107%	≤ 23%	39-98%	≤ 28%	ZZ.	Pyrene	35-142%	≤ 36%	26-127%	≤ 31%
V.	4-Chloro-3-methylphenol	26-103%	≤ 33%	23-97%	≤ 42%						

LDC #: 22533C
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: Q
2nd Reviewer: [illegible]

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 Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?

(Y) N N/A Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?

#	Date	Sample ID	Finding: cpds > calib range	Associated Samples	Qualifications
		1	YY.ZZ ~~> calib range~~	1	NA ~~data/A~~
		4	UU, YY.ZZ.CCC. DDD. ~~EEE~~. HHH III	4	
		8	YY.ZZ.DDD	8	
		10	UU.VV.YY.ZZ.CCC.DDD ~~EEE~~.HHH.III.JJ ~~KK~~.LLL	10	
		12	S.W.TTT.~~FF~~.NN.UU.VV YY.ZZ.CCC.DDD.~~EEE~~ HHH.III.JJ.~~KK~~.LLL	12	

Comments: See sample calculation verification worksheet for recalculations

LDC #: 22933c
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: Q
2nd Reviewer: K

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 Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?
Y N N/A Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		~~1-18~~ 1.3-18	~~FFF~~ and HHH were quan using same peak. The reported results for each cpd was >2 of total ⊗ conc	1.3-18	Idets/ND
			(peak could ~~separated~~)		

Comments: See sample calculation verification worksheet for recalculations

LDC #: 22575B2c
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Page: 1 of 1
Reviewer: 9
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".

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	Finding	Associated Samples	Qualifications
		1	YY. ZZ	1	E / A
		2	All except YY, ZZ	2	
		4	UU. YY. ZZ. CCC.	4	
			DDD. ~~EEE~~. HHH. III		
		5	All except above (except #4)	5	
		8	YY. ZZ. DDD	8	
		9	All except above #8	9	

Comments: _____

LDC #: 22553B2c
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Reviewer: Q
2nd Reviewer: M

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	Finding	Associated Samples	Qualifications
		10	UU. VV. YY. ZZ. CCC. DDD	10	R/A
			~~EEE~~. HHH. III. JJJ. KKK		
			LLL		
		11	All except above	11	
		12	S. W. TTT. ~~EEE~~. NN. UU	12	
			VV. YY. ZZ. CCC. DDD		
			~~EEE~~. HHH. III. JJJ		
			KKK. LLL		
		13	All except above #12	13	

Comments: _____

LDC#:22575B2c
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: 9
2nd Reviewer: A

METHOD: GC/MS PAHs (EPA SW 846 Method 8270D-SIM)

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

Compound	Concentration (ug/Kg)		RPD	Qualifications (Parent Only)
	6	18		
S	5.7	4.8U	200	
DD	9.5	10	5	
GG	4.8	6.3	27	
NN	6.2	6.3	2	
UU	42	81	63	
VV	22	32	37	
YY	150	230	42	
ZZ	90	150	50	
CCC	65	94	36	
DDD	150	180	18	
GGG	85	110	26	
~~KKK~~ HHH	85	110	26	
III	72	110	42	
JJJ	49	68	32	
KKK	17	26	42	
LLL	66	81	20	

LDC #: 22452C
SDG #: Second

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 2

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

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (2.5 std)	Recalculated RRF (2.5 std)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL	10/15/09	Phenol (1st internal standard)						
			Naphthalene (2nd internal standard)	1.034	1.034	1.053	1.053	3.7	3.7
			Fluorene (3rd internal standard)	1.267	1.267	1.250	1.250	3.6	3.6
			~~Pentachlorophenol~~ (4th internal standard) UU	1.119	1.119	1.132	1.132	3.5	3.5
			~~Bis(2-ethylhexyl)phthalate~~ (5th internal standard) DDD	1.135	1.135	1.116	1.116	3.1	3.1
			Benzo(a)pyrene (6th internal standard)	1.050	1.050	1.046	1.046	5.0	5.0
2			Phenol (1st internal standard)						
			Naphthalene (2nd internal standard)						
			Fluorene (3rd internal standard)						
			Pentachlorophenol (4th internal standard)						
			Bis(2-ethylhexyl)phthalate (5th internal standard)						
			Benzo(a)pyrene (6th internal standard)						
3			Phenol (1st internal standard)						
			Naphthalene (2nd internal standard)						
			Fluorene (3rd internal standard)						
			Pentachlorophenol (4th internal standard)						
			Bis(2-ethylhexyl)phthalate (5th internal standard)						
			Benzo(a)pyrene (6th internal standard)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575B2c
SDG #: Sequence

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

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

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CC0128	1/28/10	Phenol (1st internal standard)	1.05				
			Naphthalene (2nd internal standard)	1.053	1.05674	1.05674	0.4	0.4
			Fluorene (3rd internal standard)	1.250	1.30266	1.30266	4.2	4.2
			~~Pentachlorophenol~~ (4th internal standard) UU	1.132	1.11704	1.11704	1.3	1.3
			~~Bis(2-ethylhexyl)phthalate~~ (5th internal standard) DDD	1.116	1.14113	1.14113	2.2	2.2
			Benzo(a)pyrene (6th internal standard)	1.046	1.04626	1.04626	0.0	0.0
2	CC0129A	1/29/10	Phenol (1st internal standard)					
			Naphthalene (2nd internal standard)	1.053	1.06168	1.06168	0.8	0.8
			Fluorene (3rd internal standard)	1.250	1.26110	1.26110	0.9	0.9
			~~Pentachlorophenol~~ (4th internal standard) UU	1.132	1.12307	1.12307	0.8	0.8
			Bis(2-ethylhexyl)phthalate (5th internal standard) DDD	1.116	1.10653	1.10653	0.9	0.9
			Benzo(a)pyrene (6th internal standard)	1.046	1.02219	1.02219	2.3	2.3
3			Phenol (1st internal standard)					
			Naphthalene (2nd internal standard)					
			Fluorene (3rd internal standard)					
			Pentachlorophenol (4th internal standard)					
			Bis(2-ethylhexyl)phthalate (5th internal standard)					
			Benzo(a)pyrene (6th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22538c
SDG #: Delaware

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: 1

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

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
~~Nitrobenzene-d5~~ d10-W	3.0	1.96459	65.3	65.5	0.2
2-Fluorobiphenyl d14-kkk	↓	2.59885	86.7	86.6	0.1
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
~~1,2-Dichlorobenzene-d4~~					

Sample ID: _____

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID: _____

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 22373B2c
SDG #: Selected

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: 9
2nd Reviewer: 1

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

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentation

RPD = | MSC - MSC | * 2/(MSC + MSDC) MSC = Matrix spike concentration; MSDC = Matrix spike duplicate concentration

MS/MSD samples: 19/20

Compound	Spike Added (MS/MSD)		Sample Concentration (MS)	Spiked Sample Concentration (MS/MSD)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	-----	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol											
N-Nitroso-di-n-propylamine											
4-Chloro-3-methylphenol											
Acenaphthene	144	147	6.3	127	131	83.8	83.8	84.8	84.8	3.1	3.1
Pentachlorophenol											
Pyrene	144	147	150	275	252	86.8	86.8	69.4	69.4	8.7	8.7

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575B2C
SDG #: Sediment

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: [illegible]

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

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration; SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS-0126 10

Compound	Spike Added (ug/kg)		Spike Concentration (ug/kg)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol										
N-Nitroso-di-n-propylamine										
4-Chloro-3-methylphenol										
Acenaphthene	150	NA	103	NA	68.7	68.7				
Pentachlorophenol										
Pyrene	150	NA	118	NA	78.7	78.7				

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 25753c
SDG #: Released

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: MC

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

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

V_i = Volume of extract injected in microliters (ul)

V_t = Volume of the concentrated extract in microliters (ul)

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

2.0 = Factor of 2 to account for GPC cleanup

Example:

Sample I.D. 4 . 5 :

Conc. = $\frac{(5349)(2.0)(500)(1)(\quad)}{(18316)(1.053)(3.26)(1)(\quad)}$

= 91.63 ng/g

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22575

Polychlorinated Biphenyls

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 15, 2009 through January 12, 2010
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Polychlorinated Biphenyls
Validation Level:	EPA Level III & IV
Laboratory:	Analytical Resources, Inc.
Sample Delivery Group (SDG):	QG62

Sample Identification

LDW-SS502-010-comp
LDW-SS527-010**
LDW-SS603-010
LDW-SS503-043-comp
LDW-SS508-010**
LDW-SS509-010**
LDW-SS523-010
LDW-SS525-010
LDW-SS526-010
LDW-SS529-041-comp
LDW-SS530-010
LDW-SS531-010-comp
LDW-SS533-043-comp
LDW-SS544-010-comp
LDW-SS547-010
LDW-SS523-010MS
LDW-SS523-010MSD
LDW-SS525-010MS
LDW-SS525-010MSD

**Indicates sample underwent EPA Level IV review.

Introduction

This data review covers 19 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8082 for Polychlorinated Biphenyls.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (June 2008).

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.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. The cooler temperature for samples LDW-SS525-010 and LDW-SS526-010 was reported at 10.6°C upon receipt by the laboratory. Using professional judgment, associated results were not qualified as estimated since polychlorinated biphenyls are not expected to degrade significantly during transport.

All other cooler temperatures met validation criteria.

II. GC/ECD Instrument Performance Check

Instrument performance was acceptable unless noted otherwise under initial calibration and continuing calibration sections.

III. Initial Calibration

Initial calibration of multicomponent compounds was performed for the primary (quantitation) column as required by the method.

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

Retention times (RT) of all compounds in the calibration standards were within QC limits for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples on which a Level III review was performed.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) of calibration factors in continuing standard mixtures were within the 20.0% QC limits.

The percent difference (%D) of the second source calibration standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Standard	Column	Compound	%D	Associated Samples	Affected Compound	Flag	A or P
1/15/10	0114B044	ZB35	Aroclor-1268	21.2	LDW-SS527-010** LDW-SS603-010 LDW-SS503-043-comp LDW-SS508-010** LDW-SS525-010 LDW-SS531-010-comp LDW-SS544-010-comp LDW-SS547-010 LDW-SS525-010MS LDW-SS525-010MSD MB-0126102	Aroclor-1268	J (all detects) UJ (all non-detects)	A
1/27/10	0127A021	ZB35	Aroclor-1268	24.0	LDW-SS502-010-comp LDW-SS509-010** LDW-SS523-010 LDW-SS526-010 LDW-SS529-041-comp LDW-SS530-010 LDW-SS533-043-comp LDW-SS523-010MS LDW-SS523-010MSD MB-012610	Aroclor-1268	J (all detects) UJ (all non-detects)	A

Retention times (RT) of all compounds in the calibration standards were within QC limits for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples on which a Level III review was performed.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated biphenyl contaminants were found in the method blanks.

VI. Surrogate Spikes and Internal Standards

Surrogates were added to all samples and blanks 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) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Pesticide Cleanup Checks

a. Florisil Cartridge Check

Florisil cleanup was not required and therefore not performed in this SDG.

b. GPC Calibration

GPC cleanup was not required and therefore not performed.

XI. Target Compound Identification

All target compound identifications were within validation criteria for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XII. Compound Quantitation and CRQLs

All compound quantitation and CRQLs were within validation criteria for samples on which an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

Samples LDW-SS527-010** and LDW-SS603-010 were identified as field duplicates. No polychlorinated biphenyls were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/Kg)		RPD
	LDW-SS527-010**	LDW-SS603-010	
Aroclor-1248	23	23	0
Aroclor-1254	37	35	6
Aroclor-1260	31	20	43

XV. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Polychlorinated Biphenyls - Data Qualification Summary - SDG QG62

SDG	Sample	Compound	Flag	A or P	Reason
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010 LDW-SS503-043-comp LDW-SS508-010** LDW-SS509-010** LDW-SS523-010 LDW-SS525-010 LDW-SS526-010 LDW-SS529-041-comp LDW-SS530-010 LDW-SS531-010-comp LDW-SS533-043-comp LDW-SS544-010-comp LDW-SS547-010	Aroclor-1268	J (all detects) UJ (all non-detects)	A	Continuing calibration (ICV %D)

Lower Duwamish Waterway Group
Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG QG62

No Sample Data Qualified in this SDG

LDC #: 22575B3b
SDG #: QG62
Laboratory: Analytical Resources, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV III/IV

Date: 2/26/10
Page: 1 of 1
Reviewer: 9
2nd Reviewer: W

METHOD: GC Polychlorinated Biphenyls (EPA SW 846 Method 8082)

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.	Technical holding times	SW	Sampling dates: 12/15/09 - 1/12/10
II.	GC/ECD Instrument Performance Check	A	
III.	Initial calibration	A	
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 20%
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	LCS
IX.	Regional quality assurance and quality control	N	
Xa.	Florisil cartridge check	N	
Xb.	GPC Calibration	N	
XI.	Target compound identification	A	
XII.	Compound quantitation and reported CRQLs	A	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	SW	D = 2+3.
XV.	Field blanks	N	

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

Validated Samples: ** level IV
MS only

1	LDW-SS502-010-comp	11	LDW-SS530-010	21	MB-012610	31	
2	LDW-SS527-010 **	12	LDW-SS531-010-comp	22	MB-012610S	32	
3	LDW-SS603-010	13	LDW-SS533-010-comp	23		33	
4	LDW-SS503-043-comp	14	LDW-SS544-010-comp	24		34	
5	LDW-SS508-010 **	15	LDW-SS547-010	25		35	
6	LDW-SS509-010 **	16	LDW-SS523-010MS	26		36	
7	LDW-SS523-010	17	LDW-SS523-010MSD	27		37	
8	LDW-SS525-010	18	LDW-SS525-010MS	28		38	
9	LDW-SS526-010	19	LDW-SS525-010MSD	29		39	
10	LDW-SS529-041-comp	20		30		40	

DC #: 22575B3b
DG #: [illegible]

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: 9
2nd Reviewer: [illegible]

Method: ✓ GC ____ HPLC

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?	✓			
Was a curve fit used for evaluation?		✓		
Did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?			✓	
Were the RT windows properly established?	✓			
IV. Continuing calibration				
Was a continuing calibration analyzed daily?	✓			
Were all percent differences (%D) ≤ ~~15%.0 or percent recoveries 85-115%?~~ 20%?	✓			
Were all the retention times within the acceptance windows?	✓			
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Surrogate spikes				
Were all surrogate %R within the QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	
VII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
VIII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

.DC #: 225753b
SDG #: see cover

VALIDATION FINDINGS CHECKLIST

Reviewer: 9
2nd Reviewer: M

Validation Area	Yes	No	NA	Findings/Comments
X. Target compound identification				
Were the retention times of reported detects within the RT windows?	✓			
XI. Compound quantitation/CRQLs				
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XII. System performance				
System performance was found to be acceptable.	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target compounds were detected in the field duplicates.	✓			
XV. Field blanks				
Field blanks were identified in this SDG.		✓		
Target compounds were detected in the field blanks.			✓	

VALIDATION FINDINGS WORKSHEET

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

A. alpha-BHC	I. Dieldrin	Q. Endrin ketone	Y. Aroclor-1242	GG.
B. beta-BHC	J. 4,4'-DDE	R. Endrin aldehyde	Z. Aroclor-1248	HH.
C. delta-BHC	K. Endrin	S. alpha-Chlordane	AA. Aroclor-1254	II.
D. gamma-BHC	L. Endosulfan II	T. gamma-Chlordane	BB. Aroclor-1260	JJ.
E. Heptachlor	M. 4,4'-DDD	U. Toxaphene	CC. DB 608	KK.
F. Aldrin	N. Endosulfan sulfate	V. Aroclor-1016	DD. DB 1701	LL.
G. Heptachlor epoxide	O. 4,4'-DDT	W. Aroclor-1221	EE. Aroclor-1268	MM.
H. Endosulfan I	P. Methoxychlor	X. Aroclor-1232	FF.	NN.

Notes: _____

LDC #: 22573536
SDG #: Selected

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: 9
2nd Reviewer: R

All circled dates have exceeded the technical holding times.
(Y) N N/A Were all cooler temperatures within validation criteria?

METHOD: ✓ GC ___ HPLC

Sample ID	Matrix	Preserved	Sampling Date	Extraction date	Analysis date	Total # of Days	Qualifier
8-9	Temp	(Y) 10.6 °C					Text

TECHNICAL HOLDING TIME CRITERIA

VOLATILES:	Water unpreserved:	Aromatic within 7 days, non-aromatic within 14 days of sample collection.
	Water preserved:	Both within 14 days of sample collection.
	Soils:	Both within 14 days of sample collection.
EXTRACTABLES:		
	Water:	Extracted within 7 days, analyzed within 40 days.
	Soil:	Extracted within 14 days, analyzed within 40 days.

LDC #: 22573B35
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: 9
2nd Reviewer: M

METHOD: ___ GC ___ HPLC (EPA_____)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
What type of continuing calibration calculation was performed? ___%D or ___RPD
Y N N/A Were continuing calibration standards analyzed at the required frequencies?
Y N N/A Did the continuing calibration standards meet the %D / RPD validation criteria of ≤15.0%?
Level IV Only
Y N N/A Were the retention times for all calibrated compounds within their respective acceptance windows?

#	Date	Standard ID	Column / ~~Detector~~	Compound	%D / RPD (Limit ≤ 15.0)	RT (Limits)	Associated Samples	Qualifications
	1/15/10	011CB044 (1eV)	2B35	EE	21.2	( )	2-5, 8, 12	J/UJ/A
						( )	14-15, 18-19	
						( )	MB-012602	
						( )		
						( )		
	1/27/10	012TA021 (1eV)	2B35	EE	24.0	( )	1.6-7, 9-11	J/UJ/A
						( )	13, 16-17	
						( )	MB-012610	
						( )		
						( )		
						( )		
						( )		
						( )		
						( )		
						( )		
						( )		
						( )		
						( )		
						( )		
						( )		
						( )		

A._____ D._____ G._____ J._____ M._____
B._____ E._____ H._____ K._____ O._____
C._____ F._____ I._____ L._____ P._____

LDC #: 22573B3b
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: [illegible]
2nd reviewer: [illegible]

METHOD: 1 GC __ HPLC (EPA_____)

Y N N/A Were field duplicate pairs identified in this SDG?
Y N N/A Were target compounds detected in the field duplicate pairs?

Compound	Concentration (ug/kg)		RPD
	2	3	
Z	23	23	0
AA	37	35	6
BB	31	20	43

Compound	Concentration ( )		RPD

Compound	Concentration ( )		RPD

Compound	Concentration ( )		RPD

LDC #: 22573B36
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: 9
2nd Reviewer: 1

METHOD: GC ✓ HPLC _____

The calibration Factor (CF), average CF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

CF = A/C
average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

A = Area of compound,
C = Concentration of compound,
S = Standard deviation of the CF
X = Mean of the CFs

#	Standard ID	Calibration Date	Compound	Reported CF (0.1 std)	Recalculated CF (0.1 std)	Reported Average CF (initial)	Recalculated Average CF (initial)	Reported %RSD	Recalculated %RSD
1	ICAL	1/14/10	BB-1 (2B5)	0.116T	0.116T	0.1136	0.1136	11.3	11.3
			BB-1 (2B35)	0.1188	0.1188	0.114T	0.114T	10.6	10.6
2	ICAL	1/27/10	BB-1 (2B5)	0.1238T	0.1238T	0.12108	0.12108	5.32T	5.326
			BB-1 (2B35)	0.0837B	0.0837B	0.0825	0.0825	18.452	18.45
3									
4									

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575B3b
SDG #: Leitcover

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: a
2nd Reviewer: a

METHOD: GC ✓ HPLC _____

The percent difference (%D) of the initial calibration average Calibration Factors (CF) and the continuing calibration CF were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. CF - CF)/ave. CF
CF = A/C

Where: ave. CF = initial calibration average CF
CF = continuing calibration CF
A = Area of compound
C = Concentration of compound

#	Standard ID	Calibration Date	Compound	Average CF(Ical)/ CCV Conc.	Reported CF/Conc. CCV	Recalculated CF/Conc. CCV	Reported %D	Recalculated %D
1	0128B064	1/29/10	BB-1 (2B5)	250.0	239.6	239.6	4.2	4.1
			BB-1 (2B35)	✓	242.0	242.0	3.2	3.2
2	0201B002	2/1/10	BB-1 (2B05)	250.0	266.4	266.5	6.6	6.6
			BB-1 (2B35)	✓	254.4	254.4	1.8	1.8
3	0129A006	1/29/10	BB-1 (2B5)	250.0	259.5	259.5	3.8	3.8
			BB-1 (2B35)	250.0	240.1	240.1	4.0	4.0
4								

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 225TSB36
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: R

METHOD: ✓ **GC** __ **HPLC**

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 6

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
DCB	ZB5	8.0	9.7	121	121	0
TCMX	ZB35	8.0	6.0	74.6	75	0.4

Sample ID: _____

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference

Sample ID: _____

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference

LDC #: 22575B3b
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample/Laboratory Control Sample Duplicate Results Verification

Reviewer: 9
2nd Reviewer: L

METHOD: ✓ GC __ HPLC

The percent recoveries (%R) and Relative Percent difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100* (SSC-SC)/SA

RPD = I SSCLCS - SSCLCSD I * 2/(SSCLCS + SSCLCSD)

Where: SSC = Spiked sample concentration
SA = Spike added
LCS = Laboratory control sample percent recovery
SC = Concentration
LCSD = Laboratory control sample duplicate percent recovery

LCS/LCSD samples: LCS-DF610

Compound	Spike Added (mg/kg)		Spiked Sample Concentration (mg/kg)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
Gasoline (8015)										
Diesel (8015)										
Benzene (8021B)										
Methane (RSK-175)										
2,4-D (8151)										
Dinoseb (8151)										
Naphthalene (8310)										
Anthracene (8310)										
HMX (8330)										
2,4,6-Trinitrotoluene (8330)										
BB	20.0	NA	14.3	NA	71.5	71.5				

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicate findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575B3b
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 10

METHOD: 1 GC __HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

%Recovery = 100 * (SSC - SC)/SA

Where SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration; MS = Matrix spike; MSD = Matrix spike duplicate

RPD =(({SSCMS - SSCMSD} * 2) / (SSCMS + SSCMSD))*100

MS/MSD samples: 16/17

Compound	Spike Added (ug/kg)		Sample Conc. (ug/kg)	Spike Sample Concentration (ug/kg)		Matrix spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	---	MS	MSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
Gasoline (8015)											
Diesel (8015)											
Benzene (8021B)											
Methane (RSK-175)											
2,4-D (8151)											
Dinoseb (8151)											
Naphthalene (8310)											
Anthracene (8310)											
HMX (8330)											
2,4,6-Trinitrotoluene (8330)											
BB	97.1	98.0	32.5	106	110	75.7	75.7	79.1	79	3.7	3.7

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22533b
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 4

METHOD: / GC __ HPLC

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10% of the reported results?

Concentration= (A)(Fv)(Df) / (RF)(Vs or Ws)(%S/100)

A= Area or height of the compound to be measured
Fv= Final Volume of extract
Df= Dilution Factor
RF= Average response factor of the compound In the initial calibration
Vs= Initial volume of the sample
Ws= Initial weight of the sample
%S= Percent Solid

Example:

Sample ID. 2 Compound Name BB-2

Concentration = $\frac{(6066468)(80)}{(\cancel{354}2458133)(\cancel{0.09345}\ 0.1138)}$

$= 173.49$

$PCB\ 1260 = \frac{(173.49+141.2+149.3)(5)(1)}{(3)(25.2)} = 30.7\ \mu g/kg$

#	Sample ID	Compound	Reported Concentrations ( )	Recalculated Results Concentrations ( )	Qualifications

Comments: _____

SAMPCALew.wpd

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22575

Metals

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 15, 2009 through January 12, 2010
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Metals
Validation Level:	EPA Level III & IV
Laboratory:	Analytical Resources, Inc.
Sample Delivery Group (SDG):	QG62

Sample Identification

LDW-SS502-010-comp
LDW-SS527-010**
LDW-SS603-010
LDW-SS503-043-comp
LDW-SS508-010**
LDW-SS509-010**
LDW-SS523-010
LDW-SS525-010
LDW-SS526-010
LDW-SS529-041-comp
LDW-SS530-010
LDW-SS531-010-comp
LDW-SS533-043-comp
LDW-SS544-010-comp
LDW-SS547-010
LDW-SS502-010-compMS
LDW-SS502-010-compDUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 17 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 and EPA SW 846 Method 7000 for Metals. The metals analyzed were Antimony, Arsenic, Cadmium, Chromium, Cobalt, Copper, Lead, Molybdenum, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, and Zinc.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a 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.

Blanks are summarized in Section IV.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

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. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

CRDL standards for ICP and AA were analyzed and reported as required.

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Copper Zinc	0.3 mg/Kg 1 mg/Kg	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010 LDW-SS502-010-compDUP

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks.

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	%R (Limits)	Flag	A or P
LDW-SS502-010-compMS (LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010 LDW-SS502-010-compDUP)	Antimony	12.8 (70-130)	J (all detects) UJ (all non-detects)	A

Although the percent recovery for antimony was severely low, using professional judgement, the associated results were qualified as estimated (J/UJ) since the post spike percent recovery was within the QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
LDW-SS502-010-compDUP (LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010)	Nickel	30.8 (≤30)	-	J (all detects) UJ (all non-detects)	A

VIII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

IX. Internal Standards

All internal standard percent recoveries (%R) were within QC limits.

X. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

XI. ICP Serial Dilution

ICP serial dilution was not performed for this SDG.

XII. Sample Result Verification

All sample result verifications were acceptable for samples on which an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

Samples LDW-SS527-010** and LDW-SS603-010 were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration (mg/Kg)		RPD (Limits)
	LDW-SS527-010**	LDW-SS603-010	
Arsenic	18.5	16.7	10 (≤50)
Chromium	20	25.8	25 (≤50)
Cobalt	6.7	8.6	25 (≤50)
Copper	31.4	39.7	23 (≤50)
Lead	10	15	40 (≤50)
Mercury	0.09	0.10	11 (≤50)
Nickel	16	21	27 (≤50)
Vanadium	46.9	60.7	26 (≤50)
Zinc	62	80	25 (≤50)

XV. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Metals - Data Qualification Summary - SDG QG62

SDG	Sample	Analyte	Flag	A or P	Reason
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010 LDW-SS502-010-compDUP	Antimony	J (all detects) UJ (all non-detects)	A	Matrix spike analysis (%R)
QG62	LDW-SS502-010-comp LDW-SS527-010** LDW-SS603-010 LDW-SS502-010-compDUP	Nickel	J (all detects) UJ (all non-detects)	A	Duplicate analysis (RPD)

Lower Duwamish Waterway Group
Metals - Laboratory Blank Data Qualification Summary - SDG QG62

No Sample Data Qualified in this SDG

LDC #: 22575B4

SDG #: QG62

Laboratory: Analytical Resources, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level ~~IV~~ III/IV

Date: 2-16-10

Page: 1 of 1

Reviewer: MG

2nd Reviewer:

METHOD: Metals (EPA Method 200.8, EPA SW 846 Method 7000)

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.	Technical holding times	~~A~~SW	Sampling dates: 12-15-09 through 1-12-10
II.	ICP/MS Tune	A	
III.	Calibration	A	CRDL std (70-130 %)
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	SW	MS
VII.	Duplicate Sample Analysis	SW	DUP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	
X.	Furnace Atomic Absorption QC	N	not utilized
XI.	ICP Serial Dilution	N	not performed
XII.	Sample Result Verification	A	
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	D = 2+3
XV	Field Blanks	N	

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

Validated Samples: for level IV all sediment

1	LDW-SS502-010-comp	11	LDW-SS530-010	21		31	
2	LDW-SS527-010 **	12	LDW-SS531-010-comp	22		32	
3	LDW-SS603-010	13	LDW-SS533-~~0~~043-comp	23	MS	33	
4	LDW-SS503-043-comp	14	LDW-SS544-010-comp	24		34	
5	~~SS508-~~ LDW-SS508-010 **	15	LDW-SS547-010	25		35	
6	LDW-SS509-010 **	16	LDW-SS502-010-compMS	26		36	
7	LDW-SS523-010	17	LDW-SS502-010-comp~~MSD~~ DUP	27		37	
8	LDW-SS525-010	18	PBS	28		38	
9	LDW-SS526-010	19		29		39	
10	LDW-SS529-041-comp	20		30		40	

Notes:

LDC #: 72575B4
SDG #: QG62

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: MG
2nd Reviewer:

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓	JK		
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	✓			
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
IV. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			
VI. Furnace Atomic Absorption QC				
If MSA was performed, was the correlation coefficients > 0.995?			✓	
Do all applicable analysies have duplicate injections? (Level IV only)			✓	
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? (Level IV only)			✓	
Were analytical spike recoveries within the 85-115% QC limits?			✓	

LDC #: 22575B4
SDG #: QG62

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
VIII. Internal Standards (EPA SW 846 Method 6020)				
Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 22575B4
SDG #: QG62

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→3	sed	Al, **Sb, As,** Ba, Be, **Cd,** Ca, **Cr, Co, Cu,** Fe, **Pb,** Mg, Mn, **Hg, Ni,** K, **Se, Ag,** Na, **Tl, V, Zn, Mo,** B, Si, CN⁻, ___ ___
4→15	↓	Al, Sb, **As,** Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
QC 16, 17	↓	Al, **Sb, As,** Ba, Be, **Cd,** Ca, **Cr, Co, Cu,** Fe, **Pb,** Mg, Mn, **Hg, Ni,** K, **Se, Ag,** Na, **Tl, V, Zn, Mo,** B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
ICP Trace	sed	Al, Sb, As, Ba, Be, **Cd,** Ca, **Cr, Co, Cu,** Fe, **Pb,** Mg, Mn, Hg, **Ni,** K, Se, **Ag,** Na, Tl, **V, Zn, Mo,** B, Si, CN⁻, ___ ___
ICP-MS	↓	Al, **Sb, As,** Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, **Se,** Ag, Na, **Tl,** V, Zn, Mo, B, Si, CN⁻, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___

Comments: **Mercury by CVAA if performed**

ELEMENTS.4

LDC #: 08513B4
SDG #: QG62

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: MG
2nd Reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/7000) Soil preparation factor applied: 50x
Sample Concentration units, unless otherwise noted: mg/Kg Associated Samples: 1→3, 17 (>10x)

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Blank Action Limit	Sample Identification
					No samples were qualified
Al					
Sb					
As					
Ba					
Be					
Cd					
Ca					
Cr					
Co					
Cu	0.3			3.00	
Fe					
Pb					
Mg					
Mn					
Hg					
Mo					
Ni					
K					
Se					
Ag					
Na					
Tl					
V					
Zn	1.			10,00	
Sn					
B					

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results wer qualified as not detected, "U".
Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

LDC #: 22575B4
SDG #: QG62

VALIDATION FINDINGS WORKSHEET
Matrix Spike Analysis

Reviewer: MG
2nd Reviewer: [illegible]

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

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

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Was a post digestion spike analyzed for ICP elements that did not meet the required criteria for matrix spike recovery?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Matrix Spike ID	Matrix	Analyte	%R	Associated Samples	Qualifications
1	16	sed	Sb	12.8 (70-130)	1→3, 17	* J-/UJ/A

Comments: post digestion spike in limit for Sb

LDC #: 22575B4
SDG #: QG62

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: MG
2nd Reviewer:

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

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

(Y) N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y (N) N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤ 35% for soil samples? If no, see qualifications below. A control limit of ±R.L. (±2X R.L for soil) was used for sample values that were <5X the R.L., including the case when only one of the duplicate sample values was <5X R.L.. If field blanks were used for laboratory duplicates, note in the Overall Assessment.

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Duplicate ID	Matrix	Analyte	RPD (Limits)	Difference (Limits)	Associated Samples	Qualifications
1	17	sed	Ni	30.8 (≤ 30)		1→3, 17	J / UJ / A

Comments:

LDC#: 22575B4
SDG#: QG62

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6010B/7000)

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

Compound	Concentration (mg/Kg)		RPD (≤ 50)	
	2	3		
Arsenic	18.5	16.7	10	
Chromium	20	25.8	25	
Cobalt	6.7	8.6	25	
Copper	31.4	39.7	23	
Lead	10	15	40	
Mercury	0.09	0.10	11	
Nickel	16	21	27	
Vanadium	46.9	60.7	26	
Zinc	62	80	25	

V:\FIELD DUPLICATES\FD_inorganic\22575B4.WPD

LDC #: 22575B4
SDG #: QG62

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

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

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found x 100 / True

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
1102 ICV	ICP (Initial calibration)	Cd	1015.	1000.0	101.5	101.5	Y
	GFAA (Initial calibration)						
1205 ICV	CVAA (Initial calibration)	Hg	7.66	8.0	95.8	95.8	
1906 CCV8	ICP (Continuing calibration)	Cu	1044.	1000.0	104.4	104.4	
	GFAA (Continuing calibration)						
1354 CCV7	CVAA (Continuing calibration)	Hg	3.92	4.0	98.0	98.0	
1124 ICV	ICP/MS (Initial calibration)	Sb	49.743	50.0	99.5	99.5	
1725 CCV7	ICP/MS (Continuing calibation)	Tl	49.398	50.0	98.7	98.7	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575B4
SDG #: QG62

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: ~

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

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1858 ICSAB3	ICP Interference check	Zn	965.5 (mg/L)	1000. (mg/L)	96.6	96.6	Y
1746 LCS	Laboratory control sample	As	27.11 (mg/kg)	25.0 (mg/kg)	108	108	↓
1916 16	Matrix spike	Se	(SSR-SR) 100.11 (mg/kg)	107. (mg/kg)	93.6	93.5	↓
1953/1946 17	Duplicate	Co	5.07 (mg/kg)	4.01 (mg/kg)	23.3	24.2	↓
—	ICP serial dilution	—	—	—	—	—	—

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575B4
SDG #: QG62

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: ✓

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

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

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
(Y) N N/A Are all detection limits below the CRDL?

Detected analyte results for #2. As were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)(\%S)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor
%S = Decimal percent solids

Recalculation:

$$\frac{(9.795\ \mu g/L)(0.050\ L)(20)}{(1.051\ g)(0.505)} = 18.455\ \frac{\mu g}{g}\ \text{or}\ \frac{mg}{Kg}$$

Sample ID	Analyte	Reported Concentration (mg/Kg)	Calculated Concentration (mg/Kg)	Acceptable (Y/N)
2	As	18.5	18.5	Y
	Cr	20.	20.0	
	Co	6.7	6.7	
	Cu	31.4	31.4	
	Pb	10.	10.4	
	Hg	0.09	0.094	
	Ni	16.	16.3	
	V	46.9	46.9	
	Zn	62.	62.1	

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22575

Wet Chemistry

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	January 11 through January 12, 2010
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Wet Chemistry
Validation Level:	EPA Level IV
Laboratory:	Analytical Resources, Inc.
Sample Delivery Groups (SDG):	QF92

Sample Identification

LDW-SS502-010-comp
LDW-SS503-043-comp
LDW-SS529-041-comp
LDW-SS531-010-comp
LDW-SS533-043-comp
LDW-SS544-010-comp
LDW-SS547-010
LDW-SS520-010
LDW-SS502-010-compMS
LDW-SS502-010-compDUP
LDW-SS502-010-compTRP
LDW-SS544-010-compDUP
LDW-SS544-010-compTRP

Introduction

This data review covers 13 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per the Plumb Method for Total Organic Carbon, PSEP Method for Particle Size, and EPA Method 160.3 for Percent Solids.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a 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.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

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

b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

V. Duplicates/Triplicates

Duplicate (DUP) and triplicate (TRP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VII. Sample Result Verification

All sample result verifications were acceptable.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Wet Chemistry - Data Qualification Summary - SDG QF92

No Sample Data Qualified in this SDG

Lower Duwamish Waterway Group
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG QF92

No Sample Data Qualified in this SDG

LDC #: 22575A6 **VALIDATION COMPLETENESS WORKSHEET** Date: 2-16-10
SDG #: QF92 Level IV Page: 1 of 1
Laboratory: Analytical Resources, Inc. Reviewer: MG
2nd Reviewer:

METHOD: TOC (Plumb Method), Particle Size (PSEP Method), Total Solids (EPA Method 160.3)

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.	Technical holding times	SW A	Sampling dates: 1-11-10 through 1-12-10
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IV	Matrix Spike/Matrix Spike Duplicates	A	MS
V	Duplicates	A	DUP/TRP
VI.	Laboratory control samples	A	LCS
VII.	Sample result verification	A	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
X	Field blanks	N	

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

Validated Samples: all sediment

1	LDW-SS502-010-comp	11	LDW-SS502-010-comp~~DUP~~ TRP	21		31	
2	LDW-SS503-043-comp	12	LDW-SS544-010-compDUP	22		32	
3	LDW-SS529-041-comp	13	LDW-SS544-010-compTRP	23		33	
4	LDW-SS531-010-comp	14	PBS	24		34	
5	LDW-SS533-043-comp	15		25		35	
6	LDW-SS544-010-comp	16		26		36	
7	LDW-SS547-010	17		27		37	
8	LDW-SS520-010	18		28		38	
9	LDW-SS502-010-compMS	19		29		39	
10	LDW-SS502-010-comp~~MSD~~ DUP	20		30		40	

Notes:

LDC #: 22575A6
SDG #: QF92

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: V

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.		✓		
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 22575A6
SDG #: QF92

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: [illegible]
SDG #: QF92

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→8	Sed	pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
QC 9→11	↓	pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
		pH Br Cl F NO_3 NO_2 SO_4 O-PO_4 ClO_3 TOC CN NH_3 TKN CEC S Cr^{6+}
1→8		Moisture Density Porosity Organic Solids Gravity Particle size Total Solids
QC 10,11		Moisture Density Porosity Organic Solids Gravity Particle size Total Solids
↓ 12,13	↓	Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size
		Moisture Density Porosity Organic Solids Gravity Particle size

Comments:

LDC #: 22575A6
SDG #: QF92

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: MG
2nd reviewer: V

All circled dates have exceeded the technical holding time.
Y N (N/A) Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:	160.3					
Parameters:	Total Solids					
Technical holding time:	7 day					

Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1	1-11-10	1-19-10	(8 day)				No qual * J/UJ/P
2	↓	↓	↓				↓
3							
7							
8							
10							
11	↓	↓	↓				

* using professional judgment, data were not qualified, delay in analysis is due to compositing scheme agreement w/ EPA

LDC #: 22575A6
SDG #: QF92

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of TOC was recalculated. Calibration date: 1-4-10

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found x 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte		µg C (units)	Area (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	TOC	Blank	0.0 (µg)	58147	r^2=0.99965	r^2=0.99965	Y
Calibration verification		Standard 1	8.0 ( )	1770583			
		Standard 2	20.0 ( )	4611982			
		Standard 3	40.0 ( )	9454085			
		Standard 4	100.0 ( )	24563398			
		Standard 5	-	-			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	Toc	ICV	998. (mg/kg)	1000. (mg/kg)	99.8	99.80	
Calibration verification	Toc	CCV1	1028. (mg/kg)	1000. (mg/kg)	102.8	102.80	
Calibration verification	—	—	—	—	—	—	—

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575A6
SDG #: QF92

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	TOC	0.0998 (%)	0.100 (%)	99.8	100.0	Y
9	Matrix spike sample	TOC	(SSR-SR) 2.13 (%)	1.86 (%)	114.5	119.1	
1/10/11	Duplicate sample	Total Solids	Samp 72.8 (%)	Dup. 74.0 (%)	TRA 72.5 (%)	RSD recalc. 1.1 / report 1.1	

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22575A6
SDG #: QF92

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer:

METHOD: Inorganics, Method see cover

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

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments?
(Y) N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, TOC reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

for µg C: $Y = mx + b$ $12064713 = 2.464e+05(x) - 186465$

where $m = 2.464e+05$ $49.72\ \mu g\ C = x$

$b = -186465.$

burn wt = 2.8 mg or 0.0028g

then $\frac{49.72\ \mu g}{0.0028\ g} = 17757\ \frac{\mu g}{g}$ or $\frac{mg}{kg}$ or 1.776 %

#	Sample ID	Analyte	Reported Concentration (%)	Calculated Concentration (%)	Acceptable (Y/N)
1	1	Total Solids	72.80	72.77	Y
		TOC	1.82	1.78	
		% Finer Than			
		4750. (µm)	96.2	96.2	
		2000. ( )	92.1	92.1	
		1000. ( )	87.0	87.0	
		500. ( )	68.6	68.6	
		250. ( )	29.0	29.0	
		125. ( )	9.7	9.6	
		63. ( )	6.0	6.0	
		31.0 ( )	4.8	4.9	
		15.6 ( )	4.0	4.2	
		7.8 ( )	3.5	3.6	
		3.9 ( )	2.8	2.9	
		2.0 ( )	1.9	2.0	
		1.0 ( )	1.1	1.3	

Note:

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Windward Environmental, LLC
200 West Mercer Street, Suite 401
Seattle, WA 98119
ATTN: Ms. Marina Mitchell

April 30, 2010

SUBJECT: Lower Duwamish Waterway Group, Data Validation

Dear Ms. Mitchell,

Enclosed is the revised validation report for the fraction listed below. This SDG was received on February 19, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 22612:

SDG #	Fraction
DPWG31853/WG31628	Dioxins/Dibenzofurans

The data validation was performed under EPA Level IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005
- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005, Dioxin/Furan Addendum, December 2009
- EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin(PCDD) and Polychlorinated Dibenzofuran(PCDF) Data, Revision 2.0, January 1996
- USEPA, Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Diobenzofurans Data Review, September 2005

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

Sincerely,

Stella S. Cuenco
Data Validation Operations Manager/Senior Chemist

1 WEEK TAT

Attachment 1

EDD

LDC #22612 (Windward Environmental, LLC - Seattle WA / Lower Duwamish Waterway Group)

PO# Axys07-04

LDC	SDG#	DATE REC'D	(3) DATE DUE	Dioxins (8290)																													
Matrix:	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
A	DPWG31853/WG31628	02/19/10	02/26/10	0	12																												
Total	T/SC			0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12

Shaded cells indicate Level IV validation (all other cells are Level II validation). These sample counts do not include MS/MSD, and DUPs

22612ST.wpd

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22612

Dioxins/Dibenzofurans

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	December 15 through December 16, 2009
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Dioxins/Dibenzofurans
Validation Level:	EPA Level IV
Laboratory:	AXYS Analytical Services Ltd.
Sample Delivery Group (SDG):	DPWG31853/WG31628

Sample Identification

LDW-SS523-010
LDW-SS530-010
LDW-SS509-010
LDW-SS501-010
LDW-SS505-010
LDW-SS507-010
LDW-SS510-010
LDW-SS514-010
LDW-SS515-010
LDW-SS516-010
LDW-SS517-010
LDW-SS525-010
LDW-SS505-010DUP

Introduction

This data review covers 13 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 1613 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data (Revision 2.0, January 31, 1996) and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005) as there are no current guidelines for the method stated above.

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

- J1 Blank Contamination: Indicates possible high bias and/or false positives.
- J2 Calibration Range exceeded: Indicates possible low bias.
- J3 Holding times not met: Indicates low bias for most analytes.
- J4 Other QC parameters outside control limits: bias not readily determined.
- J5 Other QC parameters outside control limits. The reported results appear to be biased high. The actual value of target compound in the sample may be lower than the value reported by the laboratory.
- J6 Other QC parameters outside control limits. The reported results appear to be biased low. The actual value of target compound in the sample may be higher than the value reported by the laboratory.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between ^{13}C-2,3,7,8-TCDD and ^{13}C-1,2,3,4-TCDD was less than or equal to 25%.

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

III. Initial Calibration

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

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for all native compounds and less than or equal to 35.0% for all labeled compounds.

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

The minimum S/N ratio was technically acceptable.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration concentrations were within the QC limits.

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks.

Method blank results flagged "K" by the laboratory as estimated maximum possible concentration (EMPC) were considered not detected.

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.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VII. Ongoing Precision & Recovery (OPR) and Standard Reference Material (SRM) Samples

Percent recoveries (%R) of the ongoing precision and recovery samples were within QC limits.

Standard reference material samples were analyzed at the required frequency.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

All target compound identifications were within validation criteria.

XI. Compound Quantitation and CRQLs

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG DPWG31853/WG31628	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A

XII. System Performance

The system performance was acceptable.

XIII. Overall Assessment of Data

The overall assessment of data was acceptable. In the case where more than one result was reported for an individual sample, the least technically acceptable results were rejected as follows:

Sample	Compound	Flag	A or P
All samples in SDG DPWG31853/WG31628	2,3,7,8-TCDF (from DB-5)	R	A

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG31853/WG31628

SDG	Sample	Compound	Flag	A or P	Reason
DPWG31853/ WG31628	LDW-SS523-010 LDW-SS530-010 LDW-SS509-010 LDW-SS501-010 LDW-SS505-010 LDW-SS507-010 LDW-SS510-010 LDW-SS514-010 LDW-SS515-010 LDW-SS516-010 LDW-SS517-010 LDW-SS525-010 LDW-SS505-010DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and CRQLs (EMPC)
DPWG31853/ WG31628	LDW-SS523-010 LDW-SS530-010 LDW-SS509-010 LDW-SS501-010 LDW-SS505-010 LDW-SS507-010 LDW-SS510-010 LDW-SS514-010 LDW-SS515-010 LDW-SS516-010 LDW-SS517-010 LDW-SS525-010 LDW-SS505-010DUP	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

Lower Duwamish Waterway Group
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG31853/WG31628

No Sample Data Qualified in this SDG

LDC #: 22612A21 **VALIDATION COMPLETENESS WORKSHEET** Date: 2/22/10
SDG #: DPWG31853/WG31628 Level IV Page: 1 of 1
Laboratory: AXYS Analytical Services Ltd. Reviewer: Q
2nd Reviewer: N

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

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.	Technical holding times	A	Sampling dates: 1/15 - 16/09
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	20/35
IV.	Routine calibration	A	QC limits
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates /DUP	N/A	
VII.	Laboratory control samples	A	OPR. CRM
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	A SW	
XII.	System performance	A	
XIII.	Overall assessment of data	SW	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

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

Validated Samples:
All Seds

1 1	LDW-SS523-010	11 1	LDW-SS517-010	21 1	WG31628-10 1	31	
2 2	LDW-SS530-010	12 2	LDW-SS525-010	22		32	
3 3	LDW-SS509-010	13 3	LDW-SS505-010DUP	23		33	
4 2	LDW-SS501-010	14		24		34	
5 3	LDW-SS505-010	15		25		35	
6 3	LDW-SS507-010	16		26		36	
7 2	LDW-SS510-010	17		27		37	
8 3	LDW-SS514-010	18		28		38	
9 2	LDW-SS515-010	19		29		39	
10 1	LDW-SS516-010	20		30		40	

Notes: _____

DC #: 226121
DG #: See cover

VALIDATION FINDINGS CHECKLIST

Reviewer: Q
2nd Reviewer: L

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?	✓			
Were the retention time windows established for all homologues?	✓			
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?	✓			
Is the static resolving power at least 10,000 (10% valley definition)?	✓			
Was the mass resolution adequately check with PFK?	✓			
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?	✓			
III. Initial calibration				
Was the initial calibration performed at 5 concentration levels?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% for unlabeled standards and ≤ 35% for labeled standards?	✓			
Did all calibration standards meet the Ion Abundance Ratio criteria?	✓			
Was the signal to noise ratio for each target compound ≥ 2.5 and for each recovery and internal standard ≥ 10?	✓			
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?	✓			
Were all percent differences (%D) ~~≤ 20%~~ for unlabeled standards and ~~≤ 30%~~ for labeled standards? Not QC limits	✓			
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	✓			
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank performed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.		✓		DUP
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			

)C #: 22612A21
)G #: See cover

VALIDATION FINDINGS CHECKLIST

Reviewer: 9
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
IX. Internal standards				
Were internal standard recoveries within the 40-135% criteria?	✓			
Was the minimum S/N ratio of all internal standard peaks $\geq$ 10?	✓			
X. Target compound identification				
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?	✓			
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?	✓			
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?	✓			
Did compound spectra contain all characteristic ions listed in the table attached?	✓			
Was the Ion Abundance Ratio for the two quantitation ions within criteria?	✓			
Was the signal to noise ratio for each target compound and labeled standard $\geq$ 2.5?	✓			
Does the maximum intensity of each specified characteristic ion coincide within $\pm$ 2 seconds (includes labeled standards)?	✓			
For PCDF identification, was any signal (S/N $\geq$ 2.5, at $\pm$ seconds RT) detected in the corresponding PCDPE channel?			✓	
Was an acceptable lock mass recorded and monitored?	✓			
XI. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XII. System performance				
System performance was found to be acceptable.	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		

)C #: 23612A21
)G #: see cover

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
Target compounds were detected in the field duplicates.			✓	
XV. Field blanks				
Field blanks were identified in this SDG.		✓		
Target compounds were detected in the field blanks.			✓	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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 #: 22612A21
SDG #: 2nd round

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: 4
2nd Reviewer: A

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 8290)
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 analyzed for each matrix?
Y N N/A Was the blank contaminated? If yes, please see qualification below.

Blank extraction date:_____ **Blank analysis date:**_____
Conc. units:_____ Associated Samples:_____

Compound	Blank ID	Sample Identification								
All EMPC results		—	qual	U						

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".

LDC #: 22612A2
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: M

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Y N N/A Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound?
Y N N/A Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		all	EMPC results	all	U

Comments: See sample calculation verification worksheet for recalculations

LDC # [illegible]
SDG # See cover

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Page: 1 of 1
Reviewer: 9
2nd Reviewer: A

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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	Finding	Associated Samples	Qualifications
		All	H on OB-S	all	R/A

Comments: _____

C:\WPDOCS\WRK\DIOXIN90\OVR90.21

SDG #: see cover

Initial Calibration Calculation Verification

Reviewer: 9
2nd Reviewer: A

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~ 1613)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	ICAL	11/19/09	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	0.83	0.83	0.83	2.19	2.31
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	0.87	0.84	0.84	4.39	4.26
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	0.79	0.78	0.78	1.51	1.45
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	1.07	1.13	1.13	3.27	3.52
			OCDF (^{13}C-OCDD)	0.78	0.78	0.75	0.75	19.8	20.0
2	ICAL	12/23/09	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	0.92	0.91	0.91	4.69	4.56
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

SDG #: 3ECONEW

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Page: 1 of
Reviewer:
2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	DXON015 S=6	2/2/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.6	10.6		
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.85	10.2	10.1		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	53.0	53.0		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	45.9	46.1		
			OCDF (^{13}C-OCDD)	0.98	117	116		
2	DB0B03 S=3	2/3/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	11.8	11.8		
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
3	DXON015 S=17	2/3/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.5	10.6		
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.85	10.1	10.0		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	53.8	53.3		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	45.4	45.6		
			OCDF (^{13}C-OCDD)	0.78	116	115		

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: [illegible]
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	DBOB033 S=2	2/7/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	11.1	11.8		
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
2	DXOM-015 S=28	2/3/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.5	10.5		
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.81	10.1	10.1		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	53.9	53.5		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	46.7	45.8		
			OCDF (^{13}C-OCDD)	0.78	120	119		
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 22613A2
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer:

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = | LCS - LCSD | * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: WF31628-102

Compound	Spike Added (ng/mL)		Spiked Sample Concentration (ng/mL)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	10.0	NA	9.68	NA	96.8	96.8				
1,2,3,7,8-PeCDD	50.0		49.8		99.7	99.7				
1,2,3,4,7,8-HxCDD	56.5		51.3		90.8	90.8				
1,2,3,4,7,8,9-HpCDF	50.0		43.9		87.9	87.8				
OCDF	104	↓	112	↓	108	108				

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

Descriptor	Accurate mass[a]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 22613A21
SDG #: Tencover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: Q
2nd reviewer: JL

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

(Y) N N/A Were all reported results recalculated and verified for all level IV samples?
(Y) N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

RRF = Relative Response Factor (average) from the initial calibration

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

Example:

Sample I.D. 1 , F :

Conc. = $\frac{(8.4Tes)(2000)(\quad)}{(4.7Tes)(1.0T)(10.6)(\quad)}$

= 313.1 ng/kg

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Windward Environmental, LLC
200 West Mercer Street, Suite 401
Seattle, WA 98119
ATTN: Ms. Marina Mitchell

April 30, 2010

SUBJECT: Lower Duwamish Waterway Group, Data Validation

Dear Ms. Mitchell,

Enclosed is the revised validation report for the fraction listed below. This SDG was received on March 3, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 22683:

SDG #	Fraction
DPWG31962/WG31619	Dioxins/Dibenzofurans

The data validation was performed under EPA Level IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005
- Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan, January 2005, Dioxin/Furan Addendum, December 2009
- EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin(PCDD) and Polychlorinated Dibenzofuran(PCDF) Data, Revision 2.0, January 1996
- USEPA, Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Diobenzofurans Data Review, September 2005

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

Sincerely,

Stella S. Cuenco
Data Validation Operations Manager/Senior Chemist

1 WEEK TAT

Attachment 1

EDD

LDC #22683 (Windward Environmental, LLC - Seattle WA / Lower Duwamish Waterway Group)

PO# Axys07-04

LDC	SDG#	DATE REC'D	(3) DATE DUE	Dioxins (8290)																													
Matrix: 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
A	DPWG31962/WG31619	03/03/10	03/10/10	0	8																												

Shaded cells indicate Level IV validation (all other cells are Level II validation). These sample counts do not include MS/MSD, and DUPs

Lower Duwamish Waterway Group
Data Validation Reports
LDC #22683

Dioxins/Dibenzofurans

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Lower Duwamish Waterway Group
Collection Date:	January 11 through January 12, 2010
LDC Report Date:	April 29, 2010
Matrix:	Sediment
Parameters:	Dioxins/Dibenzofurans
Validation Level:	EPA Level IV
Laboratory:	AXYS Analytical Services Ltd.
Sample Delivery Group (SDG):	DPWG31962/WG31619

Sample Identification

LDW-SS502-010-COMP
LDW-SS503-043-COMP
LDW-SS529-041-COMP
LDW-SS531-010-COMP
LDW-SS533-043-COMP
LDW-SS544-010-COMP
LDW-SS547-010
LDW-SS520-010
LDW-SS520-010DUP

Introduction

This data review covers 9 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 1613 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway Quality Assurance Project Plan (QAPP) (January 14, 2005), Final Surface Sediment Sampling for Chemical Analyses and Toxicity Testing of the Lower Duwamish Waterway QAPP, Dioxin/Furan Addendum (December 15, 2009), EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data (Revision 2.0, January 31, 1996) and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005) as there are no current guidelines for the method stated above.

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

The following are definitions of the data qualifiers:

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

- J1 Blank Contamination: Indicates possible high bias and/or false positives.
- J2 Calibration Range exceeded: Indicates possible low bias.
- J3 Holding times not met: Indicates low bias for most analytes.
- J4 Other QC parameters outside control limits: bias not readily determined.
- J5 Other QC parameters outside control limits. The reported results appear to be biased high. The actual value of target compound in the sample may be lower than the value reported by the laboratory.
- J6 Other QC parameters outside control limits. The reported results appear to be biased low. The actual value of target compound in the sample may be higher than the value reported by the laboratory.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between ^{13}C-2,3,7,8-TCDD and ^{13}C-1,2,3,4-TCDD was less than or equal to 25%.

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

III. Initial Calibration

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

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for all native compounds and less than or equal to 35.0% for all labeled compounds.

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

The minimum S/N ratio was technically acceptable.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration concentrations were within the QC limits.

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
WG31619-101	1/25/10	OCDD	0.123 pg/g	All samples in SDG DPWG31962/WG31619

Sample concentrations were compared to concentrations detected in the method blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks.

Method blank results flagged "K" by the laboratory as estimated maximum possible concentration (EMPC) were considered not detected.

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.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Compound	RPD (Limits)	Difference (Limits)	Flag	A or P
LDW-SS520-010DUP (LDW-SS520-010 LDW-SS520-010DUP)	2,3,4,6,7,8-HxCDF	62.7 (≤50)	-	J (all detects)	A

VII. Ongoing Precision & Recovery (OPR) and Standard Reference Material (SRM) Samples

Percent recoveries (%R) of the ongoing precision and recovery samples were within QC limits.

Standard reference material samples were analyzed at the required frequency.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

All target compound identifications were within validation criteria.

XI. Compound Quantitation and CRQLs

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG DPWG31962/WG31619	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A

XII. System Performance

The system performance was acceptable.

XIII. Overall Assessment of Data

The overall assessment of data was acceptable. In the case where more than one result was reported for an individual sample, the least technically acceptable results were rejected as follows:

Sample	Compound	Flag	A or P
All samples in SDG DPWG31962/WG31619	2,3,7,8-TCDF (from DB-5)	R	A

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

No field blanks were identified in this SDG.

Lower Duwamish Waterway Group
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG31962/WG31619

SDG	Sample	Compound	Flag	A or P	Reason
DPWG31962/ WG31619	LDW-SS520-010 LDW-SS520-010DUP	2,3,4,6,7,8-HxCDF	J (all detects)	A	Duplicate sample analysis (RPD)
DPWG31962/ WG31619	LDW-SS502-010-COMP LDW-SS503-043-COMP LDW-SS529-041-COMP LDW-SS531-010-COMP LDW-SS533-043-COMP LDW-SS544-010-COMP LDW-SS547-010 LDW-SS520-010 LDW-SS520-010DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and CRQLs (EMPC)
DPWG31962/ WG31619	LDW-SS502-010-COMP LDW-SS503-043-COMP LDW-SS529-041-COMP LDW-SS531-010-COMP LDW-SS533-043-COMP LDW-SS544-010-COMP LDW-SS547-010 LDW-SS520-010 LDW-SS520-010DUP	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

Lower Duwamish Waterway Group
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG31962/WG31619

No Sample Data Qualified in this SDG

LDC #: 22683A21 **VALIDATION COMPLETENESS WORKSHEET** Date: 3/4/10
SDG #: DPWG31962/WG31619 Level IV Page: 1 of 1
Laboratory: AXYS Analytical Services Ltd. Reviewer: 2
2nd Reviewer: N

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

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.	Technical holding times	A	Sampling dates: 1/11-12/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration	A	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates DUP	SW	
VII.	Laboratory control samples	A	OPR. CRM
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	A	
XIII.	Overall assessment of data	SW	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

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

Validated Samples:
All soils

1	LDW-SS502-010-COMP	11	WG31619-101	21		31	
2	LDW-SS503-043-COMP	12		22		32	
3	LDW-SS529-041-COMP	13		23		33	
4	LDW-SS531-010-COMP	14		24		34	
5	LDW-SS533-043-COMP	15		25		35	
6	LDW-SS544-010-COMP	16		26		36	
7	LDW-SS547-010	17		27		37	
8	LDW-SS520-010	18		28		38	
9	LDW-SS520-010DUP	19		29		39	
10		20		30		40	

Notes: _____

DC #: 22683A21
DG #: See cover

VALIDATION FINDINGS CHECKLIST

Page: 1 of 3
Reviewer: CF
2nd Reviewer: K

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?	✓			
Were the retention time windows established for all homologues?	✓			
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?	✓			
Is the static resolving power at least 10,000 (10% valley definition)?	✓			
Was the mass resolution adequately check with PFK?	✓			
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?	✓			
III. Initial calibration				
Was the initial calibration performed at 5 concentration levels?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% ~~for unlabeled standards and ≤ 30% for labeled standards~~?	✓			
Did all calibration standards meet the Ion Abundance Ratio criteria?	✓			
Was the signal to noise ratio for each target compound ≥ 2.5 and for each recovery and internal standard ≥ 10?	✓			
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?	✓			
Were all ~~percent differences (%D) ≤ 20%~~ conc meet QC criteria for unlabeled standards and ~~≤ 30%~~ for labeled standards?	✓			
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	✓			
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank performed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.		✓		Dup
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			

IC #: 22683A2/
)G #: See cover

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
IX. Internal standards				
Were internal standard recoveries within the 40-135% criteria?	✓			
Was the minimum S/N ratio of all internal standard peaks $\geq$ 10?	✓			
X. Target compound identification				
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?	✓			
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?	✓			
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?	✓			
Did compound spectra contain all characteristic ions listed in the table attached?	✓			
Was the Ion Abundance Ratio for the two quantitation ions within criteria?	✓			
Was the signal to noise ratio for each target compound and labeled standard $\geq$ 2.5?	✓			
Does the maximum intensity of each specified characteristic ion coincide within $\pm$ 2 seconds (includes labeled standards)?	✓			
For PCDF identification, was any signal (S/N $\geq$ 2.5, at $\pm$ seconds RT) detected in the corresponding PCDPE channel?			✓	
Was an acceptable lock mass recorded and monitored?	✓			
XI. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XII. System performance				
System performance was found to be acceptable.	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		

)C #: 22683A21
)G #: see cover

VALIDATION FINDINGS CHECKLIST

Reviewer: 9
2nd Reviewer: A

Validation Area	Yes	No	NA	Findings/Comments
Target compounds were detected in the field duplicates.			✓	
XV. Field blanks				
Field blanks were identified in this SDG.		✓		
Target compounds were detected in the field blanks.			✓	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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 #: 22683A21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer:
2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 8290)
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 analyzed for each matrix?
(Y) N N/A Was the blank contaminated? If yes, please see qualification below.
Blank extraction date: 1/29/10 **Blank analysis date:** 2/11/10
Conc. units: ng/Kg Associated Samples: All (>5X)

Compound	Blank ID	Sample Identification								
	WG31619-10	1								
G	0.123									
Q qual	EMPC	-	U							

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".

LDC #: 22685A21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: 9
2nd Reviewer: M

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Y (N) N/A — Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have a associated MS/MSD. Soil / Water.

Y (N) N/A — Was a MS/MSD analyzed every 20 samples of each matrix?

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

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		~~8~~ 9	M	( )	( )	62.7 (≤50)	8, 9	J dets/A
				( )	( )	( )		
				( )	( )	( )		
		No MS/MSD client specified				( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 22683A2/
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: M

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Y N N/A Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound?
Y N N/A Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		All	EMPC results	all	U

Comments: See sample calculation verification worksheet for recalculations

LDC #: [illegible]
SDG #: Second

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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	Finding	Associated Samples	Qualifications
		All	H on DB-5	All	R/A

Comments: _____

C:\WPDOCS\WRK\DIOXIN90\OVR90.21

LDC #: 22683A2
SDG #: Sequence

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: A

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

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$ — A_x = Area of compound, A_{is} = Area of associated internal standard
average RRF = sum of the RRFs/number of standards — C_x = Concentration of compound, C_{is} = Concentration of internal standard
%RSD = 100 * (S/X) — S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	ICAL	11/19/09	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	0.83	0.83	0.83	2.19	2.31
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	0.87	0.84	0.84	4.39	4.26
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	0.79	0.78	0.78	1.51	1.45
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	1.07	1.13	1.13	3.27	3.52
			OCDF (^{13}C-OCDD)	0.78	0.78	0.75	0.75	19.8	20.0
2	ICAL	12/23/09	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	0.92	0.91	0.91	4.69	4.58
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

SDG #: 2er cond

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: 4
2nd Reviewer: 05

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	DX0M-019	2/11/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.4	10.4		
	S=2		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	10.4	10.3		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	53.2	53.0		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	45.9	46.0		
			OCDF (^{13}C-OCDD)	0.78	113	113		
2	DB0B-039	2/11/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.92	12.9	13.0		
	S=2		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
3	DX0M-019		2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.83	10.7	10.6		
	S=12		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.87	10.8	10.7		
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	0.79	52.2	52.8		
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.07	45.5	45.4		
			OCDF (^{13}C-OCDD)	0.78	115	115		

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: [illegible]
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: [illegible]
Reviewer:
2nd Reviewer:

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCS - LCSD I * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: WF31619-102

Compound	Spike Added (ng/mL)		Spiked Sample Concentration (ng/mL)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	10.0	NA	10.6	NA	106	106				
1,2,3,7,8-PeCDD	50.0		51.5		99.1	99.0				
1,2,3,4,7,8-HxCDD	56.5		54.1		95.7	95.7				
1,2,3,4,7,8,9-HpCDF	50.0		46.4		92.9	92.8				
OCDF	104	↓	123	↓	119	118				

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

Descriptor	Accurate mass[a]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 22683A21
SDG #: Receiver

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: M

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

RRF = Relative Response Factor (average) from the initial calibration

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

Example:

Sample I.D. 1 , F :

Conc. = (1.105)(2000)( ) / (4.785)(1.07)(10.2)( )

= 42.7 ng/kg

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification