



LABORATORY DATA CONSULTANTS, INC.

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Froehling & Robertson, Inc.
1735 Seibel Drive, NE
Roanoke, VA 24012
ATTN: Mr. Glenn Hargrove

August 8, 2018

SUBJECT: Wills Wharf, MD, Hexavalent Chromium Monitoring

Dear Mr. Hargrove,

Enclosed is the final validation report for the fraction listed below. This SDG was received on August 6, 2018. Attachment 1 is a summary of the samples that were reviewed for analysis.

LDC Project #42830:

<u>SDG #</u>	<u>Fraction</u>
8071901	Hexavalent Chromium

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

- Air Monitoring Program Quality Assurance Project Plan, Wills Wharf Office Project, Baltimore Works Site, Baltimore, Maryland; April 2016
- USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review; January 2017

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

Sincerely,

Christina Rink
Project Manager/Senior Chemist

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Wills Wharf, MD, Hexavalent Chromium Monitoring

LDC Report Date: August 8, 2018

Parameters: Hexavalent Chromium

Validation Level: Level IV

Laboratory: Eastern Research Group

Sample Delivery Group (SDG): 8071901

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
PWAM-1 (07/16/18)	8071901-01	Air	07/16/18
PWAM-2 (07/16/18)	8071901-02	Air	07/16/18
PWAM-3 (07/16/18)	8071901-03	Air	07/16/18
PWAM-FB (07/16/18)	8071901-04	Air	07/16/18
PWAM-TB (07/16/18)	8071901-05	Air	07/16/18
PWAM-1 (07/17/18)	8071901-06	Air	07/17/18
PWAM-2 (07/17/18)	8071901-07	Air	07/17/18
PWAM-3 (07/17/18)	8071901-08	Air	07/17/18
PWAM-FB (07/17/18)	8071901-09	Air	07/17/18
PWAM-TB (07/17/18)	8071901-10	Air	07/17/18
PWAM-1 (07/18/18)	8071901-11	Air	07/18/18
PWAM-2 (07/18/18)	8071901-12	Air	07/18/18
PWAM-3 (07/18/18)	8071901-13	Air	07/18/18
PWAM-FB (07/18/18)	8071901-14	Air	07/18/18
PWAM-TB (07/18/18)	8071901-15	Air	07/18/18
PWAM-3 (07/16/18)DUP	8071901-03DUP	Air	07/16/18

The date was appended to the sample ID to differentiate between samples.

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Air Monitoring Program Quality Assurance Project Plan, Wills Wharf Office Project, Baltimore Works Site, Baltimore, Maryland (April 2016) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Hexavalent Chromium by ERG-MOR-063

All sample results were subjected to Level IV data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

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

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

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

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

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

V. Field Blanks

Samples PWAM-TB (07/16/18), PWAM-TB (07/17/18), and PWAM-TB (07/18/18) were identified as trip blanks. No contaminants were found.

Samples PWAM-FB (07/16/18), PWAM-FB (07/17/18), and PWAM-FB (07/18/18) were identified as field blanks. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

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

VII. Duplicate Sample Analysis

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

VIII. Laboratory Control Samples

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

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

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

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

**Wills Wharf, MD, Hexavalent Chromium Monitoring
Hexavalent Chromium - Data Qualification Summary - SDG 8071901**

No Sample Data Qualified Due to QA/QC Exceedances in this SDG

**Wills Wharf, MD, Hexavalent Chromium Monitoring
Hexavalent Chromium - Laboratory Blank Data Qualification Summary - SDG
8071901**

No Sample Data Qualified Due to Laboratory Blank Contamination in this
SDG

**Wills Wharf, MD, Hexavalent Chromium Monitoring
Hexavalent Chromium - Field Blank Data Qualification Summary - SDG 8071901**

No Sample Data Qualified Due to Field Blank Contamination in this SDG

METHOD: (Analyte) Hexavalent Chromium (ERG-MOR-063)

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

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A, A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	ND	FB=4,9,14 TB=5,10,15
VI.	Matrix Spike/Matrix Spike Duplicates	N	
VII.	Duplicate sample analysis	A	
VIII.	Laboratory control samples	A	LCS/D
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
 N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
 SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	PWAM-1 (07/16/18)	8071901-01	Air	07/16/18
2	PWAM-2 (07/16/18)	8071901-02	Air	07/16/18
3	PWAM-3 (07/16/18)	8071901-03	Air	07/16/18
4	PWAM-FB (07/16/18)	8071901-04	Air	07/16/18
5	PWAM-TB (07/16/18)	8071901-05	Air	07/16/18
6	PWAM-1 (07/17/18)	8071901-06	Air	07/17/18
7	PWAM-2 (07/17/18)	8071901-07	Air	07/17/18
8	PWAM-3 (07/17/18)	8071901-08	Air	07/17/18
9	PWAM-FB (07/17/18)	8071901-09	Air	07/17/18
10	PWAM-TB (07/17/18)	8071901-10	Air	07/17/18
11	PWAM-1 (07/18/18)	8071901-11	Air	07/18/18
12	PWAM-2 (07/18/18)	8071901-12	Air	07/18/18
13	PWAM-3 (07/18/18)	8071901-13	Air	07/18/18
14	PWAM-FB (07/18/18)	8071901-14	Air	07/18/18
15	PWAM-TB (07/18/18)	8071901-15	Air	07/18/18
16	PWAM-3 (07/16/18)DUP	8071901-03DUP	Air	07/16/18
17				

Method: Inorganics (EPA Method See recovery)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
II. Calibration				
Were all instruments calibrated daily, each set-up time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were the proper number of standards used?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were all initial calibration correlation coefficients ≥ 0.995 ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were all initial and continuing calibration verification %Rs within the 90-110 ⁸⁵⁻¹¹⁵ QC limits?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were titrant checks performed as required? (Level IV only)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Were balance checks performed as required? (Level IV only)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
III. Blanks				
Was a method blank associated with every sample in this SDG?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
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.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
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.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Were the MS/MSD or duplicate relative percent differences (RPD) $\leq 20\%$ for waters and $\leq 35\%$ for soil samples? A control limit of $\leq \text{CRDL}$ ($\leq 2\text{X CRDL}$ for soil) was used for samples that were $\leq 5\text{X}$ the CRDL, including when only one of the duplicate sample values were $\leq 5\text{X}$ the CRDL.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
V. Laboratory control samples				
Was an LCS analyzed for this SDG?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was an LCS analyzed per extraction batch?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Were the performance evaluation (PE) samples within the acceptance limits?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

VALIDATION FINDINGS CHECKLIST

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 #: 42830A6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

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

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of Cr⁶⁺ was recalculated. Calibration date: 7/25/18

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

$$\%R = \frac{\text{Found} \times 100}{\text{True}}$$

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	Standard	Conc. (mg/L)	Area	Recalculated	Reported	Acceptable (Y/N)
					r or r ²	r or r ²	
Initial calibration	Cr ⁶⁺	s1	0.1	0.0446857	0.99995	0.99991	
		s2	0.1	0.0845748			
		s3	0.2	0.1659267			
		s4	0.5	0.421366			
		s5	1	0.8396928			
		s6	2	1.711045			
Calibration verification		ICV	0.5	0.4997	99.9	99.9	
Calibration verification		CCV	0.5	0.4954	99.1	99.1	
Calibration verification		CCV	0.5	0.4967	99.3	99.3	

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 #: 42830A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: OR
2nd Reviewer: ell

METHOD: Inorganics, Method See cover

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

$$\%R = \frac{\text{Found}}{\text{True}} \times 100$$
 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	Reported	Acceptable (Y/N)
					%R / RPD	%R / RPD	
LCS	Laboratory control sample	Cr^{6+}	0.465	0.463	100	100	Y
	Matrix spike sample		(SSR-SR)				
16	Duplicate sample	Cr^{6+}	0.0515	0.0464	10.4	10.5	Y

Comments: _____

LDC #: 42830A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
 Reviewer: CR
 2nd reviewer: LR

METHOD: Inorganics, Method See over

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 Cr⁶⁺ reported with a positive detect were recalculated and verified using the following equation:

Concentration = $y = 0.8478365x + 0.000520$ Recalculation:

$$3: \frac{0.0881384 - 0.00052}{0.8478365} \times \frac{10\text{mL}}{22.27\text{L}} = 0.04640\text{mg/m}^3$$

#	Sample ID	Analyte	Reported Concentration (ng/m ³)	Calculated Concentration (ng/m ³)	Acceptable (Y/N)	
	1	Cr ⁶⁺ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	0.0356	0.0356	Y	
	2		0.0281	0.0281	Y	
	3		0.0464	0.0464	Y	
	6		0.0347	0.0347	Y	
	7		0.0292	0.0292	Y	
	8		0.0342	0.0342	Y	
	11		0.0356	0.0356	Y	
	12		0.0271	0.0271	Y	
	13		0.0216	0.0216	Y	