ATTACHMENT 1: QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

This attachment summarizes the field quality assurance, laboratory quality assurance, data verification and data validation procedures utilized for the JPL groundwater monitoring program. Data validation was performed by an independent contractor, Laboratory Data Consultants, Inc. of Carlsbad, California. Data verification and validation indicated that the all volatile organic carbon (VOC), perchlorate, and metal results obtained from the fourth quarter 2013 groundwater monitoring event were acceptable for their intended use of characterizing the aquifer quality.

ATTACHMENT 1: QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

Field and laboratory QC samples were collected and analyzed to fulfill quality requirements. Proper sample collection and handling procedures were utilized to ensure the integrity of the analytical results. A comprehensive quality assurance and quality control (QA/QC) plan for groundwater monitoring is described in the *Work Plan for Performing a Remedial Investigation/Feasibility Study* (Ebasco, 1993).

FIELD QUALITY ASSURANCE/QUALITY CONTROL

The field QA/QC samples collected for JPL groundwater monitoring included field duplicate samples, equipment rinsate blanks and trip blanks. The QC sample results were used for the qualitative evaluation of the data. Table 1-1 summarizes analytical results for the field quality control samples during the fourth quarter 2013 groundwater monitoring event.

Field Duplicate Samples. Duplicate samples were collected to evaluate the precision of the sample collection process. Duplicate samples for volatile organic compounds (VOCs), perchlorate and metals were collected from monitoring wells MW-8, MW-10, MW-14 (Screen 1), MW-15, MW-16, MW-20 (Screen 4), MW-25 (Screen 2) and MW-26 (Screen 1). The analytical results for the field duplicate samples were comparable to the results of the original groundwater samples for VOCs (Table 1) and Metals (Table 2), with the exception of total chromium in the MW-16 and the MW-16 duplicate sample (260 µg/L and 180 µg/L, respectively).

Equipment Rinsate Blanks. Equipment rinsate blanks were collected each day that non-dedicated sampling equipment was used. The equipment rinsate blanks, consisting of distilled water run through the sampling equipment after decontamination, were analyzed for all contaminants of concern to monitor possible cross-contamination of the samples due to inadequate decontamination. Total chromium was detected in one of the equipment blanks as shown in Table 1-1. Total chromium was present in many of the field samples and the detected concentrations in one equipment blank may have occurred during to the decontamination process. The source of the contamination could not be determined. Detected concentrations in the equipment blanks were compared to the detected concentrations in the monitoring wells during the data validation process described below to determine if data validation qualifiers were necessary. No other contaminants or TICs were detected in the equipment blanks as shown in Table 1-1.

Trip Blanks. Trip blanks, which consisted of reagent-grade water in vials transported with the sample bottles to and from the field, were submitted to the laboratory with each shipment of groundwater samples. Trip blanks were used to help identify cross-contamination of groundwater samples during transport and sample handling procedures. No VOC contaminants or TICs were detected in the trip blanks as shown in Table 1-1.

Source Blank. Two source blanks which consisted of distilled water used by sampling personnel for equipment decontamination were collected during the sampling event.

This QC sample serves as a check for any contamination present in the source water. No VOC contaminants or TICs were detected in the source blanks as shown in Table 1-1.

LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Laboratory QC samples included surrogate compounds (for VOC analyses), matrix spike samples, blank spike samples, and method blanks. The results of the laboratory QC samples were used by the laboratory to determine the accuracy and precision of the analytical techniques, and to identify anomalous results due to laboratory contamination or instrument malfunction.

DATA VERIFICATION AND VALIDATION

The purpose of data verification and validation is to assure that the data collected meet the data quality objectives (DQOs) outlined in the Quality Assurance Project Plan of the Groundwater Monitoring Plan (Ebasco, 1993).

Data Verification. Data verification is a review of the analytical data that includes confirming that the sample identification numbers on the laboratory reports match those on the chain-of-custody records. Data verification also includes a review of the analytical data reports to confirm that all samples were analyzed and all required analytes were quantified for each sample.

Data Validation. Data validation is a systematic review of the analytical data to determine the compliance with established method performance criteria. Validation of a data package included review of the technical holding time requirements, review of sample preparation, review of the initial and continuing calibration data, review and recalculation of the laboratory QC sample data, review of the equipment performance, reconciliation of the raw data with the reduced results, identification of data anomalies, and qualification of data to identify data usability limitations.

Data validation was performed by an independent contractor, Laboratory Data Consultants, Inc. (LDC) of Carlsbad, CA. All of the data provided by BC Laboratories, Inc., of Bakersfield, California were validated. Ninety percent of the data were subjected to Level III validation and ten percent of the data were subjected to Level IV validation in accordance with the EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (U.S. EPA, 2008; 2010).

Data Validation Qualifiers. Analytical data were qualified based on the data validation. Data qualifiers were assigned in accordance with EPA guidelines.

All samples were analyzed within the analytical holding times. Data validation indicated that the all of the data from the fourth quarter 2013 groundwater monitoring event were acceptable for their intended use of characterizing aquifer quality.

The data validation reports are included in Attachment 2.

REFERENCES

Ebasco. 1993. *Work Plan for Performing a Remedial Investigation/Feasibility Study*. National Aeronautics and Space Administration Jet Propulsion Laboratory, Pasadena, California. December.

U.S. EPA. 2008. *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. June.

U.S. EPA. 2010. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review*. January.

TABLE 1-1
SUMMARY OF CONTAMINANTS DETECTED IN QUALITY CONTROL SAMPLES
COLLECTED DURING THE OCT/NOV 2013 SAMPLING EVENT
(All concentrations reported in µg/L.)

Blank Type	Sample ID Number	Sampling Location(s)	Total Chromium	Methylene Chloride	1,2,3-Trichloropropane	2-Butanone	Other Organic Compounds		TICs	
EQUIPMENT BLANK	EB-1-10/21/13	MW-4, MW-12	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-2-10/22/13	MW-19, MW-20	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-3-10/23/13	MW-14. MW-23	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-4-10/24/13	MW-22, MW-24, MW-26	1.7 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-5-10/25/13	MW-21, MW-25	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-6-10/28/13	MW-17, MW-18	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-7-10/29/13	MW-3, MW-11	3 U	0.5 U	1 U	10 U				
SOURCE BLANK	SB-1-10/21/13	--	3 U	0.5 U	1 U	10 U				
SOURCE BLANK	SB-2-10/25/13	--	3 U	0.5 U	1 U	10 U				
TRIP BLANK	TB-1-10/21/13	MW-4, MW-12	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-2-10/22/13	MW-19, MW-20	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-3-10/23/13	MW-14, MW-23	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-4-10/24/13	MW-22, MW-24, MW-26	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-5-10/25/13	MW-21, MW-25	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-6-10/28/13	MW-17, MW-18	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-7-10/29/13	MW-3, MW-11	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-8-10/30/13	MW-7, MW-8, MW-13, MW-15	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-9-10/31/13	W-1, MW-5, MW-6, MW-10, MW-1	NA	0.5 U	1 U	10 U				

Notes

NA Not Analyzed

U Analyte was analyzed for but not detected at or above the stated limit

ATTACHMENT 2: DATA VALIDATION REPORTS

This attachment contains the data validation reports performed by an independent subcontractor, Laboratory Data Consultants, Inc. (LDC) of Carlsbad, California.

LABORATORY DATA CONSULTANTS, INC.

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

Battelle
505 King Avenue
Room 10-1-170
Columbus, OH 43201
ATTN: Ms. Betsy Cutie

December 5, 2013

SUBJECT: NASA JPL, Data Validation

Dear Ms. Cutie,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on November 19, 2013. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 30870:

SDG #	Fraction
13-22918 13-23038	Volatiles, Total Recoverable Chromium, 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:

- USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, January 2010

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

Sincerely,

Pei Geng

Pei Geng
Project Manager/Senior Chemist

HC

Attachment 1

90/10 (client select)

LDC #30870 (Battelle-San Diego / NASA JPL)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (524.2)		Cr (200.8)		CLO_4 (314.0)		Cr(VI) (7196)																									
Matrix:	Water/Soil			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	13-22918	11/19/13	12/12/13	14	0	14	0	15	0	18	0																								
A	13-22918	11/19/13	12/12/13	1	0	1	0	1	0	1	0																								
B	13-23038	11/19/13	12/12/13	15	0	16	0	13	0	16	0																								
B	13-23038	11/19/13	12/12/13	2	0	2	0	2	0	2	0																								
Total	A/PG			32	0	33	0	31	0	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	133

Shaded cells indicate Level IV validation (all other cells are Level III validation).

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 21, 2013

LDC Report Date: December 5, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-22918

Sample Identification

TB-1-10/21/13
SB-1-10/21/13
EB-1-10/21/13
MW-12-5
MW-12-4
MW-12-3
MW-12-2
MW-12-1
MW-4-5
MW-4-4**
MW-4-3
MW-4-2
MW-4-1
MW-12-1MS
MW-12-1MSD

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 15 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 524.2 for Volatiles.

This review follows 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.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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 20.0% for all compounds with the following exceptions:

Date	Compound	%RSD	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	29.54078	All samples in SDG 13-22918	J (all detects) UJ (all non-detects)	P

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

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 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/22/13	Pentachloroethane	208	All samples in SDG 13-22918	J (all detects) UJ (all non-detects)	P

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

Date	Compound	%D	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	80.5	All samples in SDG 13-22918	J (all detects) UJ (all non-detects)	P

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile 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

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. 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 an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

XII. Compound Quantitation

All compound quantitations 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 EPA Level III criteria.

XIII. Tentatively Identified Compounds (TICs)

All tentatively identified compounds 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 EPA Level III criteria.

XIV. System Performance

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

XV. Overall Assessment of Data

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 TB-1-10/21/13 was identified as a trip blank. No volatile contaminants were found.

Sample EB-1-10/21/13 was identified as an equipment blank. No volatile contaminants were found.

Sample SB-1-10/21/13 was identified as a source blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 13-22918

SDG	Sample	Compound	Flag	A or P	Reason
13-22918	TB-1-10/21/13 SB-1-10/21/13 EB-1-10/21/13 MW-12-5 MW-12-4 MW-12-3 MW-12-2 MW-12-1 MW-4-5 MW-4-4** MW-4-3 MW-4-2 MW-4-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Initial calibration (%RSD)
13-22918	TB-1-10/21/13 SB-1-10/21/13 EB-1-10/21/13 MW-12-5 MW-12-4 MW-12-3 MW-12-2 MW-12-1 MW-4-5 MW-4-4** MW-4-3 MW-4-2 MW-4-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (CCV %D)
13-22918	TB-1-10/21/13 SB-1-10/21/13 EB-1-10/21/13 MW-12-5 MW-12-4 MW-12-3 MW-12-2 MW-12-1 MW-4-5 MW-4-4** MW-4-3 MW-4-2 MW-4-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (ICV %D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 13-22918

No Sample Data Qualified in this SDG

LDC #: 30870A1
SDG #: 13-22918
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 12/4/13
Page: 1 of 1
Reviewer: EJ
2nd Reviewer: JL

METHOD: GC/MS Volatiles (EPA Method 524.2)

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: 10/21/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	SW	% RSD ≤ 20, r²
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 30
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	
X.	Internal standards	A	
XI.	Target compound identification	A	Not reviewed for Level III validation.
XII.	Compound quantitation/RL/LOQ/LODs	A	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	A	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	A	
XVI.	Field duplicates	N	
XVII.	Field blanks	NT	TB = 1 SB = 2 EB = 3

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:** Indicates sample underwent Level IV validation

water

1	TB-1-10/21/13	11	MW-4-3	21	BWJ1662	31	
2	SB-1-10/21/13	12	MW-4-2	22		32	
3	EB-1-10/21/13	13	MW-4-1	23		33	
4	MW-12-5	14	MW-12-1MS	24		34	
5	MW-12-4	15	MW-12-1MSD	25		35	
6	MW-12-3	16		26		36	
7	MW-12-2	17		27		37	
8	MW-12-1	18		28		38	
9	MW-4-5	19		29		39	
10	MW-4-4**	20		30		40	

LDC #: 30870A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer:

Method: Volatiles (EPA Method 524.2)

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 BFB 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) < 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) < 30%?		✓		
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed at least once every 12 hours 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 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				
Was a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for this SDG?	✓			
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 analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

LDC #: 30870A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
IX. Regional 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 +/-40% from the associated calibration standard?	✓			
Were retention times within - 30% of the last continuing calibration or +/- 50% of the initial calibration?	✓			
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/RLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Tentatively identified compounds (TICs)				
Were the major ions (> 25 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.		✓		

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene	BB. 1,1,2,2-Tetrachloroethane	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane	CC. Toluene	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform	EE. Ethylbenzene	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. Iodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP. Pentachloroethane
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ. Methyl Methacrylate
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC #: 30870A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration

Reviewer: FT
2nd Reviewer: Q

METHOD: GC/MS VOA (EPA Method 524.2)

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

(Y) N N/A Did the laboratory perform a 5 point calibration prior to sample analysis?

Y (N) N/A Were all percent relative standard deviations (%RSD) ≤ 20% ?

#	Date	Standard ID	Compound	Finding %RSD (Limit: ≤20.0%)	Associated Samples	Qualifications
	10/17/13	ICAL MS-Y5	PPPP	29.54078	all	J/UJ/P

LDC #: 30870A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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 for each instrument?

Y N N/A Were all percent differences (%D) ≤ 30% ?

#	Date	Standard ID	Compound	Finding %D (Limit: <30.0%)	Associated Samples	Qualifications
	10/17/13	ICV2 MS-V5	PPPP	80.5	all	J/UJ/P
	10/22/13	1314211-CCV2	PPPP	208	all	J/UJ/P

LDC #: 36870A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 10 std)	Recalculated (RRF 10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	C (IS 1)	0.446210	0.446210	0.4403805	0.4403805	5.759154	5.759154
	MS-V5		S (IS 2)	0.353115	0.353115	0.3462535	0.3462535	7.483333	7.483333
			EE (IS 3)	1.854653	1.854653	1.8783910	1.8783910	13.16845	13.16845

LDC #: 30870A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer:

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound		Reported (RRF 160/40/8 std)	Recalculated (RRF 160/40/8 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	F	(IS 1)	0.0252902	0.0252902	0.0247595	0.0247595	3.379941	3.379941
	MS-V5		QQQQ	(IS 2)	0.0692452	0.0692452	0.0665553	0.0665553	5.630492	5.630492
			PPPP	(IS 3)	0.1220467	0.1220467	0.1793848	0.1793848	29.54078	29.54078

LDC #: 30870A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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	1314211-CCV1	10/22/13	C (1st Internal Standard)	0.4403805	0.4072354	0.4072354	7.5	7.5
			S (2nd Internal Standard)	0.3462535	0.3315172	0.3315172	4.3	4.3
			EE (3rd Internal Standard)	1.8783910	1.703189	1.703189	9.3	9.3
2	1314211-CCV2	10/22/13	F (1st Internal Standard)	0.0247595	0.0239424	0.0239424	3.3	3.3
			QQQQ (2nd Internal Standard)	0.0665553	0.0649972	0.0649972	2.3	2.3
			PPPP (3rd Internal Standard)	0.1793848	0.5521961	0.5521961	208	208
3			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd Internal Standard)					
4			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd 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 #: 30870A1

VALIDATION FINDINGS WORKSHEET

Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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: #10

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.0	10.010	100	100	0
Bromofluorobenzene	|	9.20	92.0	92	0
1,2-Dichlorobenzene-d4	↓	10.180	102	102	0
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

LDC #: 30870A1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

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 concentration

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

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

MS/MSD sample: 14 & 15

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	25.0	25.0	ND	24.610	25.190	98.4	98.4	101	101	2.33	2.33
Trichloroethene	↓	↓	↓	23.970	25.170	95.9	95.9	101	101	4.88	4.88
Benzene				25.140	26.140	101	101	105	105	3.90	3.90
Toluene				25.090	26.480	100	100	106	106	5.39	5.39
Chlorobenzene				24.300	25.150	97.2	97.2	101	101	3.44	3.44

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 #: 30870A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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

LCS ID: BWJ1662-LCS

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	25.0	NA	24.300	NA	97.2	97.2				
Trichloroethene	↓	↓	23.770	↓	95.1	95.1				
Benzene			25.340		101	101				
Toluene			24.610		98.4	98.4				
Chlorobenzene	↓	↓	23.570	↓	94.3	94.3	NA			

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.

LDC #: 30870A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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)

RRF = Relative response factor of the calibration standard.

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

Df = Dilution factor.

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

Example:

Sample I.D. BWJ1662-BS1 : S

Conc. = $\frac{(414878)(10)(\quad)}{(503972)(0.346)(2535)(\quad)}$

= 23.77 ug/L

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 21, 2013

LDC Report Date: December 4, 2013

Matrix: Water

Parameters: Total Recoverable Chromium

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-22918

Sample Identification

SB-1-10/21/13
EB-1-10/21/13
MW-12-5
MW-12-4
MW-12-3
MW-12-2
MW-12-1
MW-4-5
MW-4-4**
MW-4-3
MW-12-1MS
MW-12-1MSD
MW-4-2
MW-4-1
MW-12-1DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 15 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Total Recoverable Chromium.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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

The initial and continuing calibrations were performed at the required frequency.

The calibration standards criteria were met.

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No total recoverable chromium was found in the initial, continuing and preparation blanks.

V. ICP Interference Check Sample (ICS) Analysis

ICP interference check sample (ICS) analysis was not required.

VI. Matrix Spike Analysis

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.

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 (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits for samples on which an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

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 EPA 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

No field duplicates were identified in this SDG.

XV. Field Blanks

Sample EB-1-10/21/13 was identified as an equipment blank. No total recoverable chromium was found.

Sample SB-1-10/21/13 was identified as a source blank. No total recoverable chromium was found.

NASA JPL
Total Recoverable Chromium - Data Qualification Summary - SDG 13-22918

No Sample Data Qualified in this SDG

NASA JPL
Total Recoverable Chromium - Laboratory Blank Data Qualification Summary - SDG 13-22918

No Sample Data Qualified in this SDG

LDC #: 30870A4 **VALIDATION COMPLETENESS WORKSHEET** Date: 12-2-13
SDG #: 13-22918 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: MG
2nd Reviewer: ✓

METHOD: Total Recoverable Chromium (EPA Method 200.8)

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: 10-21-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	A	
V.	ICP Interference Check Sample (ICS) Analysis	N	not required
VI.	Matrix Spike Analysis	A	MS/MSD
VII.	Duplicate Sample Analysis	A	DUP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	not reviewed for level III
X.	Furnace Atomic Absorption QC	N	not utilized
XI.	ICP Serial Dilution	N	not performed
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	N	
XV	Field Blanks	ND	SB = 1 EB = 2

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:** Indicates sample underwent Level IV validation

all water

1	SB-1-10/21/13	11	MW-12-1MS	21		31	
2	EB-1-10/21/13	12	MW-12-1MSD	22		32	
3	MW-12-5	13[2]	MW-4-2	23		33	
4	MW-12-4	14[2]	MW-4-1	24		34	
5	MW-12-3	15	#7 DUP	25		35	
6	MW-12-2	16		26		36	
7	MW-12-1	17		27		37	
8	MW-4-5	18		28		38	
9	MW-4-4**	19		29[1]	PBW1	39	
10	MW-4-3	20		30[2]	PBW2	40	

Notes: _____

LDC #: 30870A4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. 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) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. 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.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?		✓		
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?			✓	
VI. 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.	✓			
VII. 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?	✓			

Validation Area	Yes	No	NA	Findings/Comments
VIII. 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?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
XI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
XII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
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 analytes were detected in the field duplicates.			✓	
XV. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 30870A4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer:

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)
	ICP (Initial calibration)						
1332 ICV	ICP/MS (Initial calibration)	Cr	53.410	50.000	107	107	Y
	CVAA (Initial calibration)						
	ICP (Continuing calibration)						
1924 CCV8	ICP/MS (Continuing calibration)	Cr	40.138	40.000	100	100	
	CVAA (Continuing calibration)						
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

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 #: 30870A4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

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

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

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

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

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)
–	ICP interference check	–	–	–	–	–	–
1857 LCS	Laboratory control sample	Cr	41.050 (mg/L)	40.000 (mg/L)	103	103	Y
1913 11	Matrix spike	Cr	(SSR-SR) 38.60 (mg/L)	40.000 (mg/L)	96.5	96.5	↓
1904 / 1907 15	Duplicate	Cr	1.922 (mg/L)	1.884 (mg/L)	2.00	2.00	↓
–	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 #: 30870A4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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

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 #9, Cr were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(1.136\ \mu g/L)(0.050\ L)}{0.050\ L} = 1.136\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
1	9	Cr	1.1	1.1	Y

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 21, 2013

LDC Report Date: December 4, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-22918

Sample Identification

SB-1-10/21/13
EB-1-10/21/13
MW-12-5
MW-12-4
MW-12-3
MW-12-2
MW-12-1
MW-4-5
MW-4-4**
MW-4-3
MW-4-2
MW-4-1
SB-1-10/21/13MS
SB-1-10/21/13MSD
SB-1-10/21/13DUP
MW-12-1MS
MW-12-1MSD
MW-12-1DUP
MW-4-2MS
MW-4-2MSD
MW-4-2DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 21 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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. Initial Calibration

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

III. Continuing Calibration

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

IV. Blanks

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

V. 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)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
MW-4-2MS/MSD (MW-4-2 MW-4-1)	Hexavalent chromium	37.9 (85-115)	39.1 (85-115)	-	J (all detects) UJ (all non-detects)	A

VI. Duplicates

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

VII. Laboratory Control Samples

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

VIII. 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 EPA Level III criteria.

IX. Overall Assessment of Data

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

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Field Blanks

Sample EB-1-10/21/13 was identified as an equipment blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration (mg/L)
EB-1-10/21/13	Hexavalent chromium	0.00091

Sample SB-1-10/21/13 was identified as a source blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration (mg/L)
SB-1-10/21/13	Hexavalent chromium	0.00091

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 13-22918

SDG	Sample	Analyte	Flag	A or P	Reason
13-22918	MW-4-2 MW-4-1	Hexavalent chromium	J (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 13-22918

No Sample Data Qualified in this SDG

LDC #: 30870A6
SDG #: 13-22918
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 12-2-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer: V

METHOD: Perchlorate (EPA Method 314.0), Hexavalent Chromium (EPA SW846 Method 7196)

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: 10-21-13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	A	
V	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VI.	Duplicates	A	DUP #18 OK by difference
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	A	Not reviewed for Level III validation.
IX.	Overall assessment of data	A	
X.	Field duplicates	N	
XI	Field blanks	SW	SB = 1 EB = 2

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:** Indicates sample underwent Level IV validation

All Water

1	SB-1-10/21/13	11 (2)	MW-4-2	21 (2)	MW-4-2DUP	31	
2	EB-1-10/21/13	12 (2)	MW-4-1	22		32	
3	MW-12-5	13	SB-1-10/21/13MS	23		33	
4	MW-12-4	14	SB-1-10/21/13MSD	24		34	
5	MW-12-3	15	SB-1-10/21/13DUP	25		35	
6	MW-12-2	16	MW-12-1MS	26		36	
7	MW-12-1	17	MW-12-1MSD	27		37	
8	MW-4-5	18	MW-12-1DUP	28		38	
9	MW-4-4**	19 (2)	MW-4-2MS	29		39 (1)	PBW
10	MW-4-3	20 (2)	MW-4-2MSD	30		40 (2)	PBW

Notes:

LDC #: 30870A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

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?			✓	

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 #: 30870A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1 → 12	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4]
QC 13 → 15	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} [✓ ClO_4]
↓ 16 → 21	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 30870A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

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

METHOD: Inorganics, EPA Method See cover

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 Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

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

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	19/20	water	Cr VI	37.9 (85-115)	39.1 (85-115)		11, 12	J/UJ/A

Comments: _____

MSD.6

LDC #: 30870A6
SDG #: —

VALIDATION FINDINGS WORKSHEET
Field Blanks

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

METHOD: Inorganics, EPA Method See cover

(Y) N N/A Were field blanks identified in this SDG?
(Y) N N/A Were target anlytes detected in the field blanks?

Sample: 1 Field Blank / Trip Blank / Rinsate (circle one) (SB)

Analyte	Concentration Units (J mg/L
Cr VI	0.00091

Sample: 2 Field Blank / Trip Blank / Rinsate (circle one) (EB)

Analyte	Concentration Units (J mg/L
Cr VI	0.00091

LDC #: 30870A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

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

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of ClO4 was recalculated. Calibration date: 10-30-13

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	Standard ID	Conc Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	ClO4	Blank	-	-	r^2=0.999277	r^2=0.999501	Y
		Standard 1	2.0 (µg/L)	0.0023			
		Standard 2	4.0 ( )	0.0047			
		Standard 3	6.0 ( )	0.0069			
		Standard 4	10.0 ( )	0.0122			
		Standard 5	20.0 ( )	0.0235			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	Cr VI	2148 CCV2	0.053 (mg/L)	0.050 (mg/L)	106	106	
Calibration verification	ClO4	0800 CCV3	9.051 (µg/L)	10.000 (µg/L)	90.5	90.5	
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 #: 30870A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer:

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)
2142 LCS	Laboratory control sample	Cr VI	0.047 (mg/L)	0.050 (mg/L)	94.0	93.2	Y
2212 13	Matrix spike sample	ClO_4	(SSR-SR) 9.436 (µg/L)	10.101 (µg/L)	93.4	93.4	↓
2142/2142 18	Duplicate sample	Cr VI	0.00070 (mg/L)	0.00078 (mg/L)	10.8	10.4	↓

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 #: 30870A6

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 level IV sample = N.D. ~~reported with a positive detect were recalculated and verified using the following equation~~:

Concentration = Recalculation:

#	Sample ID	Analyte	Reported Concentration ( )	Calculated Concentration ( )	Acceptable (Y/N)

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 22, 2013

LDC Report Date: December 5, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23038

Sample Identification

TB-2-10/22/13
EB-2-10/22/13
MW-20-5
MW-20-4
DUPE-1-4Q13
MW-20-3
MW-20-2
MW-20-1
MW-19-5**
MW-19-4
MW-19-3**
MW-19-2
MW-19-1
MW-20-2MS
MW-20-2MSD
MW-19-1MS
MW-19-1MSD

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 17 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 524.2 for Volatiles.

This review follows 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.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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 20.0% for all compounds with the following exceptions:

Date	Compound	%RSD	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	29.54078	All samples in SDG 13-23038	J (all detects) UJ (all non-detects)	P

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

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 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/22/13 (1314301-CCV5)	Pentachloroethane	71.5	MW-19-2 MW-19-1 MW-19-1MS MW-19-1MSD BWJ1781	J (all detects) UJ (all non-detects)	P

Date	Compound	%D	Associated Samples	Flag	A or P
10/22/13 (131430-CCV2)	Pentachloroethane	130	TB-2-10/22/13 EB-2-10/22/13 MW-20-5 MW-20-4 DUPE-1-4Q13 MW-20-3 MW-20-2 MW-20-1 MW-19-5** MW-19-4 MW-19-3** MW-20-2MS MW-20-2MSD BWJ1780	J (all detects) UJ (all non-detects)	P

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

Date	Compound	%D	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	80.5	All samples in SDG 13-23038	J (all detects) UJ (all non-detects)	P

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile 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

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. 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 an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

XII. Compound Quantitation

All compound quantitations 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 EPA Level III criteria.

XIII. Tentatively Identified Compounds (TICs)

All tentatively identified compounds 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 EPA Level III criteria.

XIV. System Performance

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

XV. Overall Assessment of Data

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

XVI. Field Duplicates

Samples MW-20-4 and DUPE-1-4Q13 were identified as field duplicates. No volatiles were detected in any of the samples.

XVII. Field Blanks

Sample TB-2-10/22/13 was identified as a trip blank. No volatile contaminants were found.

Sample EB-2-10/22/13 was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 13-23038

SDG	Sample	Compound	Flag	A or P	Reason
13-23038	TB-2-10/22/13 EB-2-10/22/13 MW-20-5 MW-20-4 DUPE-1-4Q13 MW-20-3 MW-20-2 MW-20-1 MW-19-5** MW-19-4 MW-19-3** MW-19-2 MW-19-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Initial calibration (%RSD)
13-23038	TB-2-10/22/13 EB-2-10/22/13 MW-20-5 MW-20-4 DUPE-1-4Q13 MW-20-3 MW-20-2 MW-20-1 MW-19-5** MW-19-4 MW-19-3** MW-19-2 MW-19-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (CCV %D)
13-23038	TB-2-10/22/13 EB-2-10/22/13 MW-20-5 MW-20-4 DUPE-1-4Q13 MW-20-3 MW-20-2 MW-20-1 MW-19-5** MW-19-4 MW-19-3** MW-19-2 MW-19-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (ICV %D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 13-23038

No Sample Data Qualified in this SDG

LDC #: 30870B1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/4/13
SDG #: 13-23038 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: EJ
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA Method 524.2)

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: 10/22/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	SW	%RSD ≤ 20, r ≥
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 30
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	
X.	Internal standards	A	
XI.	Target compound identification	A	Not reviewed for Level III validation.
XII.	Compound quantitation/RL/LOQ/LODs	A	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	A	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	A	
XVI.	Field duplicates	ND	D = 4, 5
XVII.	Field blanks	ND	TB = 1 EB = 2

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:** Indicates sample underwent Level IV validation

water

1 1	TB-2-10/22/13	11 1	MW-19-3**	21 1	BWJ1780	31	
2 1	EB-2-10/22/13	12 2	MW-19-2	22 2	BWJ1781	32	
3 1	MW-20-5	13 2	MW-19-1	23		33	
4 1	MW-20-4 D	14 1	MW-20-2MS	24		34	
5 1	DUPE-1-4Q13 D	15 1	MW-20-2MSD	25		35	
6 1	MW-20-3	16 2	#13MS	26		36	
7 1	MW-20-2	17 2	#13MSD	27		37	
8 1	MW-20-1	18		28		38	
9 1	MW-19-5**	19		29		39	
10 1	MW-19-4	20		30		40	

LDC #: 3087013

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer:

Method: Volatiles (EPA Method 524.2)

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 BFB 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) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 30%?		✓		
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed at least once every 12 hours 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 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				
Was a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for this SDG?	✓			
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 analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

LDC #: 30870B1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
IX. Regional 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 +/-40% from the associated calibration standard?	✓			
Were retention times within - 30% of the last continuing calibration or +/- 50% of the initial calibration?	✓			
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/RLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Tentatively identified compounds (TICs)				
Were the major ions (> 25 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.		✓		

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene	BB. 1,1,2,2-Tetrachloroethane	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane	CC. Toluene	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform	EE. Ethylbenzene	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. Iodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP. Pentachloroethane
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ. Methyl Methacrylate
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC #: 30870B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration

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

METHOD: GC/MS VOA (EPA Method 524.2)

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

Y N N/A Did the laboratory perform a 5 point calibration prior to sample analysis?
Y N N/A Were all percent relative standard deviations (%RSD) ≤ 20% ?

#	Date	Standard ID	Compound	Finding %RSD (Limit: ≤20.0%)	Associated Samples	Qualifications
	10/17/13	ICAL MS-V5	PPPP	29.54078	all	J/MJ/P

LDC #: 30870 B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GC/MS VOA (EPA Method 524.2)

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 for each instrument?

Y N N/A Were all percent differences (%D) ≤ 30% ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Associated Samples	Qualifications
	10/17/13	ICV2 MS-V5	PPPP	80.5	all	J/UJ/P
	10/23/13	131430-CCV2	PPPP	130	BWJ1780, 1-011, 14, 15	J/UJ/P
	10/23/13	131430I-CCV5	PPPP	71.5	BWJ1781, 12, 13, 16, 17	J/UJ/P

LDC #: 30870B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 160/40/8 std)	Recalculated (RRF 160/40/8 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	F (IS 1)	0.0252902	0.0252902	0.0247595	0.0247595	3.379941	3.379941
	MS-V5		QQQQ (IS 2)	0.0692452	0.0692452	0.0665553	0.0665553	5.630492	5.630492
			PPPP (IS 3)	0.1220467	0.1220467	0.1793848	0.1793848	29.54078	29.54078

LDC #: 30870B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 10 std)	Recalculated (RRF 10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	C (IS 1)	0.446210	0.446210	0.4403805	0.4403805	5.759154	5.759154
	MS-V5		S (IS 2)	0.353115	0.353115	0.3462535	0.3462535	7.483333	7.483333
			EE (IS 3)	1.854653	1.854653	1.8783910	1.8783910	13.16845	13.16845

LDC #: 308708/

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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	1314301-	10/23/13	C (1st Internal Standard)	0.4403805	0.4161618	0.4161618	5.5	5.5
	CCV1		S (2nd Internal Standard)	0.3462535	0.3298099	0.3298099	4.7	4.7
			EE (3rd Internal Standard)	1.8783910	1.715896	1.715896	8.7	8.7
2	1314301-	10/23/13	F (1st Internal Standard)	0.0247595	0.0240577	0.0240577	2.8	2.8
	CCV2		QQQQ (2nd Internal Standard)	0.0665553	0.0656528	0.0656528	1.4	1.4
			PPPP (3rd Internal Standard)	0.1793848	0.4130575	0.4130575	130	130
3			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd Internal Standard)					
4			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd 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 #: 30870B1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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: #9

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.0	9.970	99.7	99.7	0
Bromofluorobenzene	↓	9.070	90.7	90.7	↓
1,2-Dichlorobenzene-d4	↓	9.85	98.5	98.5	↓
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

LDC #: 30870B1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GC/MS VOA (EPA Method 524.2)

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 concentration

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

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

MS/MSD sample: 14 a 15

Compound	Spike Added (ng/L)		Sample Concentration (ng/L)	Spiked Sample Concentration (ng/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
Benzene	25.0	25.0	ND	25.470	25.780	102	102	103	103	1.2	1.2
Chlorobenzene	↓	↓	↓	24.860	25.130	99.4	99.4	101	101	1.08	1.08
1,1-Dichloroethene	↓	↓	↓	24.280	24.910	97.1	97.1	99.6	99.6	2.56	2.56
Toluene	↓	↓	↓	25.370	26.040	101	101	104	104	2.61	2.61
Trichloroethene	↓	↓	0.48	24.620	25.060	96.6	96.6	98.3	98.3	1.77	1.77

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 #: 30870B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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

LCS ID: BWJ1780 LCS

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	25.0	NA	23,520	NA	94.1	94.1				
Trichloroethene	↓	↓	23,180	↓	92.7	92.7				
Benzene	↓	↓	24,860	↓	99.4	99.4				
Toluene	↓	↓	24,430	↓	97.7	97.7				
Chlorobenzene	↓	↓	23,650	↓	94.6	94.6	NA			

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.

LDC #: 30870B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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)

RRF = Relative response factor of the calibration standard.

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

Df = Dilution factor.

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

Example:

Sample I.D. #9, AA:

Conc. = $\frac{(10034)(10)(\quad)}{(455534)(0.3790159)(\quad)}$

=

0.58 ug/L

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 22, 2013

LDC Report Date: December 4, 2013

Matrix: Water

Parameters: Total Recoverable Chromium

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23038

Sample Identification

EB-2-10/22/13
MW-20-5
MW-20-4
DUPE-1-4Q13
MW-20-3
MW-20-2
MW-20-1
MW-19-5**
MW-19-4
MW-19-3**
MW-19-2
MW-19-1
MW-20-2MS
MW-20-2MSD
MW-19-1MS
MW-19-1MSD
MW-20-2DUP
MW-19-1DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 18 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Methods 200.8 for Total Recoverable Chromium.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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

The initial and continuing calibrations were performed at the required frequency.

The calibration standards criteria were met.

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No total recoverable chromium was found in the initial, continuing and preparation blanks.

V. ICP Interference Check Sample (ICS) Analysis

ICP interference check sample (ICS) analysis was not required.

VI. Matrix Spike Analysis

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.

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 (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits for samples on which an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

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 EPA 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 MW-20-4 and DUPE-1-4Q13 were identified as field duplicates. No total recoverable chromium was detected in any of the samples.

XV. Field Blanks

Sample EB-2-10/22/13 was identified as an equipment blank. No total recoverable chromium was found.

NASA JPL
Total Recoverable Chromium - Data Qualification Summary - SDG 13-23038

No Sample Data Qualified in this SDG

NASA JPL
Total Recoverable Chromium - Laboratory Blank Data Qualification Summary - SDG 13-23038

No Sample Data Qualified in this SDG

LDC #: 30870B4 **VALIDATION COMPLETENESS WORKSHEET** Date: 12-3-13
SDG #: 13-23038 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: MG
2nd Reviewer: ✓

METHOD: Total Recoverable Chromium (EPA Method 200.8)

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: 10-22-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	A	
V.	ICP Interference Check Sample (ICS) Analysis	N	not required
VI.	Matrix Spike Analysis	A	MS/MSD
VII.	Duplicate Sample Analysis	A	DUP #18 ok by difference
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	not reviewed for level III
X.	Furnace Atomic Absorption QC	N	not utilized
XI.	ICP Serial Dilution	N	not performed
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	ND	D = 3+4
XV	Field Blanks	ND	EB = 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:** Indicates sample underwent Level IV validation

all water

1	EB-2-10/22/13	11 [2]	MW-19-2	21		31	
2	MW-20-5	12 [2]	MW-19-1	22		32	
3	MW-20-4	13	MW-20-2MS	23		33	
4	DUPE-1-4Q13	14	MW-20-2MSD	24		34	
5	MW-20-3	15	MW-19-1MS	25		35	
6	MW-20-2	16	MW-19-1MSD	26		36	
7	MW-20-1	17	#6 DUP	27		37	
8	MW-19-5**	18 [2]	#12 DUP	28		38	
9	MW-19-4	19		29 [1]	PBW1	39	
10	MW-19-3**	20		30 [2]	PBW2	40	

Notes: _____

LDC #: 30870B4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: V

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. 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) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. 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.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?		✓		
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?			✓	
VI. 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.	✓			
VII. 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?	✓			

LDC #: 30870B4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
VIII. 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?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
XI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
XII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
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 analytes were detected in the field duplicates.		✓		
XV. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 30870B4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [signature]

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)
	ICP (Initial calibration)						
1330 ICV	ICP/MS (Initial calibration)	Cr	53.415	50.000	107	107	Y
	CVAA (Initial calibration)						
	ICP (Continuing calibration)						
2135 CCVC	ICP/MS (Continuing calibration)	Cr	42.174	40.000	105	105	
	CVAA (Continuing calibration)						
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

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 #: 30870B4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer:

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

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)
—	ICP interference check	—	—	—	—	—	—
2106 LCS	Laboratory control sample	Cr	42.409 (mg/L)	40.000 (mg/L)	106	106	Y
2122 13	Matrix spike	Cr	(SSR-SR) 38.570 (mg/L)	40.000 (mg/L)	96.4	96.4	↓
2112 / 2115 17	Duplicate	Cr	ND (mg/L)	ND (mg/L)	0	—	↓
—	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 #: 30870B4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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

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 #8, Cr were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(1.069\ mg/L)(0.050\ L)}{0.050\ L} = 1.069\ mg/L$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	8	Cr	1.1	1.1	Y
2	10	Cr	2.6	2.6	↓

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 22, 2013

LDC Report Date: December 4, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23038

Sample Identification

EB-2-10/22/13
MW-20-5
MW-20-4
DUPE-1-4Q13
MW-20-3
MW-20-2
MW-20-1
MW-19-5**
MW-19-4
MW-19-3**
MW-19-2
MW-19-1
MW-20-2MS
MW-20-2MSD
MW-20-2DUP
MW-19-2MS
MW-19-2MSD
MW-19-2DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 18 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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. Initial Calibration

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

III. Continuing Calibration

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

IV. Blanks

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

V. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VI. Duplicates

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

VII. Laboratory Control Samples

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

VIII. 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 EPA Level III criteria.

IX. Overall Assessment of Data

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

X. Field Duplicates

Samples MW-20-4 and DUPE-1-4Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples.

XI. Field Blanks

Sample EB-2-10/22/13 was identified as an equipment blank. No contaminant concentrations were found.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 13-23038

No Sample Data Qualified in this SDG

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 13-23038

No Sample Data Qualified in this SDG

LDC #: 30870B6
SDG #: 13-23038
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 12-3-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer: V

METHOD: Perchlorate (EPA Method 314.0), Hexavalent Chromium (EPA SW846 Method 7196)

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: 10-22-13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	A	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD
VI.	Duplicates	A	DUP
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	A	Not reviewed for Level III validation.
IX.	Overall assessment of data	A	
X.	Field duplicates	ND	D = 3+4
XI	Field blanks	ND	EB = 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:** Indicates sample underwent Level IV validation
all water

1	EB-2-10/22/13	11	MW-19-2	21		31	
2	MW-20-5	12	MW-19-1	22		32	
3	MW-20-4	13	MW-20-2MS	23		33	
4	DUPE-1-4Q13	14	MW-20-2MSD	24		34	
5	MW-20-3	15	MW-20-2DUP	25		35	
6	MW-20-2	16	MW-19-2MS	26		36	
7	MW-20-1	17	MW-19-2MSD	27		37	
8	MW-19-5**	18	MW-19-2DUP	28	PBW1	38	
9	MW-19-4	19		29	PBW2	39	
10	MW-19-3**	20		30	PBW3	40	

Notes:

LDC #: 30870B6

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?			✓	

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 #: 30870B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1 → 12	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4]
QC 13→15	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4]
↓ 16→18	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 30870B6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

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

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Cr VI was recalculated. Calibration date: ~~11-10-13~~ 10-11-13

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	Standard ID	Conc Found (units)	Abs True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Cr VI	Blank	0.000 (mg/L)	0.001	r^2=0.999907	r^2=0.999993	Y
		Standard 1	0.002 ( )	0.003			
		Standard 2	0.005 ( )	0.005			
		Standard 3	0.025 ( )	0.020			
		Standard 4	0.050 ( )	0.040			
		Standard 5	0.100 (↓)	0.078			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	ClO4	2038 CCV3	9.373 (µg/L)	10.000 (µg/L)	93.7	93.7	
Calibration verification	Cr VI	0003 CCV2	0.0489 (mg/L)	0.050 (mg/L)	97.8	97.8	↓
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 #: 30870B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

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

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)
1343 LCS	Laboratory control sample	ClO_4	10.156 (µg/L)	10.000 (µg/L)	102	102	Y
2357 13	Matrix spike sample	Cr VI	(SSR-SR) 0.0526 (mg/L)	0.052632 (mg/L)	99.9	99.9	↓
2106/0033 15	Duplicate sample	ClO_4	2.344 (µg/L)	2.354 (µg/L)	0.426	0.426	↓

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 #: 30870B6

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 #8, ClO4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = $Y = mx + b$

where
$m = 0.0012$
$b = 0.0000$
dil = 1x

Recalculation:

$0.004 = 0.0012(x) + 0.0000$

$3.333\ \mu g/L = x$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	8	ClO4	3.8	3.3	Y *
					↓
2	10	ClO4	3.4	3.3	↓

Note: method 7196 is N.D.
* lab is using more significant figures than displayed in raw data.

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

Battelle
505 King Avenue
Room 10-1-170
Columbus, OH 43201
ATTN: Ms. Betsy Cutie

December 12, 2013

SUBJECT: NASA JPL, Data Validation

Dear Ms. Cutie,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on November 21, 2013. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 30879:

SDG #	Fraction
13-23134 13-23218	Volatiles, Total Recoverable Chromium, 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:

- USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, January 2010

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

Sincerely,

Pei Geng
Project Manager/Senior Chemist

HC

Attachment 1

90/10 (client select)

LDC #30879 (Battelle-San Diego / NASA JPL)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (524.2)		Cr (200.8)		Cl, SO_4 NO_3-N (300.0)		NO_2-N (353.2)		O-PO_4 (365.1)		Cr(VI) (7196)		CLO_4 (314.0)																	
Matrix	Water/Soil			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	13-23134	11/21/13	12/16/13	12	0	14	0	-	-	-	-	-	-	17	0	17	0																
A	13-23134	11/21/13	12/16/13	1	0	1	0	-	-	-	-	-	-	1	0	1	0																
B	13-23218	11/21/13	12/16/13	15	0	18	0	1	0	4	0	4	0	18	0	15	0																
B	13-23218	11/21/13	12/16/13	2	0	2	0	0	0	0	0	0	0	2	0	2	0																
Total	T/PG			30	0	35	0	1	0	4	0	4	0	38	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147

Shaded cells indicate Level IV validation (all other cells are Level III validation).

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 23, 2013

LDC Report Date: December 11, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23134

Sample Identification

TB-3-10-23-13
EB-3-10-23-13
MW-23-5
MW-23-4
MW-23-3
MW-23-2
MW-23-1
MW-14-5
MW-14-4
MW-14-3**
MW-14-2
MW-14-1
DUPE-2-4Q13

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 13 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 524.2 for Volatiles.

This review follows 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.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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 20.0% for all compounds with the following exceptions:

Date	Compound	%RSD	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	29.54078	All samples in SDG 13-23134	J (all detects) UJ (all non-detects)	P

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

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 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/24/13	Pentachloroethane	246	All samples in SDG 13-23134	J (all detects) UJ (all non-detects)	P

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

Date	Compound	%D	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	80.5	All samples in SDG 13-23134	J (all detects) UJ (all non-detects)	P

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile 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) were within QC limits.

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 an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

XII. Compound Quantitation

All compound quantitations 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 EPA Level III criteria.

XIII. Tentatively Identified Compounds (TICs)

All tentatively identified compounds 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 EPA Level III criteria.

XIV. System Performance

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

XV. Overall Assessment of Data

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

XVI. Field Duplicates

Samples MW-14-1 and DUPE-2-4Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-14-1	DUPE-2-4Q13	
Chloroform	0.50	0.41	20
cis-1,2-Dichloroethene	0.090	0.085U	200
Methyl-tert-butyl ether	0.40	0.38	5
Tetrachloroethene	0.18	0.14	25
Trichloroethene	1.6	1.3	21

XVII. Field Blanks

Sample TB-3-10-23-13 was identified as a trip blank. No volatile contaminants were found.

Sample EB-3-10-23-13 was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 13-23134

SDG	Sample	Compound	Flag	A or P	Reason
13-23134	TB-3-10-23-13 EB-3-10-23-13 MW-23-5 MW-23-4 MW-23-3 MW-23-2 MW-23-1 MW-14-5 MW-14-4 MW-14-3** MW-14-2 MW-14-1 DUPE-2-4Q13	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Initial calibration (%RSD)
13-23134	TB-3-10-23-13 EB-3-10-23-13 MW-23-5 MW-23-4 MW-23-3 MW-23-2 MW-23-1 MW-14-5 MW-14-4 MW-14-3** MW-14-2 MW-14-1 DUPE-2-4Q13	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)
13-23134	TB-3-10-23-13 EB-3-10-23-13 MW-23-5 MW-23-4 MW-23-3 MW-23-2 MW-23-1 MW-14-5 MW-14-4 MW-14-3** MW-14-2 MW-14-1 DUPE-2-4Q13	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (ICV %D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 13-23134

No Sample Data Qualified in this SDG

LDC #: 30879A1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/4/13
SDG #: 13-23134 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA Method 524.2)

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: 10/23/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	SW	% RSD ≤ 20, r ≥
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 30
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	
VIII.	Laboratory control samples	A	LCS
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	A	Not reviewed for Level III validation.
XII.	Compound quantitation/RL/LOQ/LODs	A	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	A	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	A	
XVI.	Field duplicates	SW	D = 12, 13
XVII.	Field blanks	ND	TB = 1 EB = 2

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:** Indicates sample underwent Level IV validation

water

1	TB-3-10-23-13	11	MW-14-2	21	BWJ1881	31	
2	EB-3-10-23-13	12	MW-14-1 D	22		32	
3	MW-23-5	13	DUPE-2-4Q13 D	23		33	
4	MW-23-4	14		24		34	
5	MW-23-3	15		25		35	
6	MW-23-2	16		26		36	
7	MW-23-1	17		27		37	
8	MW-14-5	18		28		38	
9	MW-14-4	19		29		39	
10	MW-14-3**	20		30		40	

LDC #: 30879A \

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA Method 524.2)

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 BFB 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) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 30%?		✓		
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed at least once every 12 hours 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 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				
Was a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for this SDG?			✓	
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 analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

Validation Area	Yes	No	NA	Findings/Comments
IX. Regional 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 +/-40% from the associated calibration standard?	✓			
Were retention times within - 30% of the last continuing calibration or +/- 50% of the initial calibration?	✓			
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/RLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Tentatively identified compounds (TICs)				
Were the major ions (> 25 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.		✓		

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene	BB. 1,1,2,2-Tetrachloroethane	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane	CC. Toluene	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform	EE. Ethylbenzene	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. Iodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP. Pentachloroethane
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ. Methyl Methacrylate
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC #: 30879A)

VALIDATION FINDINGS WORKSHEET

Initial Calibration

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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

Y N N/A Did the laboratory perform a 5 point calibration prior to sample analysis?

Y N N/A Were all percent relative standard deviations (%RSD) ≤ 20% ?

#	Date	Standard ID	Compound	Finding %RSD (Limit: ≤20.0%)	Associated Samples	Qualifications
	10/17/13	ICAL MS-Y5	PPPP	29.54078	all	J/UJ/P

LDC #: 30879A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

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

METHOD: GC/MS VOA (EPA Method 524.2)

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 for each instrument?

Y N N/A Were all percent differences (%D) ≤ 30% ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Associated Samples	Qualifications
	10/17/13	ICV2 MS-V5	PPPP	80.5	all	J/UJ/P
	10/24/13	1314398-CCV2	PPPP	246	all	J/UJ/P

LDC#: 30879A

VALIDATION FINDINGS WORKSHEET

Field Duplicates

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

METHOD: GC/MS VOA (EPA SW 846 Method 524.2)

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/L)		RPD
	12	13	
K	0.50	0.41	20
QQQ	0.090	0.085U	200
LL	0.40	0.38	5
AA	0.18	0.14	25
S	1.6	1.3	21

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LDC #: 30879A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: R

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound		Reported (RRF 160/40/8 std)	Recalculated (RRF 160/40/8 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	F	(IS 1)	0.0252902	0.0252902	0.0247595	0.0247595	3.379941	3.379941
	MS-V5		QQQQ	(IS 2)	0.0692452	0.0692452	0.0665553	0.0665553	5.630492	5.630492
			PPPP	(IS 3)	0.1220467	0.1220467	0.1793848	0.1793848	29.54078	29.54078

LDC #: 30879A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 10 std)	Recalculated (RRF 10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	C (IS 1)	0.446210	0.446210	0.4403805	0.4403805	5.759154	5.759154
	MS-V5		S (IS 2)	0.353115	0.353115	0.3462535	0.3462535	7.483333	7.483333
			EE (IS 3)	1.854653	1.854653	1.8783910	1.8783910	13.16845	13.16845

LDC #: 30879A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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	1314398-	10/24/13	C (1st Internal Standard)	0.4403805	0.4631591	0.4631591	5.2	5.2
	CCV1		S (2nd Internal Standard)	0.3462535	0.3532029	0.3532029	2.0	2.0
			EE (3rd Internal Standard)	1.8783910	1.776554	1.776554	5.4	5.4
2	1314398-	10/24/13	F (1st Internal Standard)	0.0247595	0.0225028	0.0225028	9.1	9.1
	CCV2		QQQQ (2nd Internal Standard)	0.0665553	0.0647079	0.0647079	2.8	2.8
			PPPP (3rd Internal Standard)	0.1793848	0.6206334	0.6206334	246	246
3			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd Internal Standard)					
4			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd 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 #: 30879A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10	10.10	101	101	0
Bromofluorobenzene	10	9.63	96.3	96.3	↓
1,2-Dichlorobenzene-d4	10	10.0	100	100	↓
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

LDC #: 30879A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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

LCS ID: BWJ1881-LCS

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	25.0	NA	25.470	NA	102	102				
Trichloroethene	↓	↓	25.500	↓	102	102				
Benzene			26.510		106	106				
Toluene			26.310		105	105				
Chlorobenzene	↓	↓	25.410	↓	102	102	NA			

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.

LDC #: 308794 1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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)

RRF = Relative response factor of the calibration standard.

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

Df = Dilution factor.

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

Example:

Sample I.D. #10 , K

Conc. = (14513)(10)( )( )
(393375)(0.703515)( )( )

=

0.52 ug/L

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 23, 2013

LDC Report Date: December 10, 2013

Matrix: Water

Parameters: Total Recoverable Chromium

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23134

Sample Identification

EB-3-10-23-13
MW-23-5
MW-23-4
MW-23-3
MW-23-2
MW-23-1
MW-14-5
MW-14-4
MW-14-3**
MW-14-2
DUPE-2-4Q13
MW-23-3MS
MW-23-3MSD
MW-23-3DUP
MW-14-1

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 15 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Total Recoverable Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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

The initial and continuing calibrations were performed at the required frequency.

The calibration standards criteria were met.

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No total recoverable chromium was found in the initial, continuing and preparation blanks.

V. ICP Interference Check Sample (ICS) Analysis

ICP Interference check sample analysis was not required by the method.

VI. Matrix Spike Analysis

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.

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 (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits for samples on which an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

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 EPA 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 DUPE-2-4Q13 and MW-14-1 were identified as field duplicates. No total recoverable chromium was detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	DUPE-2-4Q13	MW-14-1	
Chromium	1.0	0.76	27

XV. Field Blanks

Sample EB-3-10-23-13 was identified as an equipment blank. No total recoverable chromium was found.

NASA JPL
Total Recoverable Chromium - Data Qualification Summary - SDG 13-23134

No Sample Data Qualified in this SDG

NASA JPL
Total Recoverable Chromium - Laboratory Blank Data Qualification Summary - SDG 13-23134

No Sample Data Qualified in this SDG

LDC #: 30879A4 **VALIDATION COMPLETENESS WORKSHEET** Date: 12-3-13
SDG #: 13-23134 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: MG
2nd Reviewer: V

METHOD: Total Recoverable Chromium (EPA Method 200.8)

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: 10-23-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	A	
V.	ICP Interference Check Sample (ICS) Analysis	N	not required
VI.	Matrix Spike Analysis	A	MS/MSD
VII.	Duplicate Sample Analysis	A	DUP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	not reviewed for level III
X.	Furnace Atomic Absorption QC	N	not utilized
XI.	ICP Serial Dilution	N	not performed
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	D = 11 + 15
XV	Field Blanks	ND	EB = 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:** Indicates sample underwent Level IV validation
all water

1 1	EB-3-10-23-13	11	DUPE-2-4Q13	21		31	
2 1	MW-23-5	12	MW-23-3MS	22		32	
3 1	MW-23-4	13	MW-23-3MSD	23		33	
4	MW-23-3	14	MW-23-3DUP	24		34	
5	MW-23-2	15	MW-14-1	25		35	
6	MW-23-1	16		26		36	
7	MW-14-5	17		27		37	
8	MW-14-4	18		28		38	
9	MW-14-3**	19		29 1	PBW1	39	
10	MW-14-2	20		30 2	PBW2	40	

Notes:

LDC #: 30879A4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer:

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. 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) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. 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.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?		✓		
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?			✓	
VI. 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.	✓			
VII. 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?	✓			

LDC #: 30879A4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VIII. 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?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
XI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
XII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
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 analytes were detected in the field duplicates.	✓			
XV. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC#: 30879A4

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer:

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?

Analyte	Concentration (ug/L)		RPD	
	11	15		
Chromium	1.0	0.76	27	

V:\FIELD DUPLICATES\FD_inorganic\30879A4.WPD

LDC #: 30879A4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer:

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)
	ICP (Initial calibration)						
1651 ICV	ICP/MS (Initial calibration)	Cr	51.792	50.000	104	104	Y
	CVAA (Initial calibration)						
	ICP (Continuing calibration)						
0103 CCVF	ICP/MS (Continuing calibration)	Cr	41.297	40.000	103	103	
	CVAA (Continuing calibration)						
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

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 #: 30879A4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

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

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)
–	ICP interference check	–	–	–	–	–	–
2320 LCS	Laboratory control sample	Cr	41.021 (mg/L)	40.000 (mg/L)	103	103	Y
2336 12	Matrix spike	Cr	(SSR-SR) 39.162 (mg/L)	40.000 (mg/L)	97.9	97.9	↓
2326/2329 14	Duplicate	Cr	2.689 (mg/L)	2.717 (mg/L)	1.04	1.04	↓
–	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 #: 30879A4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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

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 level IV sample = N.D. ~~were recalculated and verified using the following equation~~:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

Recalculation:

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

#	Sample ID	Analyte	Reported Concentration ( )	Calculated Concentration ( )	Acceptable (Y/N)

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 23, 2013

LDC Report Date: December 10, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23134

Sample Identification

EB-3-10-23-13	MW-14-1
MW-23-5	
MW-23-4	
MW-23-3	
MW-23-2	
MW-23-1	
MW-14-5	
MW-14-4	
MW-14-3**	
MW-14-2	
DUPE-2-4Q13	
EB-3-10-23-13MS	
EB-3-10-23-13MSD	
EB-3-10-23-13DUP	
MW-14-1MS	
MW-14-1MSD	
MW-14-1DUP	
DUPE-2-4Q13MS	
DUPE-2-4Q13MSD	
DUPE-2-4Q13DUP	

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 21 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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. Initial Calibration

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

III. Continuing Calibration

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

IV. Blanks

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

V. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VI. Duplicates

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

VII. Laboratory Control Samples

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

VIII. 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 EPA Level III criteria.

IX. Overall Assessment of Data

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

X. Field Duplicates

Samples DUPE-2-4Q13 and MW-14-1 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	DUPE-2-4Q13	MW-14-1	
Perchlorate	3.7	4.0	8

XI. Field Blanks

Sample EB-3-10-23-13 was identified as an equipment blank. No contaminant concentrations were found.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 13-23134

No Sample Data Qualified in this SDG

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 13-23134

No Sample Data Qualified in this SDG

LDC #: 30879A6
SDG #: 13-23134
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 12-3-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer: [signature]

METHOD: Hexavalent Chromium (EPA SW846 Method 7196), Perchlorate (EPA Method 314.0)

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: 10-23-13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	A	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD
VI.	Duplicates	A	DUP #17 ClO4 OK by difference
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	A	Not reviewed for Level III validation.
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	D = 11 + 21
XI.	Field blanks	ND	EB = 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: ** Indicates sample underwent Level IV validation
all water

1	EB-3-10-23-13	11[2]	DUPE-2-4Q13	21[2]	MW-14-1	31	
2	MW-23-5	12	EB-3-10-23-13MS	22		32	
3	MW-23-4	13	EB-3-10-23-13MSD	23		33	
4	MW-23-3	14	EB-3-10-23-13DUP	24		34	
5	MW-23-2	15[2]	MW-14-1MS	25		35	
6	MW-23-1	16[2]	MW-14-1MSD	26		36	
7	MW-14-5	17[2]	MW-14-1DUP	27		37	
8	MW-14-4	18[2]	DUPE-2-4Q13MS	28		38	
9	MW-14-3**	19[2]	DUPE-2-4Q13MSD	29		39[1]	PBW1
10	MW-14-2	20[2]	DUPE-2-4Q13DUP	30		40[2]	PBW2

Notes: _____

LDC #: 30879A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: MG

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?			✓	

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 #: 30879A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→11, 21	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
QC 12→14		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
15→17		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
↓ 18→20	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC# 30879A6

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: MG
2nd Reviewer:

Inorganics: Method See Cover

Analyte	Concentration (ug/L)		RPD	
	11	21		
Perchlorate	3.7	4.0	8	

V:\FIELD DUPLICATES\FD_inorganic\30879A6.WPD

LDC #: 30879A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

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

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of ClO4 was recalculated. Calibration date: 11-5-13

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	Standard ID	Conc Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	ClO_4	Blank	-	-	r^2=0.997516	r^2=0.997286	Y
		Standard 1	2.0 (µg/L)	0.0021			
		Standard 2	4.0 ( )	0.0043			
		Standard 3	6.0 ( )	0.0070			
		Standard 4	10.0 ( )	0.0117			
		Standard 5	20.0 ( )	0.0218			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	Cr VI	2323 CCV2	0.0502 (mg/L)	0.050 (mg/L)	100	100	
Calibration verification	ClO_4	1603 CCV6	10.733 (µg/L)	10.000 (µg/L)	107	107	
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 #: 30879A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

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

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)
2317 LCS	Laboratory control sample	Cr VI	0.0489 (mg/L)	0.050 (mg/L)	97.8	97.8	Y
1359 12	Matrix spike sample	ClO_4	(SSR-SR) 10.823 (µg/L)	10.101 (µg/L)	107	107	
2317 / 2317 14	Duplicate sample	Cr VI	ND (mg/L)	ND (mg/L)	0	-	

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 #: 30879A6

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 #9, ClO_4 reported with a positive detect were recalculated and verified using the following equation:

Concentration =

$y = mx + b$
where
$m = 0.0011$
$b = 0.0000$
dil = 1x

Recalculation:

$0.006 = 0.0011(x) + 0.0000$

$5.455\ mg/L = x$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	9	ClO_4	5.7	5.5	Y

Note: method 7196 is N.D.

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 24, 2013

LDC Report Date: December 11, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23218

Sample Identification

TB-4-10/24/13
EB-4-10/24/13
MW-22-5
MW-22-4**
MW-22-3
MW-22-2
MW-22-1
MW-24-5
MW-24-4
MW-24-3
MW-24-2**
MW-24-1
MW-26-2
MW-26-1
DUPE-3-4Q13
MW-24-2MS
MW-24-2MSD

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 17 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 524.2 for Volatiles.

This review follows 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.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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 20.0% for all compounds with the following exceptions:

Date	Compound	%RSD	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	29.54078	All samples in SDG 13-23218	J (all detects) UJ (all non-detects)	P

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

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 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/28/13	tert-Butyl alcohol trans-1,4-Dichloro-2-butene Pentachloroethane	30.3 46.8 249	TB-4-10/24/13 EB-4-10/24/13 MW-22-5 MW-22-3 MW-22-2 MW-22-1 MW-24-5 MW-24-4 MW-24-3 MW-24-2** MW-24-1 MW-26-2 MW-26-1 DUPE-3-4Q13 MW-24-2MS MW-24-2MSD BWJ2115	J (all detects) UJ (all non-detects)	P

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

Date	Compound	%D	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	80.5	All samples in SDG 13-23218	J (all detects) UJ (all non-detects)	P

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile 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 with the following exceptions:

Sample	Surrogate	%R (Limits)	Compound	Flag	A or P
MW-22-3	Bromofluorobenzene	72.3 (80-120)	All TCL compounds	J (all detects) UJ (all non-detects)	P
MW-24-1	Bromofluorobenzene	79.5 (80-120)	All TCL compounds	J (all detects) UJ (all non-detects)	P
1314511-CCB2	Bromofluorobenzene	59.70 (80-120)	All TCL compounds	J (all detects) UJ (all non-detects)	P

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. 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 an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

XII. Compound Quantitation

All compound quantitations 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 EPA Level III criteria.

XIII. Tentatively Identified Compounds (TICs)

All tentatively identified compounds 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 EPA Level III criteria.

XIV. System Performance

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

XV. Overall Assessment of Data

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

XVI. Field Duplicates

Samples MW-26-1 and DUPE-3-4Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-26-1	DUPE-3-4Q13	
Chloroform	0.27	0.30	11
Tetrachloroethene	0.40	0.46	14
Trichloroethene	0.35	0.42	18

XVII. Field Blanks

Sample TB-4-10/24/13 was identified as a trip blank. No volatile contaminants were found.

Sample EB-4-10/24/13 was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 13-23218

SDG	Sample	Compound	Flag	A or P	Reason
13-23218	TB-4-10/24/13 EB-4-10/24/13 MW-22-5 MW-22-4** MW-22-3 MW-22-2 MW-22-1 MW-24-5 MW-24-4 MW-24-3 MW-24-2** MW-24-1 MW-26-2 MW-26-1 DUPE-3-4Q13	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Initial calibration (%RSD)
13-23218	TB-4-10/24/13 EB-4-10/24/13 MW-22-5 MW-22-3 MW-22-2 MW-22-1 MW-24-5 MW-24-4 MW-24-3 MW-24-2** MW-24-1 MW-26-2 MW-26-1 DUPE-3-4Q13	tert-Butyl alcohol trans-1,4-Dichloro-2-butene Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)
13-23218	TB-4-10/24/13 EB-4-10/24/13 MW-22-5 MW-22-4** MW-22-3 MW-22-2 MW-22-1 MW-24-5 MW-24-4 MW-24-3 MW-24-2** MW-24-1 MW-26-2 MW-26-1 DUPE-3-4Q13	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (ICV %D)
13-23218	MW-22-3 MW-24-1	All TCL compounds	J (all detects) UJ (all non-detects)	P	Surrogate spikes (%R)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 13-23218

No Sample Data Qualified in this SDG

LDC #: 30879B1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/4/13
SDG #: 13-23218 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer:
2nd Reviewer:

METHOD: GC/MS Volatiles (EPA Method 524.2)

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: 10/24/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	SW	% RSD ≤ 20, r 2
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 30
V.	Blanks	A	
VI.	Surrogate spikes	SW	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	LCS
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	A	Not reviewed for Level III validation.
XII.	Compound quantitation/RL/LOQ/LODs	A	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	A	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	A	
XVI.	Field duplicates	SW	D = 14, 15
XVII.	Field blanks	ND	TB = 1 EB = 2

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:** Indicates sample underwent Level IV validation

water

1 1	TB-4-10/24/13	11	MW-24-2**	21 1	BWJ 2115	31	
2 1	EB-4-10/24/13	12	MW-24-1	22 2	131451-CCB2	32	
3 1	MW-22-5	13	MW-26-2	23		33	
4 2	MW-22-4**	14	MW-26-1 D	24		34	
5 1	MW-22-3	15	DUPE-3-4Q13 D	25		35	
6 1	MW-22-2	16	MW-24-2MS	26		36	
7 1	MW-22-1	17	MW-24-2MSD	27		37	
8 1	MW-24-5	18		28		38	
9 1	MW-24-4	19		29		39	
10 1	MW-24-3	20		30		40	

LDC #: 30879B1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: A

Method: Volatiles (EPA Method 524.2)

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 BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓	FT ✓		
III. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 30%?		✓		
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed at least once every 12 hours 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 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				
Was a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for this SDG?	✓			
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 analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

Validation Area	Yes	No	NA	Findings/Comments
IX. Regional 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 +/-40% from the associated calibration standard?	✓			
Were retention times within - 30% of the last continuing calibration or +/- 50% of the initial calibration?	✓			
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/RLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Tentatively identified compounds (TICs)				
Were the major ions (> 25 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.		✓		

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene	BB. 1,1,2,2-Tetrachloroethane	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane	CC. Toluene	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform	EE. Ethylbenzene	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. Iodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP. Pentachloroethane
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ. Methyl Methacrylate
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR. trans-1,4-Dichloro-2-Butene
Q. 1,2-Dichloropropane	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC #: 30879B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration

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

METHOD: GC/MS VOA (EPA Method 524.2)

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

Y (N) N/A Did the laboratory perform a 5 point calibration prior to sample analysis?
Y (N) N/A Were all percent relative standard deviations (%RSD) ≤ 20% ?

#	Date	Standard ID	Compound	Finding %RSD (Limit: ≤20.0%)	Associated Samples	Qualifications
	10/17/13	ICAL MS-Y5	PPPP	29.5 40 78	all	J/UJ/P

LDC #: 30879B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

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

METHOD: GC/MS VOA (EPA Method 524.2)

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 for each instrument?

Y (N) N/A Were all percent differences (%D) ≤ 30% ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Associated Samples	Qualifications
	10/17/13	ICV2 MS-V5	PPPP	80.5	all	J/UJ/P
	10/28/13	1314511-CCV2	ZZZ	30.3	BWJ2115, 1→3,	J/UJ/P
			RRRR	46.8	5→17	
			PPPP	249	↓	

CONCAL.1S5

LDC #: 30879B1

VALIDATION FINDINGS WORKSHEET
Surrogate Spikes

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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

Y (N) N/A Were all surrogate %R within QC limits?

Y (N) N/A If the percent recovery (%R) was out of QC limits, was a reanalysis performed to confirm samples with %R out of outside of criteria?

#	Date	Lab ID/Reference	Surrogate	%Recovery (Limits)	Associated Samples	Qualifications
		5	BFB	72.3 (80-120)		J/UJ/P
				( )		
				( )		
				( )		
		12	↓	79.5 (↓)		↓
				( )		
				( )		
				( )		
		1314511-CCB2	↓	59.70 (↓)		↓
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		
				( )		

(BFB) = Bromofluorobenzene
(DCB) = 1,2-Dichlorobenzene-d4
(TOL) = Toluene-d8
(DFM) = Dibromofluoromethane

LDC#: 30879B1

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: EJ
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 524.2)

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/L)		RPD
	14	15	
K	0.27	0.30	11
AA	0.40	0.46	14
S	0.35	0.42	18

V:\FIELD DUPLICATES\templates\30879B1.wpd

LDC #: 30879B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer:

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound		Reported (RRF 160/40/8 std)	Recalculated (RRF 160/40/8 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	F	(IS 1)	0.0252902	0.0252902	0.0247595	0.0247595	3.379941	3.379941
	MS-V5		QQQQ	(IS 2)	0.0692452	0.0692452	0.0665553	0.0665553	5.630492	5.630492
			PPPP	(IS 3)	0.1220467	0.1220467	0.1793848	0.1793848	29.54078	29.54078

LDC #: 30879B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 10 std)	Recalculated (RRF 10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	C (IS 1)	0.446210	0.446210	0.4403805	0.4403805	5.759154	5.759154
	MS-V5		S (IS 2)	0.353115	0.353115	0.3462535	0.3462535	7.483333	7.483333
			EE (IS 3)	1.854653	1.854653	1.8783910	1.8783910	13.16845	13.16845

LDC #: 30879B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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	1314511	10/28/13	C (1st Internal Standard)	0.4403805	0.4463761	0.4463761	1.4	1.4
	CCV1		S (2nd Internal Standard)	0.3462535	0.3397841	0.3397841	1.9	1.9
			EE (3rd Internal Standard)	1.8783910	1.705248	1.705248	9.2	9.2
2	1314511	10/28/13	F (1st Internal Standard)	0.0247595	0.02388992	0.02388992	3.5	3.5
	CCV 2		QQQQ (2nd Internal Standard)	0.0665553	0.06751429	0.06751429	1.4	1.4
			PPPP (3rd Internal Standard)	0.1793848	0.6259287	0.6259287	249	249
3	1314511	10/28/13	C (1st Internal Standard)		0.4590449	0.4590449	4.2	4.2
	CCV 3		S (2nd Internal Standard)		0.3477343	0.3477343	0.4	0.4
			EE (3rd Internal Standard)		1.702852	1.702852	9.3	9.3
4			F (1st Internal Standard)		0.0224996	0.0224996	9.1	9.1
			QQQQ (2nd Internal Standard)		0.06722555	0.06722555	1.0	1.0
			PPPP (3rd Internal Standard)	↓	0.2155658	0.2155658	20.2	20.2

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 #: 30879B1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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: 11

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.0	10.060	101	101	0
Bromofluorobenzene	↓	89.3	89.3	89	↓
1,2-Dichlorobenzene-d4	↓	9.78	97.8	97.8	↓
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

LDC #: 30879B1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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 concentration

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

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

MS/MSD sample: 16 & 17

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Benzene	25.0	25.0	ND	25.480	25.800	102	102	103	103	1.25	1.25
Chlorobenzene	↓	↓	↓	25.900	24.93	104	104	99.7	99.7	3.82	3.82
1,1-Dichloroethene	↓	↓	↓	25.080	24.840	100	100	99.4	99.4	0.962	0.962
Toluene	↓	↓	↓	25.480	25.680	102	102	103	103	0.782	0.782
Trichloroethene	↓	↓	0.1600	25.00	25.280	99.4	99.4	100	100	1.11	1.11

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 #: 30879B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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

LCS ID: BW32115 LCS

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	25.0	NA	23.760	NA	95.0	95.0				
Trichloroethene	↓	↓	24.880	↓	99.5	99.5				
Benzene			24.080		96.3	96.3				
Toluene			25.550		102	102				
Chlorobenzene			24.180		96.7	96.7	NA			

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.

LDC #: 30879B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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)

RRF = Relative response factor of the calibration standard.

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

Df = Dilution factor.

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

Example:

Sample I.D. 11 , K :

Conc. = $\frac{(30064)(10)(\quad)}{(388477)(0.703158)(\quad)}$

=

1.1 ug/L

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 24, 2013

LDC Report Date: December 10, 2013

Matrix: Water

Parameters: Total Recoverable Chromium

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23218

Sample Identification

EB-4-10/24/13
MW-22-5
MW-22-4**
MW-22-3
MW-22-2
MW-22-1
MW-24-5
MW-24-4
MW-24-3
MW-24-2**
MW-24-1
MW-26-2
MW-26-1
DUPE-3-4Q13
MW-24-2MS
MW-24-2MSD
MW-24-2DUP
MW-24-1MS
MW-24-1MSD
MW-24-1DUP

Introduction

This data review covers 20 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Total Recoverable Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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

The initial and continuing calibrations were performed at the required frequency.

The calibration standards criteria were met.

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No total recoverable chromium was found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Chromium	0.966 ug/L	EB-4-10/24/13 MW-22-5 MW-22-4** MW-22-3 MW-22-2 MW-22-1 MW-24-5 MW-24-4 MW-24-3 MW-24-2**

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 with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
EB-4-10/24/13	Chromium	1.7 ug/L	1.7U ug/L
MW-22-4**	Chromium	2.0 ug/L	2.0U ug/L
MW-22-3	Chromium	3.2 ug/L	3.2U ug/L

Sample	Analyte	Reported Concentration	Modified Final Concentration
MW-22-2	Chromium	2.4 ug/L	2.4U ug/L
MW-22-1	Chromium	1.0 ug/L	1.0U ug/L
MW-24-5	Chromium	3.1 ug/L	3.1U ug/L
MW-24-2**	Chromium	2.3 ug/L	2.3U ug/L

V. ICP Interference Check Sample (ICS) Analysis

ICP Interference check sample analysis was not required by the method.

VI. Matrix Spike Analysis

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.

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 (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits for samples on which an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

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 EPA 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 MW-26-1 and DUPE-3-4Q13 were identified as field duplicates. No total recoverable chromium was detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	MW-26-1	DUPE-3-4Q13	
Chromium	0.50U	7.2	200

XV. Field Blanks

Sample EB-4-10/24/13 was identified as an equipment blank. No total recoverable chromium was found with the following exceptions:

Blank ID	Analyte	Concentration (ug/L)
EB-4-10/24/13	Chromium	1.7

NASA JPL
Total Recoverable Chromium - Data Qualification Summary - SDG 13-23218

No Sample Data Qualified in this SDG

NASA JPL
Total Recoverable Chromium - Laboratory Blank Data Qualification Summary - SDG 13-23218

SDG	Sample	Analyte	Modified Final Concentration	A or P
13-23218	EB-4-10/24/13	Chromium	1.7U ug/L	A
13-23218	MW-22-4**	Chromium	2.0U ug/L	A
13-23218	MW-22-3	Chromium	3.2U ug/L	A
13-23218	MW-22-2	Chromium	2.4U ug/L	A
13-23218	MW-22-1	Chromium	1.0U ug/L	A
13-23218	MW-24-5	Chromium	3.1U ug/L	A
13-23218	MW-24-2**	Chromium	2.3U ug/L	A

LDC #: 30879B4 **VALIDATION COMPLETENESS WORKSHEET** Date: 12-3-13
SDG #: 13-23218 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: MG
2nd Reviewer: ✓

METHOD: Total Recoverable Chromium (EPA Method 200.8)

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: 10-24-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	N	not required
VI.	Matrix Spike Analysis	A	MS/MSD
VII.	Duplicate Sample Analysis	A	DUP #17 OK by difference
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	not reviewed for level III
X.	Furnace Atomic Absorption QC	N	not utilized
XI.	ICP Serial Dilution	N	not performed
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	D = 13+14
XV	Field Blanks	SW	EB = 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:** Indicates sample underwent Level IV validation

all water

1	EB-4-10/24/13	11 2	MW-24-1	21		31	
2	MW-22-5	12 2	MW-26-2	22		32	
3	MW-22-4**	13 2	MW-26-1	23		33	
4	MW-22-3	14 2	DUPE-3-4Q13	24		34	
5	MW-22-2	15	MW-24-2MS	25		35	
6	MW-22-1	16	MW-24-2MSD	26		36	
7	MW-24-5	17	MW-24-2DUP	27		37	
8	MW-24-4	18 2	MW-24-1MS	28		38	
9	MW-24-3	19 2	MW-24-1MSD	29 1	PBW1	39	
10	MW-24-2**	20 2	MW-24-1DUP	30 2	PBW2	40	

Notes:

LDC #: 30879B4

VALIDATION FINDINGS CHECKLIST

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

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. 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) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. 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.	✓			
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?		✓		
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?			✓	
VI. 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.	✓			
VII. 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?	✓			

Validation Area	Yes	No	NA	Findings/Comments
VIII. 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?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
XI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
XII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
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 analytes were detected in the field duplicates.	✓			
XV. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 30879B4
SDG #: See Cover
METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)
Sample Concentration units, unless otherwise noted: ug/L

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES
Soil preparation factor applied: NA
Associated Samples: 1-10

Reviewer: MG
2nd Reviewer:

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Limit	1	3	4	5	6	7	10			
Cr		0.966		4.83	1.7	2.0	3.2	2.4	1.0	3.1	2.3			

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 were 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#: 30879B4

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: MG

2nd Reviewer: V

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?

Analyte	Concentration (ug/L)		RPD	
	13	14		
Chromium	0.50U	7.2	200	

V:\FIELD DUPLICATES\FD_inorganic\30879B4.WPD

LDC #: 30879B4

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd reviewer: ✓

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

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

Sample: 1 Field Blank / Trip Blank / Rinsate / (Other) EB (circle one)

Analyte	Concentration Units (~~ug/L~~ mg/L)
Cr	1.7

Sample: _____ Field Blank / Trip Blank / Rinsate / Other_____ (circle one)

Analyte	Concentration Units (____)

LDC #: 30879B4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer:

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)
	ICP (Initial calibration)						
1155 ICV	ICP/MS (Initial calibration)	Cr	51.711	50.000	103	103	Y
	CVAA (Initial calibration)						
	ICP (Continuing calibration)						
1717 CCV8	ICP/MS (Continuing calibration)	Cr	41.003	40.000	103	103	
	CVAA (Continuing calibration)						
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

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 #: 30879B4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer:

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

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)
—	ICP interference check	—	—	—	—	—	—
1647 LCS	Laboratory control sample	Cr	43.843 (mg/L)	40.000 (mg/L)	110	110	Y
1703 15	Matrix spike	Cr	(SSR-SR) 39.729 (mg/L)	40.000 (mg/L)	98.1	98.1	↓
1653 / 1656 17	Duplicate	Cr	2.319 (mg/L)	3.374 (mg/L)	37.1	37.1	↓
—	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 #: 30879B4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [signature]

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

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 #3, Cr were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(2.046\ mg/L)(0.050\ L)}{0.050\ L} = 2.046\ mg/L$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	3	Cr	2.0	2.0	Y
					↓
2	10	Cr	2.3	2.3	↓

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 24, 2013

LDC Report Date: December 10, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23218

Sample Identification

EB-4-10/24/13
MW-22-5
MW-22-4**
MW-22-3
MW-22-2
MW-22-1
MW-24-5
MW-24-4
MW-24-3
MW-24-2**
MW-24-1
MW-26-2
MW-26-1
DUPE-3-4Q13
MW-24-3MS
MW-24-3MSD
MW-24-3DUP
MW-24-2MS
MW-24-2MSD
MW-24-2DUP
MW-24-1MS
MW-24-1MSD
MW-24-1DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 23 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 300.0 for Chloride, Sulfate, Nitrate a Nitrogen, EPA Method 314.0 for Perchlorate, EPA Method 353.2 for Nitrite as Nitrogen, EPA SW 846 Method 7196 for Hexavalent Chromium, and EPA Method 365.1 for Orthophosphate as Phosphorus.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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. Initial Calibration

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

III. Continuing Calibration

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

IV. 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	Concentration	Associated Samples
PB (prep blank)	Chloride	0.127 mg/L	MW-24-1
ICB/CCB	Chloride Sulfate	0.097 mg/L 0.269 mg/L	MW-24-1

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

V. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VI. Duplicates

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

VII. Laboratory Control Samples

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

	Analyte	%R (Limits)	Associated Samples	Flag	A or P
LCS	Orthophosphate as P	111 (90-110)	MW-24-1	J (all detects)	P

VIII. 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 EPA Level III criteria.

IX. Overall Assessment of Data

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

X. Field Duplicates

Samples MW-26-1 and DUPE-3-4Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

	Concentration (ug/L)		
Analyte	MW-26-1	DUPE-3-4Q13	RPD
Perchlorate	4.5	4.2	7

XI. Field Blanks

Sample EB-4-10/24/13 was identified as an equipment blank. No contaminant concentrations were found.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 13-23218

SDG	Sample	Analyte	Flag	A or P	Reason
13-23218	MW-24-1	Orthophosphate as P	J (all detects)	P	Laboratory control samples (%R)

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 13-23218

No Sample Data Qualified in this SDG

LDC #: 30879B6
SDG #: 13-23218
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 12-3-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Chloride, Sulfate, Nitrate-N (EPA Method 300.0), Perchlorate (EPA Method 314.0), Nitrite-N (EPA Method 353.2), Hexavalent Chromium (EPA SW846 Method 7196), Orthophosphate-P (EPA Method 365.1)

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: 10-24-13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD
VI.	Duplicates	A	DUP #23 NO_3-N
VII.	Laboratory control samples	SW	LCS
VIII.	Sample result verification	A	Not reviewed for Level III validation.
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	D = 13+14
XI	Field blanks	ND	EB = 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:** Indicates sample underwent Level IV validation
all water

1	EB-4-10/24/13	11	MW-24-1	21	MW-24-1MS	31	
2	MW-22-5	12	MW-26-2	22	MW-24-1MSD	32	
3	MW-22-4**	13	MW-26-1	23	MW-24-1DUP	33	
4	MW-22-3	14	DUPE-3-4Q13	24		34	
5	MW-22-2	15	MW-24-3MS	25		35	
6	MW-22-1	16	MW-24-3MSD	26		36	
7	MW-24-5	17	MW-24-3DUP	27		37	
8	MW-24-4	18	MW-24-2MS	28		38	
9	MW-24-3	19	MW-24-2MSD	29		39	PBW1
10	MW-24-2**	20	MW-24-2DUP	30		40	PBW2

Notes: _____

LDC #: 30879B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: W

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?			✓	

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 #: 30879B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→10 12→14	W	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC [✓ CR^{6+}] [✓ ClO$_4$] ___ ___
11	↓	pH TDS [✓ Cl] F [✓ NO$_3$] [✓ NO$_2$] [✓ SO$_4$] [✓ PO$_4$] ALK CN$^-$ NH$_3$ TKN TOC [✓ CR^{6+}] [✓ ClO$_4$] ___ ___
QC 15→17	↓	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} [✓ ClO$_4$] ___ ___
↓ 18→20	↓	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC [✓ CR^{6+}] ClO$_4$ ___ ___
↓ 21→23	↓	pH TDS Cl F NO$_3$ [✓ NO$_2$] SO$_4$ [✓ PO$_4$] ALK CN$^-$ NH$_3$ TKN TOC [✓ CR^{6+}] ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
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		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ___ ___
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$

Comments: ______________________________

LDC #: 30879B6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** 11 (>5x)

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		No Qual's.								
Cl	0.127	0.097	0.635									
SO4		0.269	1.345									

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 #: 30879B6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

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 Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

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

LEVEL IV ONLY:

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

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
1	LCS	water	PO4-P	111 (90-110)			11	J dets / P

Comments:

LDC# 30879B6

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: MG
2nd Reviewer: V

Inorganics: Method See Cover

Analyte	Concentration (ug/L)		RPD	
	13	14		
Perchlorate	4.5	4.2	7	

V:\FIELD DUPLICATES\FD_inorganic\30879B6.WPD

LDC #: 30879B6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

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

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of Cr VI was recalculated. Calibration date: ~~11-10-13~~ 10-11-13

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	Standard ID	Conc Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Cr VI	Blank	0.000 (mg/L)	0.001	r^2=0.999898	r^2=0.999995	Y
		Standard 1	0.002 (|)	0.003			
		Standard 2	0.005 (|)	0.005			
		Standard 3	0.025 (|)	0.020			
		Standard 4	0.050 (|)	0.039			
		Standard 5	0.100 (↓)	0.078			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	ClO4	2242 CCV1	10.393 (µg/L)	10.000 (µg/L)	104	104	
Calibration verification	Cr VI	2220 CCV1	0.0512 (mg/L)	0.050 (mg/L)	102	102	↓
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 #: 30879B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer:

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)
0101 ~~1400~~ LCS	Laboratory control sample	ClO4	10.652 (ug/L)	10.000 (ug/L)	107	107	Y
2220 18	Matrix spike sample	Cr VI	(SSR-SR) 0.05211 (mg/L)	0.052632 (mg/L)	99.0	99.0	↓
0114/0156 17	Duplicate sample	ClO4	ND (ug/L)	ND (ug/L)	0	-	↓

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 #: 30879B6

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 #3, Cr VI reported with a positive detect were recalculated and verified using the following equation:

Concentration =

factor = 1.306
bias = 0.001
dil = 1x

Recalculation:

Cr VI = 1.306 x (0.002 - 0.001)
= 0.00131 mg/L

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	3	Cr VI	0.0017	0.0013	Y
			(µg/L)	(µg/L)	↓
2	10	ClO4	9.7	10.0	↓

Note: the lab is using more significant figures than displayed in raw data.

LABORATORY DATA CONSULTANTS, INC.

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

Battelle
505 King Avenue
Room 10-1-170
Columbus, OH 43201
ATTN: Ms. Betsy Cutie

December 11, 2013

SUBJECT: NASA JPL, Data Validation

Dear Ms. Cutie,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on November 25, 2013. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 30905:

SDG #	Fraction
13-23307 13-23375	Volatiles, Total Recoverable Chromium, 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:

- USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, January 2010

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

Sincerely,

Pei Geng
Project Manager/Senior Chemist

HC

Attachment 1

90/10 (client select)

LDC #30905 (Battelle-San Diego / NASA JPL)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (524.2)		Cr (200.8)		Cr(VI) (7196)		CLO_4 (314.0)																									
Matrix: Water/Soil				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	13-23307	11/25/13	12/18/13	15	0	15	0	15	0	18	0																								
A	13-23307	11/25/13	12/18/13	1	0	1	0	1	0	1	0																								
B	13-23375	11/25/13	12/18/13	12	0	12	0	12	0	12	0																								
B	13-23375	11/25/13	12/18/13	1	0	1	0	1	0	1	0																								
Total	T/PG			29	0	29	0	29	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	119

Shaded cells indicate Level IV validation (all other cells are Level III validation).

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 25, 2013

LDC Report Date: December 10, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23307

Sample Identification

TB-5-10/25/13
SB-5-10/25/13
EB-5-10/25/13
MW-25-5
MW-25-4
MW-25-3
MW-25-2**
DUPE-4-4Q13
MW-25-1
MW-21-5
MW-21-4
MW-21-3
MW-21-2
MW-21-1
MW-21-2MS
MW-21-2MSD

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 16 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 524.2 for Volatiles.

This review follows 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.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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 20.0% for all compounds with the following exceptions:

Date	Compound	%RSD	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	29.54078	All samples in SDG 13-23307	J (all detects) UJ (all non-detects)	P

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

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 30.0% for all compounds.

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

Date	Compound	%D	Associated Samples	Flag	A or P
10/17/13	Pentachloroethane	80.5	All samples in SDG 13-23307	J (all detects) UJ (all non-detects)	P

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile 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

Although matrix spike (MS) and matrix spike duplicate (MSD) samples were not required by the method, MS and MSD samples were reported by the laboratory. 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
MW-21-2MS/MSD (MW-21-2)	1,4-Dichlorobenzene	-	-	28.7 (≤20)	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.

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 an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

XII. Compound Quantitation

All compound quantitations 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 EPA Level III criteria.

XIII. Tentatively Identified Compounds (TICs)

All tentatively identified compounds 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 EPA Level III criteria.

XIV. System Performance

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

XV. Overall Assessment of Data

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

XVI. Field Duplicates

Samples MW-25-2** and DUPE-4-4Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-25-2**	DUPE-4-4Q13	
Chloroform	0.14	0.19	19
Trichloroethene	0.20	0.20	0

XVII. Field Blanks

Sample TB-5-10/25/13 was identified as a trip blank. No volatile contaminants were found.

Sample EB-5-10/25/13 was identified as an equipment blank. No volatile contaminants were found.

Sample SB-5-10/25/13 was identified as a source blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 13-23307

SDG	Sample	Compound	Flag	A or P	Reason
13-23307	TB-5-10/25/13 SB-5-10/25/13 EB-5-10/25/13 MW-25-5 MW-25-4 MW-25-3 MW-25-2** DUPE-4-4Q13 MW-25-1 MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Initial calibration (%RSD)
13-23307	TB-5-10/25/13 SB-5-10/25/13 EB-5-10/25/13 MW-25-5 MW-25-4 MW-25-3 MW-25-2** DUPE-4-4Q13 MW-25-1 MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (ICV %D)
13-23307	MW-21-2	1,4-Dichlorobenzene	J (all detects)	A	Matrix spike/Matrix spike duplicate (RPD)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 13-23307

No Sample Data Qualified in this SDG

LDC #: 30905A1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/4/13
SDG #: 13-23307 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: PD
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA Method 524.2)

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: 10/25/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	SW	% RSD ≤ 20, r 2
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 30
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	SW	
VIII.	Laboratory control samples	A	LCS
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	A	Not reviewed for Level III validation.
XII.	Compound quantitation/RL/LOQ/LODs	A	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	A	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	A	
XVI.	Field duplicates	SW	D = 7, 8
XVII.	Field blanks	ND	TB = 1 SB = 2 EB = 3

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:** Indicates sample underwent Level IV validation

water

1	TB-5-10/25/13	11	MW-21-4	21	BWJ2116	31	
2	~~SB-5/10/25/13~~ -5-10/25/13 FT	12	MW-21-3	22		32	
3	EB-5-10/25/13	13	MW-21-2	23		33	
4	MW-25-5	14	MW-21-1	24		34	
5	MW-25-4	15	MW-21-2MS	25		35	
6	MW-25-3	16	MW-21-2MSD	26		36	
7	MW-25-2** D	17		27		37	
8	DUPE-4-4Q13 D	18		28		38	
9	MW-25-1	19		29		39	
10	MW-21-5	20		30		40	

LDC #: 309105A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer:

Method: Volatiles (EPA Method 524.2)

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 BFB 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) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 30%?		✓		
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed at least once every 12 hours 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 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				
Was a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for this SDG?	✓			
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 analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

Validation Area	Yes	No	NA	Findings/Comments
IX. Regional 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 +/-40% from the associated calibration standard?	✓			
Were retention times within - 30% of the last continuing calibration or +/- 50% of the initial calibration?	✓			
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/RLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Tentatively identified compounds (TICs)				
Were the major ions (> 25 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.		✓		

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene	BB. 1,1,2,2-Tetrachloroethane	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane	CC. Toluene	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform	EE. Ethylbenzene	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. Iodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP. Pentachloroethane
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ. Methyl methacrylate
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC #: 30905A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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

Y N N/A Did the laboratory perform a 5 point calibration prior to sample analysis?

Y N N/A Were all percent relative standard deviations (%RSD) ≤ 20% ?

#	Date	Standard ID	Compound	Finding %RSD (Limit: ≤20.0%)	Associated Samples	Qualifications
	10/17/13	ICAL MS-V5	PPPP	29.54078	all	J/W/P

LDC #: 30905A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT
2nd Reviewer: R

METHOD: GC/MS VOA (EPA Method 524.2)

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 for each instrument?

Y N N/A Were all percent differences (%D) ≤ 30% ?

#	Date	Standard ID	Compound	Finding %D (Limit: <30.0%)	Associated Samples	Qualifications
	10/17/13	ICV2 MS-V5	PPPP	80.5	all	J/UJ/P

LDC #: 30905A1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD : GC/MS VOA (EPA Method 524.2)

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
		15 + 16	HHH	( )	( )	28.7 (20)	13	J/A det
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
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				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 30905A1

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: FT
2nd reviewer: [signature]

METHOD: GC/MS VOA (EPA Method 524.2)

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/L)		RPD
	7	8	
K	0.14	0.17	19
S	0.20	0.20	0

Compound	Concentration ( )		RPD

Compound	Concentration ( )		RPD

LDC #: 30905A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 10 std)	Recalculated (RRF 10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	C (IS 1)	0.446210	0.446210	0.4403805	0.4403805	5.759154	5.759154
	MS-V5		S (IS 2)	0.353115	0.353115	0.3462535	0.3462535	7.483333	7.483333
			EE (IS 3)	1.854653	1.854653	1.8783910	1.8783910	13.16845	13.16845

LDC #: 30905 A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer:

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 160/40/8 std)	Recalculated (RRF 160/40/8 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/17/2013	F (IS 1)	0.0252902	0.0252902	0.0247595	0.0247595	3.379941	3.379941
	MS-V5		QQQQ (IS 2)	0.0692452	0.0692452	0.0665553	0.0665553	5.630492	5.630492
			PPPP (IS 3)	0.1220467	0.1220467	0.1793848	0.1793848	29.54078	29.54078

LDC #: 30905A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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	1314511	10/28/13	C (1st Internal Standard)	0.4403805	0.459 0449	0.4590449	4.2	4.2
	CCV3		S (2nd Internal Standard)	0.3462535	0.3477343	0.3477343	0.4	0.4
			EE (3rd Internal Standard)	1.878 391U	1.702852	1.702852	9.3	9.3
2	1314511		F (1st Internal Standard)	0.0247595	0.0224996	0.0224996	9.1	9.1
	CCV4		QQQQ (2nd Internal Standard)	0.0665553	0.06722555	0.06722555	1.0	1.0
			PPPP (3rd Internal Standard)	0.1793848	0.2155658	0.2155658	20.2	20.2
3			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd Internal Standard)					
4			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd 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 #: 30905 A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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: #7

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.0	9.2900	92.9	92.9	0
Bromofluorobenzene	|	10.860	109	109	|
1,2-Dichlorobenzene-d4	↓	9.8200	98.2	98.2	↓
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

LDC #: 30905A1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: R

METHOD: GC/MS VOA (EPA Method 524.2)

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 concentration

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

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

MS/MSD sample: 15 & 16

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Benzene	25.0	25.0	ND	25.050	25.450	100	100	102	102	1.58	1.58
Chlorobenzene				26.570	25.370	106	106	101	101	4.62	4.62
1,1-Dichloroethene				24.650	26.010	98.6	98.6	104	104	5.37	5.37
Toluene				24.510	25.980	98.0	98.0	104	104	5.82	5.82
Trichloroethene			0.290	26.420	26.460	105	105	105	105	0.151	0.151

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 #: 30905A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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

LCS ID: BW J2116-BS1

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	25.0	NA	24.700	NA	98.8	98.8				
Trichloroethene	↓	↓	27.250	↓	109	109				
Benzene	↓	↓	24.390	↓	97.6	97.6				
Toluene	↓	↓	24.650	↓	98.6	98.6				
Chlorobenzene	↓	↓	24.710	↓	98.8	98.8	NA			

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.

LDC #: 30905A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer: [signature]

METHOD: GC/MS VOA (EPA Method 524.2)

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)

RRF = Relative response factor of the calibration standard.

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

Df = Dilution factor.

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

Example:

Sample I.D. #7, K:

Conc. = (3711)(10)( )
(384927)(0.703151)( )
=

0.14 ug/L

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 25, 2013

LDC Report Date: December 5, 2013

Matrix: Water

Parameters: Total Recoverable Chromium

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23307

Sample Identification

SB-5/10/25/13
EB-5-10/25/13
MW-25-5
MW-25-4
MW-25-3
MW-25-2**
DUPE-4-4Q13
MW-25-1
MW-21-5
MW-21-4
MW-21-3
MW-21-2
MW-21-1
MW-21-2MS
MW-21-2MSD
MW-21-2DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 16 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Total Recoverable Chromium.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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

The initial and continuing calibrations were performed at the required frequency.

The calibration standards criteria 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 with the following exceptions:

Method Blank ID	Analyte	Concentration	Associated Samples
PB (prep blank)	Chromium	1.416 ug/L	DUPE-4-4Q13 MW-25-1 MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1

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

Sample	Analyte	Reported Concentration	Modified Final Concentration
DUPE-4-4Q13	Chromium	3.7 ug/L	3.7U ug/L
MW-25-1	Chromium	2.3 ug/L	2.3U ug/L
MW-21-5	Chromium	2.3 ug/L	2.3U ug/L

Sample	Analyte	Reported Concentration	Modified Final Concentration
MW-21-4	Chromium	1.9 ug/L	1.9U ug/L
MW-21-3	Chromium	2.0 ug/L	2.0U ug/L
MW-21-2	Chromium	1.3 ug/L	1.3U ug/L
MW-21-1	Chromium	3.9 ug/L	3.9U ug/L

V. ICP Interference Check Sample (ICS) Analysis

ICP interference check sample (ICS) analysis was not required.

VI. Matrix Spike Analysis

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.

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 (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits for samples on which an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

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 EPA 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 MW-25-2** and DUPE-4-4Q13 were identified as field duplicates. No chromium was detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	MW-25-2**	DUPE-4-4Q13	
Chromium	2.5	3.7	39

XV. Field Blanks

Sample EB-5-10/25/13 was identified as an equipment blank. No chromium was found.

Sample SB-5/10/25/13 was identified as a source blank. No chromium was found.

NASA JPL
Total Recoverable Chromium - Data Qualification Summary - SDG 13-23307

No Sample Data Qualified in this SDG

NASA JPL
Total Recoverable Chromium - Laboratory Blank Data Qualification Summary - SDG 13-23307

SDG	Sample	Analyte	Modified Final Concentration	A or P
13-23307	DUPE-4-4Q13	Chromium	3.7U ug/L	A
13-23307	MW-25-1	Chromium	2.3U ug/L	A
13-23307	MW-21-5	Chromium	2.3U ug/L	A
13-23307	MW-21-4	Chromium	1.9U ug/L	A
13-23307	MW-21-3	Chromium	2.0U ug/L	A
13-23307	MW-21-2	Chromium	1.3U ug/L	A
13-23307	MW-21-1	Chromium	3.9U ug/L	A

LDC #: 30905A4
SDG #: 13-23307
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 12-5-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer:

METHOD: Total Recoverable Chromium (EPA Method 200.8)

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: 10-25-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	N	not required
VI.	Matrix Spike Analysis	A	MS/MSD (SDG 13-23218)
VII.	Duplicate Sample Analysis	A	DUP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	not reviewed for level III
X.	Furnace Atomic Absorption QC	N	not utilized
XI.	ICP Serial Dilution	N	not performed
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	D = 6+7
XV	Field Blanks	ND	SB = 1 EB = 2

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:** Indicates sample underwent Level IV validation

all Water

1	SB-5/10/25/13	11	MW-21-3	21		31	
2	EB-5-10/25/13	12	MW-21-2	22		32	
3	MW-25-5	13	MW-21-1	23		33	
4	MW-25-4	14	MW-21-2MS	24		34	
5	MW-25-3	15	MW-21-2MSD	25		35	
6	MW-25-2**	16	MW-21-2DUP	26		36	
7	DUPE-4-4Q13	17		27		37	
8	MW-25-1	18		28		38	
9	MW-21-5	19		29	PBW1	39	
10	MW-21-4	20		30	PBW2	40	

Notes:

LDC #: 30905A4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. 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) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. 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.	✓			
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?		✓		
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?			✓	
VI. 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.	✓			
VII. 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?	✓			

LDC #: 30905A4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: V

Validation Area	Yes	No	NA	Findings/Comments
VIII. 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?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
XI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
XII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
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 analytes were detected in the field duplicates.	✓			
XV. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 30905A4
SDG #: See Cover
METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)
Sample Concentration units, unless otherwise noted: ug/L

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES
Soil preparation factor applied: NA
Associated Samples: 7-13

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Limit	7	8	9	10	11	12	13			
Cr		1.416		7.08	3.7	2.3	2.3	1.9	2.0	1.3	3.9			

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 were 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#: 30905A4

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: MG
2nd Reviewer:

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?

Analyte	Concentration (ug/L)		RPD	
	6	7		
Chromium	2.5	3.7	39	

V:\FIELD DUPLICATES\FD_inorganic\30905A4.WPD

LDC #: 30905A4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer:

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)
	ICP (Initial calibration)						
1311 ICV	ICP/MS (Initial calibration)	Cr	52.321	50.000	105	105	Y
	CVAA (Initial calibration)						
	ICP (Continuing calibration)						
1910 CCV8	ICP/MS (Continuing calibration)	Cr	39.964	40.000	99.9	99.9	
	CVAA (Continuing calibration)						
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

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 #: 30905A4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer:

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

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)
—	ICP interference check	—	—	—	—	—	—
1840 LCS	Laboratory control sample	Cr	39.040 (mg/L)	40.000 (mg/L)	97.6	97.6	Y
1856 MW-24-1 MS	Matrix spike	Cr	(SSR-SR) 36.062 (mg/L)	40.000 (mg/L)	90.2	90.2	↓
1846/1849 MW-24-1 DUP	Duplicate	Cr	9.940 (mg/L)	10.098 (mg/L)	1.58	1.58	↓
—	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 #: 30905A4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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

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 #6, Cr were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(2.506\ \mu g/L)(0.050L)}{0.050L} = 2.506\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	6	Cr	2.5	2.5	Y

Note: _____

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 25, 2013

LDC Report Date: December 6, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23307

Sample Identification

SB-5/10/25/13
EB-5-10/25/13
MW-25-5
MW-25-4
MW-25-3
MW-25-2**
DUPE-4-4Q13
MW-25-1
MW-21-5
MW-21-4
MW-21-3
MW-21-2
MW-21-1
SB-5/10/25/13MS
SB-5/10/25/13MSD
SB-5/10/25/13DUP
MW-25-2MS
MW-25-2MSD
MW-25-2DUP
MW-21-2MS
MW-21-2MSD
MW-21-2DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 22 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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. Initial Calibration

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

III. Continuing Calibration

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

IV. Blanks

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

V. 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.

VI. Duplicates

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

VII. Laboratory Control Samples

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

VIII. 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 EPA Level III criteria.

IX. Overall Assessment of Data

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

X. Field Duplicates

Samples MW-25-2** and DUPE-4-4Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-25-2**	DUPE-4-4Q13	
Perchlorate	15 ug/L	16 ug/L	6
Hexavalent Chromium	0.0011 mg/L	0.0011 mg/L	0

XI. Field Blanks

Sample EB-5-10/25/13 was identified as an equipment blank. No contaminant concentrations were found.

Sample SB-5/10/25/13was identified as a source blank. No contaminant concentrations were found.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 13-23307

No Sample Data Qualified in this SDG

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 13-23307

No Sample Data Qualified in this SDG

LDC #: 30905A6
SDG #: 13-23307
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 12-5-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer: √

METHOD: Hexavalent Chromium (EPA SW846 Method 7196), Perchlorate (EPA Method 314.0)

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: 10-25-13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	A	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD
VI.	Duplicates	A	DUP
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	A	Not reviewed for Level III validation.
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	D=6+7
XI.	Field blanks	ND	SB=1 EB=2

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:** Indicates sample underwent Level IV validation
all water

1	SB-5/10/25/13	11	MW-21-3	21	MW-21-2MSD	31	
2	EB-5-10/25/13	12	MW-21-2	22	MW-21-2DUP	32	
3	MW-25-5	13	MW-21-1	23		33	
4	MW-25-4	14	SB-5/10/25/13MS	24		34	
5	MW-25-3	15	SB-5/10/25/13MSD	25		35	
6	MW-25-2**	16	SB-5/10/25/13DUP	26		36	
7	DUPE-4-4Q13	17	MW-25-2MS	27		37	
8	MW-25-1	18	MW-25-2MSD	28		38	
9	MW-21-5	19	MW-25-2DUP	29		39	PBW1
10	MW-21-4	20	MW-21-2MS	30		40	PBW2

Notes:

LDC #: 30905A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: W

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?			✓	

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 #: 30905A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→13	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] ____ ____
QC 14→16	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] ClO_4 ____ ____
17→19		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} [✓ ClO_4] ____ ____
20→22		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments: ____________________

LDC# 30905A6

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: MG
2nd Reviewer:

Inorganics: Method See Cover

Analyte	Concentration (mg/L)		RPD	
	6	7		
Perchlorate (ug/L)	15	16	6	
Hexavalent Chromium	0.0011	0.0011	0	

V:\FIELD DUPLICATES\FD_inorganic\30905A6.WPD

LDC #: 30905A6

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 ClO_4 was recalculated. Calibration date: 11-5-13

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	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	ClO_4	Blank	-	-	r^2=0.997516	r^2=0.997286	Y
		Standard 1	2.0 (µg/L)	0.0021			
		Standard 2	4.0 ( )	0.0043			
		Standard 3	6.0 ( )	0.0070			
		Standard 4	10.0 ( )	0.0117			
		Standard 5	20.0 ( )	0.0218			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	Cr VI	2226 CCV2	0.0508 (mg/L)	0.050 (mg/L)	102	102	
Calibration verification	ClO_4	1306 ICV	10.776 (µg/L)	10.000 (µg/L)	108	108	
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 #: 30905A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: M

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)
2219 LCS	Laboratory control sample	Cr VI	0.0501 (mg/L)	0.050 (mg/L)	100	100	Y
1634 17	Matrix spike sample	ClO4	(SSR-SR) 10.922 (µg/L)	10.101 (µg/L)	108	108	↓
2219/2219 16	Duplicate sample	Cr VI	ND (mg/L)	ND (mg/L)	0	-	↓

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 #: 30905A6

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 #6, ClO4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = $y = mx + b$
where
$m = 0.0011$
$b = 0.0000$
dil = 1x

Recalculation:
$0.017 = 0.0011(x) + 0.0000$

$15.455\ mg/L = X$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	6	ClO4	15	15	Y
			(mg/L)	(mg/L)	
		Cr VI	0.0011	0.0013	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 28, 2013

LDC Report Date: December 10, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23375

Sample Identification

TB-6-10/28/13
EB-6-10/28/13
MW-17-5
MW-17-4
MW-17-3
MW-17-2
MW-17-1
MW-18-5
MW-18-4
MW-18-3**
MW-18-2
MW-18-3MS
MW-18-3MSD

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 13 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 524.2 for Volatiles.

This review follows 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.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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 20.0% for all compounds.

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

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 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/30/13 (1314647-CCV2)	Pentachloroethane	127	TB-6-10/28/13 EB-6-10/28/13 MW-17-5 MW-17-4 MW-17-3 MW-17-2 MW-18-3** MW-18-3MS MW-18-3MSD BWJ2329	J (all detects) UJ (all non-detects)	P
10/30/13 (1314647-CCV5)	Pentachloroethane	74.5	MW-17-1 MW-18-5 MW-18-4 MW-18-2 1314647-CCB2	J (all detects) UJ (all non-detects)	P

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

Date	Compound	%D	Associated Samples	Flag	A or P
10/29/13	Pentachloroethane	81.9	All samples in SDG 13-23375	J (all detects) UJ (all non-detects)	P

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile 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

Although matrix spike (MS) and matrix spike duplicate (MSD) samples were not required by the method, MS and MSD samples were reported by the laboratory. 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. 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 an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

XII. Compound Quantitation

All compound quantitations 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 EPA Level III criteria.

XIII. Tentatively Identified Compounds (TICs)

All tentatively identified compounds 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 EPA Level III criteria.

XIV. System Performance

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

XV. Overall Assessment of Data

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 TB-6-10/28/13 was identified as a trip blank. No volatile contaminants were found.

Sample EB-6-10/28/13was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 13-23375

SDG	Sample	Compound	Flag	A or P	Reason
13-23375	TB-6-10/28/13 EB-6-10/28/13 MW-17-5 MW-17-4 MW-17-3 MW-17-2 MW-17-1 MW-18-5 MW-18-4 MW-18-3** MW-18-2	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (CCV %D)
13-23375	TB-6-10/28/13 EB-6-10/28/13 MW-17-5 MW-17-4 MW-17-3 MW-17-2 MW-17-1 MW-18-5 MW-18-4 MW-18-3** MW-18-2	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (ICV %D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 13-23375

No Sample Data Qualified in this SDG

LDC #: 30905B1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/4/13
SDG #: 13-23375 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: EJ
2nd Reviewer:

METHOD: GC/MS Volatiles (EPA Method 524.2)

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: 10/28/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	SW	EJ % RSD ≤ 20, r²
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 30
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	
X.	Internal standards	A	
XI.	Target compound identification	A	Not reviewed for Level III validation.
XII.	Compound quantitation/RL/LOQ/LODs	A	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	A	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	A	
XVI.	Field duplicates	N	
XVII.	Field blanks	ND	TB = 1 EB = 2

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:** Indicates sample underwent Level IV validation

Water

1	1	TB-6-10/28/13	11	2	MW-18-2	21	1	BWJ2329	31	
2	1	EB-6-10/28/13	12	1	MW-18-3MS	22	2	1314647-CCB2	32	
3	1	MW-17-5	13	1	MW-18-3MSD	23			33	
4	1	MW-17-4	14			24			34	
5	1	MW-17-3	15			25			35	
6	1	MW-17-2	16			26			36	
7	2	MW-17-1	17			27			37	
8	2	MW-18-5	18			28			38	
9	2	MW-18-4	19			29			39	
10	1	MW-18-3**	20			30			40	

LDC #: 30905B1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer:

Method: Volatiles (EPA Method 524.2)

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 BFB 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) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 30%?		✓		
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank analyzed at least once every 12 hours 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 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				
Was a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for this SDG?	✓			
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 analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

VALIDATION FINDINGS CHECKLIST

Validation Area	Yes	No	NA	Findings/Comments
IX. Regional 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 +/-40% from the associated calibration standard?	✓			
Were retention times within - 30% of the last continuing calibration or +/- 50% of the initial calibration?	✓			
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/RLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Tentatively identified compounds (TICs)				
Were the major ions (> 25 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.		✓		

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene	BB. 1,1,2,2-Tetrachloroethane	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane	CC. Toluene	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform	EE. Ethylbenzene	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. Iodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP. Pentachloroethane
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ. Methyl Methacrylate
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC #: 30905B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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 for each instrument?

Y N N/A Were all percent differences (%D) ≤ 30% ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Associated Samples	Qualifications
	10/29/13	ICV2 - MS-V5	PPPP	81.9	all	J/UJ/A P F7
	10/30/13	1314647-CCV2	PPPP	127	BWJ2329, 1→6, 10, 12, 13	J/UJ/P
	10/30/13	1314647-CCV5	PPPP	74.5	1314647-CCB2, 7→9, 11	J/UJ/P

LDC #: 30903B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 10 std)	Recalculated (RRF 10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/29/2013	C (IS 1)	0.611253	0.611253	0.6183554	0.6183554	6.768750	6.768750
	MS-V5		S (IS 2)	0.335190	0.335190	0.3400419	0.3400419	7.541073	7.541073
			EE (IS 3)	1.924297	1.924297	1.8877350	1.8877350	11.55637	11.55637

LDC #: 30905 B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GCMS 524.2

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound		Reported (RRF 160/40/8 std)	Recalculated (RRF 160/40/8 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/29/2013	F	(IS 1)	0.02962954	0.02962954	0.0288510	0.0288510	6.070736	6.070736
	MS-V5		QQQQ	(IS 2)	0.07425519	0.07425519	0.0720642	0.0720642	2.968773	2.968773
			PPPP	(IS 3)	0.27499250	0.27499250	0.2670485	0.2670485	17.55854	17.55854

LDC #: 30905 B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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	1314647-	10/30/13	C (1st Internal Standard)	0.6183554	0.636712	0.636712	3.0	3.0
	CCV1		S (2nd Internal Standard)	0.3400419	0.3367771	0.3367771	1.0	1.0
			EE (3rd Internal Standard)	1.887735	1.873091	1.873091	0.8	0.8
2	1314647-	10/30/13	F (1st Internal Standard)	0.02885098	0.02805384	0.02805384	2.8	2.8
	CCV2		QQQQ (2nd Internal Standard)	0.07206415	0.07496036	0.07496036	4.0	4.0
			PPPP (3rd Internal Standard)	0.2670485	0.6062277	0.6062277	127	127
3			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd Internal Standard)					
4			(1st Internal Standard)					
			(2nd Internal Standard)					
			(3rd 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 #: 30905B1

VALIDATION FINDINGS WORKSHEET

Surrogate Results Verification

Page: 1 of 1

Reviewer: FT

2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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: 10

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.0	9.9500	99.5	99.5	0
Bromofluorobenzene	↓	9.9700	99.7	99.7	↓
1,2-Dichlorobenzene-d4	↓	10.550	106	106	↓
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8					
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

LDC #: 30905B1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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 concentration

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

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

MS/MSD sample: 12 & 13

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Benzene	25.0	25.0	ND	26.070	26.550	104	104	106	106	1.82	1.82
Chlorobenzene	↓	↓	↓	24.330	25.630	97.3	97.3	103	103	5.20	5.20
1,1-Dichloroethene				26.420	27.140	106	106	109	109	2.69	2.69
Toluene				25.940	25.790	104	104	103	103	0.580	0.580
Trichloroethene			1.520	27.020	26.160	102	102	98.4	98.4	3.23	3.23

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 #: 30905 B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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

LCS ID: BWJ2329-BS1

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	25.0	NA	26.660	NA	107	107				
Trichloroethene	↓	↓	25.230	↓	101	101				
Benzene	↓	↓	26.130	↓	105	105				
Toluene	↓	↓	25.590	↓	102	102				
Chlorobenzene	↓	↓	24.450	↓	97.8	97.8	NA			

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.

LDC #: 30905B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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)

RRF = Relative response factor of the calibration standard.

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

Df = Dilution factor.

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

Example:

Sample I.D. #10 , Q :

Conc. = (201919)(10)( )
(278779)(0.46355342)( )

=

16 ug/L

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 28, 2013

LDC Report Date: December 6, 2013

Matrix: Water

Parameters: Total Recoverable Chromium

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23375

Sample Identification

EB-6-10/28/13
MW-17-5
MW-17-4
MW-17-3
MW-17-2
MW-17-1
MW-18-5
MW-18-4
MW-18-3**
MW-18-2
MW-18-3MS
MW-18-3MSD
MW-18-3DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 13 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Total Recoverable Chromium.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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

The initial and continuing calibrations were performed at the required frequency.

The calibration standards criteria 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

ICP interference check sample (ICS) analysis was not required.

VI. Matrix Spike Analysis

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.

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 (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits for samples on which an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by EPA Level III criteria.

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 EPA 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

No field duplicates were identified in this SDG.

XV. Field Blanks

Sample EB-6-10/28/13 was identified as an equipment blank. No chromium was found.

NASA JPL
Total Recoverable Chromium - Data Qualification Summary - SDG 13-23375

No Sample Data Qualified in this SDG

NASA JPL
Total Recoverable Chromium - Laboratory Blank Data Qualification Summary - SDG 13-23375

No Sample Data Qualified in this SDG

LDC #: 30905B4

SDG #: 13-23375

Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

Date: 12-5-13

Page: 1 of 1

Reviewer: MG

2nd Reviewer:

METHOD: Total Recoverable Chromium (EPA Method 200.8)

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: 10-28-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	A	
V.	ICP Interference Check Sample (ICS) Analysis	N	not required
VI.	Matrix Spike Analysis	A	MS/MSD
VII.	Duplicate Sample Analysis	A	DUP ok by difference
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	not reviewed for level III
X.	Furnace Atomic Absorption QC	N	not utilized
XI.	ICP Serial Dilution	N	not performed
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	N	
XV	Field Blanks	ND	EB=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:** Indicates sample underwent Level IV validation

all water

1	EB-6-10/28/13	11	MW-18-3MS	21		31	
2	MW-17-5	12	MW-18-3MSD	22		32	
3	MW-17-4	13	MW-18-3DUP	23		33	
4	MW-17-3	14		24		34	
5	MW-17-2	15		25		35	
6	MW-17-1	16		26		36	
7	MW-18-5	17		27		37	
8	MW-18-4	18		28		38	
9	MW-18-3**	19		29		39	
10	MW-18-2	20		30	PBW	40	

Notes:

LDC #: 30905B4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. 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) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. 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.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?		✓		
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?			✓	
VI. 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.	✓			
VII. 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?	✓			

LDC #: 30905B4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: V

Validation Area	Yes	No	NA	Findings/Comments
VIII. 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?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
XI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
XII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
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 analytes were detected in the field duplicates.			✓	
XV. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 30905B4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [signature]

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)
	ICP (Initial calibration)						
1153 ICV	ICP/MS (Initial calibration)	Cr	52.313	50.000	105	105	Y
	CVAA (Initial calibration)						
	ICP (Continuing calibration)						
1946 CCVD	ICP/MS (Continuing calibration)	Cr	38.989	40.000	97.5	97.5	
	CVAA (Continuing calibration)						
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

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 #: 30905B4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [signature]

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

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)
—	ICP interference check	—	—	—	—	—	—
1958 LCS	Laboratory control sample	Cr	40.822 (µg/L)	40.000 (µg/L)	102	102	Y
2014 11	Matrix spike	Cr	(SSR-SR) 36.226 (µg/L)	40.000 (µg/L)	90.6	90.6	↓
2004 / 2007 13	Duplicate	Cr	2.948 (µg/L)	1.774 (µg/L)	49.7	49.7	↓
—	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 #: 30905B4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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

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 #9, Cr were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(2.948\ \mu g/L)(0.050\ L)}{0.050\ L} = 2.948\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	9	Cr	2.9	2.9	Y

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 28, 2013

LDC Report Date: December 6, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23375

Sample Identification

EB-6-10/28/13
MW-17-5
MW-17-4
MW-17-3
MW-17-2
MW-17-1
MW-18-5
MW-18-4
MW-18-3**
MW-18-2
EB-6-10/28/13MS
EB-6-10/28/13MSD
EB-6-10/28/13DUP
MW-18-3MS
MW-18-3MSD
MW-18-3DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 16 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An 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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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. Initial Calibration

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

III. Continuing Calibration

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

IV. Blanks

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

V. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VI. Duplicates

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

VII. Laboratory Control Samples

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

VIII. 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 EPA Level III criteria.

IX. Overall Assessment of Data

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

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Field Blanks

Sample EB-6-10/28/13 was identified as an equipment blank. No contaminant concentrations were found.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 13-23375

No Sample Data Qualified in this SDG

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 13-23375

No Sample Data Qualified in this SDG

LDC #: 30905B6
SDG #: 13-23375
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 12-5-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer:

METHOD: Hexavalent Chromium (EPA SW846 Method 7196), Perchlorate (EPA Method 314.0)

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: 10-28-13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	A	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD
VI.	Duplicates	A	DUP #16 OK by difference
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	A	Not reviewed for Level III validation.
IX.	Overall assessment of data	A	
X.	Field duplicates	N	
XI	Field blanks	ND	EB=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:** Indicates sample underwent Level IV validation
all Water

1	EB-6-10/28/13	11	EB-6-10/28/13MS	21		31	
2	MW-17-5	12	EB-6-10/28/13MSD	22		32	
3	MW-17-4	13	EB-6-10/28/13DUP	23		33	
4	MW-17-3	14	MW-18-3MS	24		34	
5	MW-17-2	15	MW-18-3MSD	25		35	
6	MW-17-1	16	MW-18-3DUP	26		36	
7	MW-18-5	17		27		37	
8	MW-18-4	18		28		38	
9	MW-18-3**	19		29		39	
10	MW-18-2	20		30	PBW	40	

Notes:

LDC #: 30905B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer:

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?			✓	

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 #: 30905B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→10	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] ______ ______
QC 11→13	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} [✓ ClO_4] ______ ______
↓ 14→16	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ______ ______
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:____

LDC #: 30905B6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

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

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Cr VI was recalculated. Calibration date: 10-11-13

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	Standard ID	Conc Found (units)	Abs True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Cr VI	Blank	0.000 (mg/L)	0.001	r^2=0.999907	r^2=0.999993	Y
		Standard 1	0.002 ( )	0.003			
		Standard 2	0.005 ( )	0.005			
		Standard 3	0.025 ( )	0.020			
		Standard 4	0.050 ( )	0.040			
		Standard 5	0.100 ( )	0.078			
		Standard 6	–				
		Standard 7	–				
Calibration verification	ClO4	0949 CCV5	10.405 (µg/L)	10.000 (µg/L)	104	104	
Calibration verification	Cr VI	2230 CCV1	0.0524 (mg/L)	0.050 (mg/L)	105	105	
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 #: 30905B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer:

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)
0002 LCS	Laboratory control sample	ClO_4	10.878 (µg/L)	10.000 (µg/L)	109	109	Y
0230 14	Matrix spike sample	Cr VI	(SSR-SR) 0.0518 (mg/L)	0.052632 (mg/L)	98.4	98.3	↓
0016/0058 13	Duplicate sample	ClO_4	ND (µg/L)	ND (µg/L)	0	—	↓

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 #: 30905B6

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 # 9, Cr VI reported with a positive detect were recalculated and verified using the following equation:

Concentration =

Factor = 1.295
Bias = 0.001
dil = 1x

Recalculation:

$Cr\ VI = (0.002 - 0.001) \times 1.295$

$= 0.0013\ mg/L$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	9	ClO4	44	45	Y
			(mg/L)	(mg/L)	
		Cr VI	0.00083	0.0013 *	

Note: * the lab is using more significant figures than displayed in the raw data.

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

Battelle
505 King Avenue
Room 10-1-170
Columbus, OH 43201
ATTN: Ms. Betsy Cutie

December 19, 2013

SUBJECT: NASA JPL, Data Validation

Dear Ms. Cutie,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on November 27, 2013. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 30933:

SDG #	Fraction
13-23495 13-23598 13-23687	Volatiles, Total Recoverable Chromium, Wet Chemistry

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

- USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, January 2010
- 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,

Pei Geng
Project Manager/Senior Chemist

HC

Attachment 1

90/10 (client select)

LDC #30933 (Battelle-San Diego / NASA JPL)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (524.2)		Cr (200.8)		Cl, SO_4 NO_3-N (300.0)		NO_2-N (353.2)		O-PO_4 (365.1)		Cr(VI) (7196)		CLO_4 (314.0)																	
Matrix:	Water/Soil			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	13-23495	11/27/13	12/20/13	14	0	14	0	4	0	4	0	4	0	17	0	14	0																
B	13-23598	11/27/13	12/20/13	9	0	9	0	3	0	6	0	6	0	9	0	9	0																
C	13-23687	11/27/13	12/20/13	10	0	10	0	1	0	4	0	4	0	10	0	10	0																
Total	T/PG			33	0	33	0	8	0	14	0	14	0	36	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171

Shaded cells indicate Level IV validation (all other cells are Level III validation).

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 29, 2013

LDC Report Date: December 10, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23495

Sample Identification

TB-7-10/29/13
EB-7-10/29/13
MW-11-5
MW-11-4
MW-11-3
MW-11-2
MW-11-1
MW-3-5
MW-3-4
MW-3-3
MW-3-2
MW-3-1
MW-11-5MS
MW-11-5MSD

Introduction

This data review covers 14 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 524.2 for Volatiles.

This review follows 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.

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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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 20.0% for all compounds.

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

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 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/30/13	Pentachloroethane	74.5	All samples in SDG 13-23495	J (all detects) UJ (all non-detects)	P

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

Date	Compound	%D	Associated Samples	Flag	A or P
10/29/13	Pentachloroethane	81.9	All samples in SDG 13-23495	J (all detects) UJ (all non-detects)	P

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile 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

Although matrix spike (MS) and matrix spike duplicate (MSD) samples were not required by the method, MS and MSD samples were reported by the laboratory. 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. 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

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 of Data

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 TB-7-10/29/13 was identified as a trip blank. No volatile contaminants were found.

Sample EB-7-10/29/13 was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 13-23495

SDG	Sample	Compound	Flag	A or P	Reason
13-23495	TB-7-10/29/13 EB-7-10/29/13 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1 MW-3-5 MW-3-4 MW-3-3 MW-3-2 MW-3-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)
13-23495	TB-7-10/29/13 EB-7-10/29/13 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1 MW-3-5 MW-3-4 MW-3-3 MW-3-2 MW-3-1	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (ICV %D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 13-23495

No Sample Data Qualified in this SDG

LDC #: 30933A1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/4/13
SDG #: 13-23495 Level III Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: FT
2nd Reviewer: JC

METHOD: GC/MS Volatiles (EPA Method 524.2)

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: 10/29/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	%RSD ≤ 20, r²
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 30
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	
X.	Internal standards	A	
XI.	Target compound identification	N	
XII.	Compound quantitation/RL/LOQ/LODs	N	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	
XVI.	Field duplicates	N	
XVII.	Field blanks	ND	TB = 1 EB = 2

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	TB-7-10/29/13	11	MW-3-2	21	BWJ2330	31	
2	EB-7-10/29/13	12	MW-3-1	22		32	
3	MW-11-5	13	MW-11-5MS	23		33	
4	MW-11-4	14	MW-11-5MSD	24		34	
5	MW-11-3	15		25		35	
6	MW-11-2	16		26		36	
7	MW-11-1	17		27		37	
8	MW-3-5	18		28		38	
9	MW-3-4	19		29		39	
10	MW-3-3	20		30		40	

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene	BB. 1,1,2,2-Tetrachloroethane	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane	CC. Toluene	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform	EE. Ethylbenzene	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. Iodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP. Pentachloroethane
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ.
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC #: 30933 A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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 for each instrument?

Y N N/A Were all percent differences (%D) ≤ 30% ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Associated Samples	Qualifications
	10/29/13	ICV2 MS-V5	PPPP	81.9	all	J/UJ/P
	10/30/13	1314647-CCV5	PPPP	74.5	↓	↓

CONCAL.1S5

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 30, 2013

LDC Report Date: December 10, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23598

Sample Identification

TB-8-10/30/13
MW-13
MW-8
DUPE-5-4Q13
MW-15
DUPE-6-4Q13
MW-7
MW-13MS
MW-13MSD

Introduction

This data review covers 9 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 524.2 for Volatiles.

This review follows 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.

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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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 20.0% for all compounds.

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

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 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/31/13 (1314708-CCV1)	Bromomethane	35.0	All samples in SDG 13-23598	J (all detects) UJ (all non-detects)	P
10/31/13 (1314708-CCV2	Methyl iodide Pentachloroethane	45.0 128	All samples in SDG 13-23598	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

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

Date	Compound	%D	Associated Samples	Flag	A or P
10/29/13	Pentachloroethane	81.9	All samples in SDG 13-23598	J (all detects) UJ (all non-detects)	P

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile 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

Although matrix spike (MS) and matrix spike duplicate (MSD) samples were not required by the method, MS and MSD samples were reported by the laboratory. 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. 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

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 of Data

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

XVI. Field Duplicates

Samples MW-8 and DUPE-5-4Q13 and samples MW-15 and DUPE-6-4Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-8	DUPE-5-4Q13	
Bromodichloromethane	0.86	0.88	2
Chloroform	1.1	1.2	9
Dibromochloromethane	0.50	0.56	11
Trichloroethene	0.090	0.090	0
Trichlorofluoromethane	0.34	0.32	6

XVII. Field Blanks

Sample TB-8-10/30/13 was identified as a trip blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 13-23598

SDG	Sample	Compound	Flag	A or P	Reason
13-23598	TB-8-10/30/13 MW-13 MW-8 DUPE-5-4Q13 MW-15 DUPE-6-4Q13 MW-7	Bromomethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)
13-23598	TB-8-10/30/13 MW-13 MW-8 DUPE-5-4Q13 MW-15 DUPE-6-4Q13 MW-7	Methyl Iodide Pentachloroethane	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)
13-23598	TB-8-10/30/13 MW-13 MW-8 DUPE-5-4Q13 MW-15 DUPE-6-4Q13 MW-7	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (ICV %D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 13-23598

No Sample Data Qualified in this SDG

LDC #: 30933B1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/4/1
SDG #: 13-23598 Level III Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: FT
2nd Reviewer:

METHOD: GC/MS Volatiles (EPA Method 524.2)

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: 10/30/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	%RSD ≤ 20, r^2
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 30
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	
X.	Internal standards	A	
XI.	Target compound identification	N	
XII.	Compound quantitation/RL/LOQ/LODs	N	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	
XVI.	Field duplicates	SW	D = 3,4 *5,6
XVII.	Field blanks	ND	TB = 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	TB-8-10/30/13	11	BWJ2415	21		31	
2	MW-13	12		22		32	
3	MW-8 P	13		23		33	
4	DUPE-5-4Q13 D	14		24		34	
5	MW-15 D_1	15		25		35	
6	DUPE-6-4Q13 D_1	16		26		36	
7	MW-7	17		27		37	
8	MW-13MS	18		28		38	
9	MW-13MSD	19		29		39	
10		20		30		40	

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene	BB. 1,1,2,2-Tetrachloroethane	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane	CC. Toluene	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform	EE. Ethylbenzene	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. Iodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP. Pentachloroethane
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ.
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC #: 30933B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

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

METHOD: GC/MS VOA (EPA Method 524.2)

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 for each instrument?

Y N N/A Were all percent differences (%D) ≤ 30% ?

#	Date	Standard ID	Compound	Finding %D (Limit: <30.0%)	Associated Samples	Qualifications
	10/29/13	ICV2 MS-Y5	PPPP	81.9	All	J/UJ/P
	31 10/29/13 FT	1314708-CCV1	B	35.0	All	↓
	10/31/13	1314708-CCV2	Methyl Iodide	45.0	↓	↓
			PPPP	128		

CONCAL.1S5

LDC#: 30933B1

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: FZ
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 524.2)

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/L)		RPD
	3	4	
P	0.86	0.88	2
K	1.1	1.2	9
T	0.50	0.56	11
S	0.090	0.090	0
KK	0.34	0.32	6

V:\FIELD DUPLICATES\templates\30933B1.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 31, 2013

LDC Report Date: December 10, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23687

Sample Identification

TB-9-10/31/13
MW-6
MW-16-grab
DUPE-7-4Q13
MW-1
MW-5
MW-10
DUPE-8-4Q13
MW-1MS
MW-1MSD

Introduction

This data review covers 10 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 524.2 for Volatiles.

This review follows 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.

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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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 20.0% for all compounds.

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

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 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
11/1/13	Methyl Iodide Pentachloroethane	34.1 73	BWK0021 TB-9-10/31/13 MW-6 MW-16-grab MW-1 MW-5 MW-10 DUPE-8-4Q13 MW-1MS MW-1MSD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
11/4/13 (1314863-CCV1)	Bromomethane	34.8	1314863-CCB1 DUPE-7-4Q13	J (all detects) UJ (all non-detects)	P
11/4/13 (1314863-CCV2)	Methyl Iodide Pentachloroethane	42.9 92.0	1314863-CCB1 DUPE-7-4Q13	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

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

Date	Compound	%D	Associated Samples	Flag	A or P
10/29/13	Pentachloroethane	81.9	All samples in SDG 13-23687	J (all detects) UJ (all non-detects)	P

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile 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

Although matrix spike (MS) and matrix spike duplicate (MSD) samples were not required by the method, MS and MSD samples were reported by the laboratory. 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. 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

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 of Data

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

XVI. Field Duplicates

Samples MW-8 and DUPE-5-4Q13 and samples MW-15 and DUPE-6-4Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-16-grab	DUPE-7-4Q13	
Bromodichloromethane	7.3	8.1	10
Bromoform	2.2	2.0	10
Chloroform	6.0	6.6	10
Dibromochloromethane	6.4	6.7	5

Compound	Concentration (ug/L)		RPD
	MW-10	DUPE-8-4Q13	
Chloroform	0.93	0.91	2
1,1-Dichloroethane	0.21	0.22	5
cis-1,2-Dichloroethene	0.16	0.18	12
trans-1,2-Dichloroethene	0.24	0.26	8
Tetrachloroethene	0.90	0.89	1
Trichloroethene	8.0	8.1	1

XVII. Field Blanks

Sample TB-8-10/30/13 was identified as a trip blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 13-23687

SDG	Sample	Compound	Flag	A or P	Reason
13-23687	TB-9-10/31/13 MW-6 MW-16-grab DUPE-7-4Q13 MW-1 MW-5 MW-10 DUPE-8-4Q13	Methyl Iodide Pentachloroethane	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)
13-23687	DUPE-7-4Q13	Bromomethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)
13-23687	TB-9-10/31/13 MW-6 MW-16-grab DUPE-7-4Q13 MW-1 MW-5 MW-10 DUPE-8-4Q13	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (ICV %D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 13-23687

No Sample Data Qualified in this SDG

LDC #: 30933C1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/4/13
SDG #: 13-23687 Level III Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA Method 524.2)

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: 10/31/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	%RSD ≤ 20, r2
IV.	Continuing calibration/ICV	SW	ICV/CCV ≤ 30
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	
X.	Internal standards	A	
XI.	Target compound identification	N	
XII.	Compound quantitation/RL/LOQ/LODs	N	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	
XVI.	Field duplicates	SW	D = 3,4 7,8
XVII.	Field blanks	ND	TB = 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 1	TB-9-10/31/13	11 1	BWK0021	21		31	
2 1	MW-6 ~~D~~ FM	12 2	1314863-CCB1	22		32	
3 1	MW-16-grab D	13		23		33	
4 2	DUPE-7-4Q13 D	14		24		34	
5 1	MW-1	15		25		35	
6 1	MW-5	16		26		36	
7 1	MW-10 D,	17		27		37	
8 1	DUPE-8-4Q13 D,	18		28		38	
9 1	MW-1MS	19		29		39	
10 1	MW-1MSD	20		30		40	

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene	BB. 1,1,2,2-Tetrachloroethane	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane	CC. Toluene	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform	EE. Ethylbenzene	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. Iodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP. Pentachloroethane
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ.
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC #: 30933C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

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

METHOD: GC/MS VOA (EPA Method 524.2)

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 for each instrument?

Y N N/A Were all percent differences (%D) ≤ 30% ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Associated Samples	Qualifications
	10/29/13	ICV2 MS-V5	PPPP	81.9	All	J/UJ/P
	11/01/13	1314784-CCV2	Methyl Iodide	34.1	BWK0021, 1→3, 5→10	J/UJ/P
			PPPP	73		
	11/4/13	1314863-CCV1	B	34.8	1314863-CCB1, 4	↓
	11/4/13	1314863-CCV2	Methyl Iodide	42.9	↓	↓
			PPPP	92.0		

LDC#: 30933C1

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: EZ
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 524.2)

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/L)		RPD
	3	4	
P	7.3	8.1	10
X	2.2	2.0	10
K	6.0	6.6	10
T	6.4	6.7	5

Compound	Concentration (ug/L)		RPD
	7	8	
K	0.93	0.91	2
I	0.21	0.22	5
QQQ	0.16	0.18	12
PPP	0.24	0.26	8
AA	0.90	0.89	1
S	8.0	8.1	1

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Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 29, 2013

LDC Report Date: December 13, 2013

Matrix: Water

Parameters: Total Recoverable Chromium

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23495

Sample Identification

EB-7-10/29/13
MW-11-5
MW-11-4
MW-11-3
MW-11-2
MW-11-1
MW-3-5
MW-3-4
MW-3-3
MW-3-2
MW-3-1
EB-7-10/29/13MS
EB-7-10/29/13MSD
EB-7-10/29/13DUP

Introduction

This data review covers 14 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Total Recoverable Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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

The initial and continuing calibrations were performed at the required frequency.

The calibration standards criteria were met.

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No total recoverable chromium was found in the initial, continuing and preparation blanks.

V. ICP Interference Check Sample (ICS) Analysis

ICP Interference check sample analysis was not required by the method.

VI. Matrix Spike Analysis

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.

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 (ICP-MS)

Raw data were not reviewed for this SDG.

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 EB-7-10/29/13 was identified as an equipment blank. No total recoverable chromium was found.

NASA JPL
Total Recoverable Chromium - Data Qualification Summary - SDG 13-23495

No Sample Data Qualified in this SDG

NASA JPL
Total Recoverable Chromium - Laboratory Blank Data Qualification Summary - SDG 13-23495

No Sample Data Qualified in this SDG

LDC #: 30933A4
SDG #: 13-23495
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 12-12-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer:

METHOD: Total Recoverable Chromium (EPA Method 200.8)

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: 10-29-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	A	
V.	ICP Interference Check Sample (ICS) Analysis	N	not required
VI.	Matrix Spike Analysis	A	MS/MSD (SDG: 13-23598
VII.	Duplicate Sample Analysis	A	DUP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	N	not reviewed
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	EB=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:
all Water

1	EB-7-10/29/13	11 2	MW-3-1	21		31	
2	MW-11-5	12	EB-7-10/29/13MS	22		32	
3	MW-11-4	13	EB-7-10/29/13MSD	23		33	
4	MW-11-3	14	EB-7-10/29/13DUP	24		34	
5	MW-11-2	15		25		35	
6	MW-11-1	16		26		36	
7	MW-3-5	17		27		37	
8	MW-3-4	18		28		38	
9	MW-3-3	19		29 1	PBW1	39	
10	MW-3-2	20		30 2	PBW2	40	

Notes:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 30, 2013

LDC Report Date: December 13, 2013

Matrix: Water

Parameters: Total Recoverable Chromium

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23598

Sample Identification

MW-13
MW-8
DUPE-5-4Q13
MW-15
DUPE-6-4Q13
MW-7
MW-13MS
MW-13MSD
MW-13DUP

Introduction

This data review covers 9 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Total Recoverable Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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

The initial and continuing calibrations were performed at the required frequency.

The calibration standards criteria were met.

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No total recoverable chromium was found in the initial, continuing and preparation blanks.

V. ICP Interference Check Sample (ICS) Analysis

ICP Interference check sample analysis was not required by the method.

VI. Matrix Spike Analysis

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.

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 (ICP-MS)

Raw data were not reviewed for this SDG.

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

Samples MW-8 and DUPE-5-4Q13 and samples MW-15 and DUPE-6-4Q13 were identified as field duplicates. No total recoverable chromium was detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	MW-8	DUPE-5-4Q13	
Total recoverable chromium	2.4	2.1	13

XV. Field Blanks

No field blanks were identified in this SDG.

NASA JPL
Total Recoverable Chromium - Data Qualification Summary - SDG 13-23598

No Sample Data Qualified in this SDG

NASA JPL
Total Recoverable Chromium - Laboratory Blank Data Qualification Summary - SDG 13-23598

No Sample Data Qualified in this SDG

LDC #: 30933B4
SDG #: 13-23598
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 12-12-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer:

METHOD: Total Recoverable Chromium (EPA Method 200.8)

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: 10-30-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	A	
V.	ICP Interference Check Sample (ICS) Analysis	N	not required
VI.	Matrix Spike Analysis	A	MS/MSD
VII.	Duplicate Sample Analysis	A	DUP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	N	not reviewed
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	SW	D=2+3 D=4*+5*
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 water

1	MW-13	11		21		31	
2	MW-8	12		22		32	
3	DUPE-5-4Q13	13		23		33	
4	MW-15	14		24		34	
5	DUPE-6-4Q13	15		25		35	
6	MW-7	16		26		36	
7	MW-13MS	17		27		37	
8	MW-13MSD	18		28		38	
9	MW-13DUP	19		29		39	
10		20	PBW	30		40	

Notes:

LDC: 30933B4

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer:

Method: Metals

Analyte	Concentration (ug/L)		RPD	
	2	3		
Chromium	2.4	2.1	13	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 31, 2013

LDC Report Date: December 13, 2013

Matrix: Water

Parameters: Total Recoverable Chromium

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23687

Sample Identification

MW-6
MW-16-grab
DUPE-7-4Q13
MW-1
MW-5
MW-10
DUPE-8-4Q13
MW-1MS
MW-1MSD
MW-1DUP

Introduction

This data review covers 10 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Total Recoverable Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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

The initial and continuing calibrations were performed at the required frequency.

The calibration standards criteria were met.

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No total recoverable chromium was found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Total recoverable chromium	0.50660 ug/L	MW-6 MW-16-grab DUPE-7-4Q13 MW-5 MW-10 DUPE-8-4Q13

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

ICP Interference check sample analysis was not required by the method.

VI. Matrix Spike Analysis

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.

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 (ICP-MS)

Raw data were not reviewed for this SDG.

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

Samples MW-16-grab and DUPE-7-4Q13 and samples MW-10 and DUPE-8-4Q13 were identified as field duplicates. No total recoverable chromium was detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	MW-16-grab	DUPE-7-4Q13	
Total recoverable chromium	260	180	36

Analyte	Concentration (ug/L)		RPD
	MW-10	DUPE-8-4Q13	
Total recoverable chromium	2.9	3.4	16

XV. Field Blanks

No field blanks were identified in this SDG.

NASA JPL
Total Recoverable Chromium - Data Qualification Summary - SDG 13-23687

No Sample Data Qualified in this SDG

NASA JPL
Total Recoverable Chromium - Laboratory Blank Data Qualification Summary - SDG 13-23687

No Sample Data Qualified in this SDG

LDC #: 30933C4
SDG #: 13-23687
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 12-12-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer: V

METHOD: Total Recoverable Chromium (EPA Method 200.8)

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: 10-31-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	N	not required
VI.	Matrix Spike Analysis	A	MS/MSD
VII.	Duplicate Sample Analysis	A	DUP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	N	not reviewed
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	SW	D=2+3 D=6+7
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 Water

1	MW-6	11		21		31	
2	MW-16-grab	12		22		32	
3	DUPE-7-4Q13	13		23		33	
4	MW-1	14		24		34	
5	MW-5	15		25		35	
6	MW-10	16		26		36	
7	DUPE-8-4Q13	17		27		37	
8	MW-1MS	18		28		38	
9	MW-1MSD	19		29		39	
10	MW-1DUP	20	PBW	30		40	

Notes:

LDC #: 30933C4
SDG #: See Cover
METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)
Sample Concentration units, unless otherwise noted: ug/L

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES
Soil preparation factor applied: NA
Associated Samples: 1-3,5-7 (>5x or ND)

Reviewer: MG
2nd Reviewer: [illegible]

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Limit	No Qual's.									
Cr			0.50600	2.53										

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 were 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.

Analyte	Concentration (ug/L)		RPD	
	2	3		
Chromium	260	180	36	

Method: Metals

Analyte	Concentration (ug/L)		RPD	
	6	7		
Chromium	2.9	3.4	16	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 29, 2013

LDC Report Date: December 13, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23495

Sample Identification

EB-7-10/29/13
MW-11-5
MW-11-4
MW-11-3
MW-11-2
MW-11-1
MW-3-5
MW-3-4
MW-3-3
MW-3-2
MW-3-1
EB-7-10/29/13MS
EB-7-10/29/13MSD
EB-7-10/29/13DUP
MW-11-1MS
MW-11-1MSD
MW-11-1DUP
MW-3-1MS
MW-3-1MSD
MW-3-1DUP

Introduction

This data review covers 20 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 300.0 for Chloride, Sulfate, and Nitrate as Nitrogen, EPA Method 314.0 for Perchlorate, EPA Method 353.2 for Nitrite as Nitrogen, EPA SW 846 Method 7196 for Hexavalent Chromium, and EPA Method 365.1 for Orthophosphate as P.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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. Initial Calibration

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

III. Continuing Calibration

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

IV. 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	Concentration	Associated Samples
ICB/CCB	Perchlorate	0.8246 ug/L	MW-3-3 MW-3-2 MW-3-1
PB (prep blank)	Orthophosphate as P	0.0050670 mg/L	MW-11-1
ICB/CCB	Orthophosphate as P	0.0047010 mg/L	MW-11-1

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

Sample	Analyte	Reported Concentration	Modified Final Concentration
MW-3-3	Perchlorate	0.91 ug/L	0.91 ug/L

V. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VI. Duplicates

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

VII. Laboratory Control Samples

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

VIII. Sample Result Verification

Raw data were not reviewed for this SDG.

IX. Overall Assessment of Data

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

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Field Blanks

Sample EB-7-10/29/13 was identified as an equipment blank. No contaminant concentrations were found.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 13-23495

No Sample Data Qualified in this SDG

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 13-23495

SDG	Sample	Analyte	Modified Final Concentration	A or P
13-23495	MW-3-3	Perchlorate	0.91U ug/L	A

LDC #: 30933A6
SDG #: 13-23495
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 12-12-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer: ✓

METHOD: Chloride, Sulfate, Nitrate-N (EPA Method 300.0), Perchlorate (EPA Method 314.0), Nitrite-N (EPA Method 353.2), Hexavalent Chromium (EPA SW846 Method 7196), Orthophosphate-P (EPA Method 365.1)

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: 10-29-13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD
VI.	Duplicates	A	DUP #17, PO_4-P OK by diff.
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	N	
IX.	Overall assessment of data	A	
X.	Field duplicates	N	
XI	Field blanks	ND	EB=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: all water

1	EB-7-10/29/13	11	MW-3-1	21		31	
2	MW-11-5	12	EB-7-10/29/13MS	22		32	
3	MW-11-4	13	EB-7-10/29/13MSD	23		33	
4	MW-11-3	14	EB-7-10/29/13DUP	24		34	
5	MW-11-2	15	MW-11-1MS	25		35	
6	MW-11-1	16	MW-11-1MSD	26		36	
7	MW-3-5	17	MW-11-1DUP	27		37	
8	MW-3-4	18	#11 MS	28		38	
9	MW-3-3	19	#11 MSD	29	PBW1	39	
10	MW-3-2	20	#11 DUP	30	PBW2	40	

Notes:

LDC #: 30933A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→5, 7→11	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] _____ _____
6	↓	pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] [✓ PO_4] ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] _____ _____
QC 12→14		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] _____ _____
15→17		pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] [✓ PO_4] ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
↓ 18→20	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 _____ _____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:____

LDC #: 30933A6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: ug/L **Associated Samples:** 9-11

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (ug/L)		9								
ClO4		0.8246	4.123	0.91								

Conc. units: mg/L **Associated Samples:** 6 (>5x)

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		No Qual.								
PO4-P	0.0050670	0.0047010	0.0253									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 30, 2013

LDC Report Date: December 13, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23598

Sample Identification

MW-13
MW-8
DUPE-5-4Q13
MW-15
DUPE-6-4Q13
MW-7
MW-13MS
MW-13MSD
MW-13DUP

Introduction

This data review covers 9 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 300.0 for Chloride, Sulfate, and Nitrate as Nitrogen, EPA Method 314.0 for Perchlorate, EPA Method 353.2 for Nitrite as Nitrogen, EPA SW 846 Method 7196 for Hexavalent Chromium, and EPA Method 365.1 for Orthophosphate as P.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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. Initial Calibration

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

III. Continuing Calibration

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

IV. 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	Concentration	Associated Samples
ICB/CCB	Perchlorate	0.81510 ug/L	MW-15 DUPE-6-4Q13 MW-7
ICB/CCB	Orthophosphate as P	0.0053910 mg/L	MW-13 MW-8 MW-7

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

Sample	Analyte	Reported Concentration	Modified Final Concentration
MW-8	Orthophosphate as P	0.0097 mg/L	0.0097U mg/L
MW-7	Orthophosphate as P	0.021 mg/L	0.021U mg/L

V. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VI. Duplicates

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

VII. Laboratory Control Samples

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

VIII. Sample Result Verification

Raw data were not reviewed for this SDG.

IX. Overall Assessment of Data

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

X. Field Duplicates

Samples MW-8 and DUPE-5-4Q13 and samples MW-15 and DUPE-6-4Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-8	DUPE-5-4Q13	
Perchlorate	71 ug/L	71 ug/L	0
Hexavalent chromium	0.0010 mg/L	0.0011 mg/L	10

XI. Field Blanks

No field blanks were identified in this SDG.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 13-23598

No Sample Data Qualified in this SDG

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 13-23598

SDG	Sample	Analyte	Modified Final Concentration	A or P
13-23598	MW-8	Orthophosphate as P	0.0097U mg/L	A
13-23598	MW-7	Orthophosphate as P	0.021U mg/L	A

LDC #: 30933B6

SDG #: 13-23598

Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 12-12-13

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [signature]

METHOD: Chloride, Sulfate, Nitrate-N (EPA Method 300.0), Perchlorate (EPA Method 314.0), Nitrite-N (EPA Method 353.2), Hexavalent Chromium (EPA SW846 Method 7196), Orthophosphate-P (EPA Method 365.1)

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: 10-30-13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD
VI.	Duplicates	A	DUP
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	N	
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	D = 2+3 D = 4*+5*
XI	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 water

1	MW-13	11		21		31	
2	MW-8	12		22		32	
3	DUPE-5-4Q13	13		23		33	
4	MW-15	14		24		34	
5	DUPE-6-4Q13	15		25		35	
6	MW-7	16		26		36	
7	MW-13MS	17		27		37	
8	MW-13MSD	18		28		38	
9	MW-13DUP	19		29		39	
10		20	PBW	30		40	

Notes: _____

LDC #: 30933B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1, 2, 6	W	pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] [✓ PO_4] ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] ____ ____
3 → 5	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] ____ ____
QC 7 → 9	↓	pH TDS Cl F NO_3 [✓ NO_2] SO_4 [✓ PO_4] ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments: ____________________

LDC #: 30933B6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: ug/L **Associated Samples:** 4-6 (>5x or ND)

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (ug/L)		No Qual's.									
ClO4		0.81510	4.076										

Conc. units: mg/L **Associated Samples:** 1,2,6

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		2	6								
PO4-P		0.0053910	0.0270	0.0097	0.021								

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: 30933B6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer:

Method: Inorganics (see cover)

Analyte	Concentration (ug/L)		RPD	
	2	3		
Perchlorate	71	71	0	
Hexavalent Chromium (mg/L)	0.0010	0.0011	10	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: October 31, 2013

LDC Report Date: December 16, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 13-23687

Sample Identification

MW-6
MW-16-grab
DUPE-7-4Q13
MW-1
MW-5
MW-10
DUPE-8-4Q13
MW-16-grabMS
MW-16-grabMSD
MW-16-grabDUP
MW-1MS
MW-1MSD
MW-1DUP

Introduction

This data review covers 13 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 300.0 for Chloride, Sulfate, and Nitrate as Nitrogen, EPA Method 314.0 for Perchlorate, EPA Method 353.2 for Nitrite as Nitrogen, EPA SW 846 Method 7196 for Hexavalent Chromium, and EPA Method 365.1 for Orthophosphate as Phosphorus.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (January 2010).

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 or advisory nature.

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.

NJ Presumptive evidence of presence of the compound at an estimated quantity.

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. Initial Calibration

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

III. Continuing Calibration

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

IV. 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	Concentration	Associated Samples
PB (prep blank)	Orthophosphate as P	0.0049970 mg/L	MW-16-grab
ICB/CCB	Chloride Orthophosphate as P	0.1292 mg/L 0.0051390 mg/L	MW-16-grab
PB (prep blank)	Hexavalent chromium	0.0010440 mg/L	All samples in SDG 13-23687

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

Sample	Analyte	Reported Concentration	Modified Final Concentration
MW-6	Hexavalent chromium	0.0014 mg/L	0.0014U mg/L
MW-10	Hexavalent chromium	0.0014 mg/L	0.0014U mg/L
DUPE-8-4Q13	Hexavalent chromium	0.0014 mg/L	0.0014U mg/L

V. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses 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)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
MW-16-grabMS/MSD (MW-16-grab)	Nitrite as N	78.8 (90-110)	78.4 (90-110)	-	J (all detects) UJ (all non-detects)	A

VI. Duplicates

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

VII. Laboratory Control Samples

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

VIII. Sample Result Verification

Raw data were not reviewed for this SDG.

IX. Overall Assessment of Data

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

X. Field Duplicates

Samples MW-16-grab and DUPE-7-4Q13 and samples MW-10 and DUPE-8-4Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration (mg/L)		RPD
	MW-16-grab	DUPE-7-4Q13	
Hexavalent chromium	0.014	0.014	0

Analyte	Concentration		RPD
	MW-10	DUPE-8-4Q13	
Perchlorate	6.4 ug/L	6.4 ug/L	0

Analyte	Concentration		RPD
	MW-10	DUPE-8-4Q13	
Hexavalent chromium	0.0014 mg/L	0.0014 mg/L	0

XI. Field Blanks

No field blanks were identified in this SDG.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 13-23687

SDG	Sample	Analyte	Flag	A or P	Reason
13-23687	MW-16-grab	Nitrite as N	J (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 13-23687

SDG	Sample	Analyte	Modified Final Concentration	A or P
13-23687	MW-6	Hexavalent chromium	0.0014U mg/L	A
13-23687	MW-10	Hexavalent chromium	0.0014U mg/L	A
13-23687	DUPE-8-4Q13	Hexavalent chromium	0.0014U mg/L	A

LDC #: 30933C6
SDG #: 13-23687
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 12-12-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer:

METHOD: Chloride, Sulfate, Nitrate-N (EPA Method 300.0), Perchlorate (EPA Method 314.0), Nitrite-N (EPA Method 353.2), Hexavalent Chromium (EPA SW846 Method 7196), Orthophosphate-P (EPA Method 365.1)

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: 10-31-13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VI.	Duplicates	A	DUP
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	N	
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	D=2+3 D=6+7
XI	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 water

1	MW-6	11	MW-1MS	21		31	
2	MW-16-grab	12	MW-1MSD	22		32	
3	DUPE-7-4Q13	13	MW-1DUP	23		33	
4	MW-1	14		24		34	
5	MW-5	15		25		35	
6	MW-10	16		26		36	
7	DUPE-8-4Q13	17		27		37	
8	MW-16-grabMS	18		28		38	
9	MW-16-grabMSD	19		29		39	
10	MW-16-grabDUP	20		30	PBW	40	

Notes:

LDC #: 30933C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1, 3→7	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] ____ ____
2		pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] [✓ PO_4] ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] ____ ____
QC 8→10		pH TDS Cl F NO_3 [✓ NO_2] SO_4 [✓ PO_4] ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
↓ 11→13	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4] ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 30933C6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** 2 (>5x)

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		No Qual.								
Cl		0.1292	0.96									
PO4-P	0.0049970	0.0051390	0.0257									

Conc. units: mg/L **Associated Samples:** all

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		1	6	7						
Cr VI	0.0010440		0.00522	0.0014	0.0014	0.0014						

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 #: 30933C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

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? (90-110)

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 Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

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

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	8/9	water	NO2-N	78.8	78.4		2	J/UJ/A

Comments:

Analyte	Concentration (mg/L)		RPD	
	2	3		
Hexavalent Chromium	0.014	0.014	0	

Analyte	Concentration (ug/L)		RPD	
	6	7		
Perchlorate	6.4	6.4	0	
Hexavalent Chromium (mg/L)	0.0014	0.0014	0	