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 second quarter 2013 groundwater monitoring event were acceptable for their intended use of characterizing 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 second 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), total chromium and hexavalent chromium [Cr (VI)] analyses were collected from monitoring wells MW-1, MW-6, MW-7, MW-11 (Screen 1), MW-12 (Screen 2), MW-14 (Screen 4), MW-20 (Screen 3) and MW-22 (Screen 3). 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 two exceptions. The total chromium concentrations for the MW-6 and MW-14-4 duplicate pairs ranged from 1.1J µg/L to 5.1 µg/L and 2.1J µg/L to 5.0 µg/L, respectively. The reason for the differences in total chromium concentrations in the duplicate pairs could not be determined.

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. No VOC 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. A source blank which consisted of distilled water used by sampling personnel for equipment decontamination was collected during this 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 blank 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 second 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 APR/MAY 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-1-42213	MW-19, MW-20	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-2-42313	MW-14, MW-19	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-3-42413	MW-18, MW-25	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-4-42513	MW-4, MW-22	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-5-42613	MW-17, MW-26	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-6-42913	MW-3, MW-23	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-7-43013	MW-12, MW-24	3 U	0.5 U	1 U	10 U				
EQUIPMENT BLANK	EB-8-5113	MW-11, MW-21	**1 J**	0.5 U	1 U	10 U				
SOURCE BLANK	SB-1-42213	--	3 U	0.5 U	1 U	10 U				
SOURCE BLANK	SB-2-42313	--	**1 J**	0.5 U	1 U	10 U				
SOURCE BLANK	SB-3-42913	--	3 U	0.5 U	1 U	10 U				
TRIP BLANK	TB-10-5313	W-1, MW-5, MW-6, MW-10, MW-1	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-1-42213	MW-19, MW-20	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-2-42313	MW-14, MW-19	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-3-42413	MW-18, MW-25	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-4-42513	MW-4, MW-22	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-5-42613	MW-17, MW-26	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-6-42913	MW-3, MW-23	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-7-43013	MW-12, MW-24	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-8-5113	MW-11, MW-21	NA	0.5 U	1 U	10 U				
TRIP BLANK	TB-9-5213	W-7, MW-8, MW-9, MW-13, MW-1	NA	0.5 U	1 U	10 U				

Notes

NA	Not Analyzed
J	Analyte concentration is an estimated value
U	Analyte was analyzed for but not detected at or above the stated limit

Laboratory Data Consultants, Inc.

7750 El Camino Real, Ste. 2L Carlsbad, CA 92009

Phone 760.634.0437 **Web** www.lab-data.com **Fax** 760.634.0439

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

June 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 June 10, 2013. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 29883:

SDG #	Fraction
1308175 1308285 1308396	Volatiles, Metals, Wet Chemistry

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

- 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,

Erlinda T. Rauto
Operations Manager/Senior Chemist

2 Week rush

Attachment 1

90/10 (client select)

LDC #29883 (Battelle-San Diego / NASA JPL)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (524.2)		Metals (200.8/ 200.7)		Alk (2320B)		CLO_4 (314.0)		CrVI (7196)		NO_3-N, Cl, SO_4 (300.0)		NO_2-N (353.2)		TDS (160.1)		pH (150.1)															
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	1308175	06/10/13	06/24/13	13	0	13	0	12	0	16	0	16	0	13	0	16	0	10	0	12	0														
A	1308175	06/10/13	06/24/13	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0														
B	1308285	06/10/13	06/24/13	13	0	13	0	11	0	13	0	13	0	13	0	13	0	11	0	11	0														
C	1308396	06/10/13	06/24/13	13	0	13	0	11	0	16	0	16	0	13	0	16	0	12	0	11	0														
C	1308396	06/10/13	06/24/13	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0														
Total	A/LR			41	0	41	0	36	0	47	0	47	0	41	0	47	0	35	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	371

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: April 22, 2013

LDC Report Date: June 17, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308175

Sample Identification

TB-1-42213
SB-1-42213
EB-1-42213
MW-20-5
MW-20-4
MW-20-3**
MW-20-2
MW-20-1
MW-19-5
MW-19-4
MW-19-3
DUP-1-2Q13
MW-20-1MS
MW-20-1MSD

**Indicates sample underwent EPA Level IV review

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.

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.

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

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-20-3** and DUP-1-2Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-20-3**	DUP-1-2Q13	
Ethylbenzene	0.14	0.11	24
Styrene	0.41	0.33	22
Tetrachloroethene	0.20	0.15	29
Toluene	0.13	0.11	17
Trichloroethene	0.28	0.20	33
Acrylonitrile	2.5	2.8	11
Carbon disulfide	0.64	0.49	27

XVII. Field Blanks

Sample TB-1-42213 was identified as a trip blank. No volatile contaminants were found.

Sample EB-1-42213 was identified as an equipment blank. No volatile contaminants were found.

Sample SB-1-42213 was identified as a source blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1308175

No Sample Data Qualified in this SDG

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308175

No Sample Data Qualified in this SDG

LDC #: 29883A1 **VALIDATION COMPLETENESS WORKSHEET** Date: 6/13/13
SDG #: 1308175 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: SW
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: 04/22/2013
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	RSD ≤ 20, r²
IV.	Continuing calibration/ICV	A	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	SW	D = 12 + 6
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; SB = Source Blank

Validated Samples:** Indicates sample underwent Level IV validation

WATER

− 1	TB-1-42213	+ 11	MW-19-3	21		31	BWD2198-BLK1
− 2	SB-1-42213	+ 12	DUP-1-2Q13	22		32	
− 3	EB-1-42213	13	MW-20-1MS	23		33	
+ 4	MW-20-5	14	MW-20-1MSD	24		34	
− 5	MW-20-4	15		25		35	
+ 6	MW-20-3**	16		26		36	
+ 7	MW-20-2	17		27		37	
+ 8	MW-20-1	18		28		38	
+ 9	MW-19-5	19		29		39	
+ 10	MW-19-4	20		30		40	

LDC #: 29883A1

VALIDATION FINDINGS CHECKLIST

Reviewer: SW
2nd Reviewer: CJ

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.
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#: 29883A1

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: SW
2nd Reviewer:

METHOD: GC MS Volatiles (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
	6	12	
EE	0.14	0.11	24
FF	0.41	0.33	22
AA	0.20	0.15	29
CC	0.13	0.11	17
S	0.28	0.20	33
GGGG	2.5	2.8	11
G	0.64	0.49	27

V:\FIELD DUPLICATES\29883A1.wpd

LDC#: 29883A1

VALIDATION FINDINGS
Initial Calibration Calculation

Page: 1 of 1
Reviewer: SW
2nd Reviewer:

Method: GC/MS Volatiles (EPA Method 524.2)

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

RRF = (Ax)(Cis)/(Ais)(Cx)

average RRF = sum of the RRFs/number of standards

%RSD = 100 * (S/X)

Ax = Area of compound Ais = Area of associated internal standard

Cx = Concentration of compound Cis = Concentration of internal standard

S = Standard deviation of the RRFs X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (IS)	Reported RRF (6.4 / 1.0 std)	Recalculated RRF (6.4 / 1.0 std)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
1	1304018	4/18/2013 7:00	Carbon Disulfide (1st Internal Standard)	1.47923	1.479230	1.393525	1.39353	7.69	7.69
			Trichloroethene (2nd Internal Standard)	0.3501367	0.350137	0.3301203	0.33012	4.71	4.71
			Ethylbenzene (3rd Internal Standard)	2.070344	2.070344	1.925438	1.92544	6.23	6.23

#	Cis	Cx	Ax	Ais
1	10	6.4	292259	308711
	10	1	16474	470502
	10	1	23828	115092

	(I)	(II)	(II)		
Conc (I)	Carbon Disulfide	Trichloroethene	Ethylbenzene		Conc (II)
1.6	1.474542	0.342823	2.043477		0.5
6.4	1.479230	0.350137	2.070344		1
16	1.497544	0.334311	1.887303		10
32	1.371981	0.328386	1.915085		25
48	1.293277	0.314617	1.897387		50
80	1.244578	0.310449	1.739031		100
X	1.393525	0.330120	1.925438	#DIV/0!	
S	0.107171	0.015556	0.120022	#DIV/0!	

= Not used in average calculation

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

LDC#: 29003A1

VALIDATION FINDINGS

Continuing Calibration Results Verification

Reviewer: SW
2nd Reviewer:

Method: GC/MS Volatiles (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 = (Ax)(Cis)/(Ais)(Cx)

Ax = Area of compound

Cx = Concentration of compound

ave. RRF = initial calibration average RRF

Ais = Area of associated internal standard

Cis = Concentration of internal standard

RRF = continuing calibration RRF

#	Standard ID	Calibration Date	Compound (IS)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	28APR06.D	4/28/2013	Carbon Disulfide (1st Internal Standard)	1.3935	1.3457	1.3457	3.40	3.43
	28APR03.D	8:04	Trichloroethene (2nd Internal Standard)	0.3301	0.3204	0.3263	2.90	1.16
			Ethylbenzene (3rd Internal Standard)	1.9254	1.9732	1.9742	2.50	2.53
2								

#	Cis	Cx	Ax	Ais
1	10	32	1552514	360528
	10	25	435823	534301
	10	25	679955	137767
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 #: 29883A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: SW
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: 6

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.000	10.15	102	101.50	0
Bromofluorobenzene	|	9.44	94.4	94.41	0
1,2-Dichlorobenzene-d4	↓	10.93	109	109.34	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 #: 29883A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: SW
2nd Reviewer: 9

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: BWD2198-BS1

Compound	Spike Added (µg/L)		Spiked Sample Concentration (µg/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
TRICHLOROETHENE	25.000	—	25.200	—	101	100.81	—	—	—	—

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 #: 29883A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: SW
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. 6, TRICHLOROETHENE

Conc. = $\frac{(4605)(10)(1)}{(499507)(0.330203)(-)(-)}$

= 0.2792 µg/L

#	Sample ID	Compound	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Qualification
	1	CARBON DISULFIDE	0.64	0.6416	—
		ETHYLBENZENE	0.14	0.1383	—

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 22, 2013

LDC Report Date: June 18, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308175

Sample Identification

SB-1-42213
EB-1-42213
MW-20-5
MW-20-4
MW-20-3**
MW-20-2
MW-20-1
MW-19-5
MW-19-4
MW-19-3
DUP-1-2Q13
MW-20-1MS
MW-20-1MSD
MW-20-1DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 14 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Methods 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 metals contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Iron	6.841 ug/L	SB-1-42213 EB-1-42213 MW-20-5 MW-20-4 MW-20-3** MW-20-2 MW-20-1 MW-19-5 MW-19-4
ICB/CCB	Iron	11.147 ug/L	SB-1-42213 MW-20-1
ICB/CCB	Iron	8.184 ug/L	EB-1-42213 MW-20-5 MW-20-4 MW-20-3** MW-20-2 MW-19-5 MW-19-4
PB (prep blank)	Magnesium	0.022303 mg/L	MW-19-3 DUP-1-2Q13
ICB/CCB	Iron Magnesium	17.581 ug/L 0.030758 mg/L	MW-19-3 DUP-1-2Q13

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
SB-1-42213	Iron	6.5 ug/L	6.5U ug/L
EB-1-42213	Iron	19 ug/L	19U ug/L
MW-20-5	Iron	28 ug/L	28U ug/L
MW-20-3**	Iron	37 ug/L	37U ug/L
MW-20-2	Iron	20 ug/L	20U ug/L
MW-19-5	Iron	34 ug/L	34U ug/L
DUP-1-2Q13	Iron	16 ug/L	16U ug/L

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-20-3** and DUP-1-2Q13 were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-20-3**	DUP-1-2Q13	
Arsenic	0.96 ug/L	1.1 ug/L	14
Calcium	6.1 mg/L	6.9 mg/L	12
Iron	37 ug/L	16 ug/L	79
Magnesium	6.6 mg/L	7.1 mg/L	7
Potassium	1.8 mg/L	1.9 mg/L	5
Sodium	49 mg/L	48 mg/L	2

XV. Field Blanks

Sample EB-1-42213 was identified as an equipment blank. No metal contaminants were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-1-42213	Iron Calcium	19 ug/L 0.035 mg/L

Sample SB-1-42213 was identified as a source blank. No metal contaminants were found with the following exceptions:

Blank ID	Analyte	Concentration
SB-1-42213	Iron Calcium	6.5 ug/L 0.039 mg/L

NASA JPL
Metals - Data Qualification Summary - SDG 1308175

No Sample Data Qualified in this SDG

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1308175

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308175	SB-1-42213	Iron	6.5U ug/L	A
1308175	EB-1-42213	Iron	19U ug/L	A
1308175	MW-20-5	Iron	28U ug/L	A
1308175	MW-20-3**	Iron	37U ug/L	A
1308175	MW-20-2	Iron	20U ug/L	A
1308175	MW-19-5	Iron	34U ug/L	A
1308175	DUP-1-2Q13	Iron	16U ug/L	A

LDC #: 29883A4 **VALIDATION COMPLETENESS WORKSHEET** Date: 6-13-13

SDG #: 1308175 Level III/IV Page: 1 of 1

Laboratory: BC Laboratories, Inc. 9m4. Reviewer: MG

2nd Reviewer: W

METHOD: Metals (EPA Method 200.8) / 200.7

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: 4-22-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
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 = 5+11
XV	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-1-42213	11	DUP-1-2Q13	21		31	
2	EB-1-42213	12	MW-20-1MS	22		32	
3	MW-20-5	13	MW-20-1MSD	23		33	
4	MW-20-4	14	MW-20-1DUP	24		34	
5	MW-20-3**	15		25		35	
6	MW-20-2	16		26		36	
7	MW-20-1	17		27		37	
8	MW-19-5	18		28		38	
9	MW-19-4	19		29	PBW1	39	
10	MW-19-3	20		30	PBW2	40	

Notes:

LDC #: 29883A4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: W

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 #: 29883A4

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: W

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 #: 29883A4

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

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

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→11	W	Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Si, CN$^-$, ___
QC 12→14	↓	Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$, ___
		Analysis Method
ICP	W	Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Si, CN$^-$,
ICP-MS	↓	Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$,
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN$^-$,

Comments: Mercury by CVAA if performed

LDC #: 29883A4
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: 1-9

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Limit	1	2	3	6	8					
Fe		6.841		34.20	6.5	19	28	20	34					

Sample Concentration units, unless otherwise noted: ug/L
Associated Samples: 1,7

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Limit	1									
Fe			11.147	55.74	See PB									

Sample Concentration units, unless otherwise noted: ug/L
Associated Samples: 2-6,8,9

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Limit	2	3	5	6	8					
Fe			8.184	40.92	See PB	See PB	37	See PB	See PB					

Sample Concentration units, unless otherwise noted: ug/L (* Mg in mg/L)
Associated Samples: 10, 11

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Limit	11									
Fe			17.581	87.90	16									
Mg		0.022303*	0.030758*	0.15379*										

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#: 29883A4

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	
	5	11		
Arsenic	0.96	1.1	14	
Calcium (mg/L)	6.1	6.9	12	
Iron	37	16	79	
Magnesium (mg/L)	6.6	7.1	7	
Potassium (mg/L)	1.8	1.9	5	
Sodium (mg/L)	49	48	2	

LDC #: 29883A4

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) SB (circle one)

Analyte	Concentration Units ( )
Fe	6.5 (mg/L)
Ca	0.039 (mg/L)

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

Analyte	Concentration Units ( )
Fe	19 (mg/L)
Ca	0.035 (mg/L)

LDC #: 29883A4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
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)
1106 ICV	ICP (Initial calibration)	Ca	50470	50000	101	101	Y
1722 ICV	ICP/MS (Initial calibration)	Pb	121.847	125.00	97.5	97.5	
	CVAA (Initial calibration)						
1610 CCV2	ICP (Continuing calibration)	Mg	48210	50000	96.4	96.4	
1911 CCV2	ICP/MS (Continuing calibration)	As	103.396	100.00	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 #: 29883A4

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)
1118 IFB1	ICP interference check	Ca	510.0 (mg/L)	500.00 (mg/L)	102	102	Y
1550 LCS	Laboratory control sample	K	9.531 (mg/L)	10.000 (mg/L)	95.3	95.3	↓
1901 12	Matrix spike	Cr	(SSR-SR) 38.837 (µg/L)	40.000 (µg/L)	97.1	97.1	↓
1552 / 1555 14	Duplicate	Fe	76.0 (µg/L)	72.8 (µg/L)	4.30	4.22	↓
—	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 #: 29883 A4

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 # 5, Mg 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:

$$\frac{(6.633\ mg/L)(0.050\ L)}{0.050\ L} = 6.633\ mg/L$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	5	Fe	37	37	Y
		As	0.96	0.96	
			(mg/L)	(mg/L)	
		Ca	6.1	6.1	
		Mg	6.6	6.6	
		Na	49	49	
		K	1.8	1.8	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 22, 2013

LDC Report Date: June 18, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308175

Sample Identification

SB-1-42213
EB-1-42213
MW-20-5
MW-20-4
MW-20-3**
MW-20-2
MW-20-1
MW-19-5
MW-19-4
MW-19-3
DUP-1-2Q13
SB-1-42213MS
SB-1-42213MSD
SB-1-42213DUP
MW-20-1MS
MW-20-1MSD
MW-20-1DUP
MW-19-3MS
MW-19-3MSD
MW-19-3DUP
DUP-1-2Q13DUP

**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 Standard Method 2320B for Alkalinity, 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, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
SB-1-42213 EB-1-42213 SB-1-42213DUP	pH	75.75 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-20-5 DUP-1-2Q13DUP	pH	75.00 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-20-4	pH	74.50 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-20-3**	pH	74.00 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-20-2	pH	73.25 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-20-1	pH	73.00 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-19-5	pH	71.75 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-19-4	pH	71.25 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-19-3	pH	71.00 hours	48 hours	J (all detects) UJ (all non-detects)	P
DUP-1-2Q13	pH	74.75 hours	48 hours	J (all detects) UJ (all non-detects)	P

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	Chloride Sulfate	0.155 mg/L 0.271 mg/L	SB-1-42213 EB-1-42213 MW-20-5 MW-20-4 MW-20-1
ICB/CCB	Chloride Sulfate	0.155 mg/L 0.291 mg/L	MW-20-3** MW-20-2 MW-19-5 MW-19-4 MW-19-3 DUP-1-2Q13
PB (prep blank)	Chloride Sulfate	0.165 mg/L 0.357 mg/L	DUP-1-2Q13

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
SB-1-42213	Chloride Sulfate	0.14 mg/L 0.40 mg/L	0.14U mg/L 0.40U mg/L
EB-1-42213	Chloride	0.16 mg/L	0.16U 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

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-20-3** and DUP-1-2Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-20-3**	DUP-1-2Q13	
Total alkalinity	98 mg/L	99 mg/L	1
Bicarbonate	88 mg/L	92 mg/L	4
Carbonate	16 mg/L	14 mg/L	13
Chloride	39 mg/L	39 mg/L	0
Nitrate as N	0.27 mg/L	0.30 mg/L	11
pH	9.22 units	9.19 units	0
Sulfate	3.4 mg/L	3.7 mg/L	8
Total dissolved solids	180 mg/L	180 mg/L	0

XI. Field Blanks

Sample EB-1-42213 was identified as an equipment blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-1-42213	pH Chloride	5.88 units 0.16 mg/L

Sample SB-1-42213 was identified as a source blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
SB-1-42213	pH Chloride Sulfate	6.00 units 0.14 mg/L 0.40 mg/L

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1308175

SDG	Sample	Analyte	Flag	A or P	Reason
1308175	SB-1-42213 EB-1-42213 MW-20-5 MW-20-4 MW-20-3** MW-20-2 MW-20-1 MW-19-5 MW-19-4 MW-19-3 DUP-1-2Q13	pH	J (all detects) UJ (all non-detects)	P	Technical holding times

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 1308175

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308175	SB-1-42213	Chloride Sulfate	0.14U mg/L 0.40U mg/L	A
1308175	EB-1-42213	Chloride	0.16U mg/L	A

LDC #: 29883A6
SDG #: 1308175
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

gm.

Date: 6-14-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer: W

METHOD: Alkalinity (SM2320B), Chloride, Sulfate, ~~Nitrite-N~~, Nitrate-N (EPA Method 300.0), Perchlorate (EPA Method 314.0), Nitrite-N (EPA Method 353.2), Hexavalent Chromium (EPA SW846 Method 7196), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	SW	Sampling dates: 4-22-13
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	A	Not reviewed for Level III validation.
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	D = 5 + 11
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-1-42213	11	DUP-1-2Q13	21	DUP-1-2Q13DUP	31	
2	EB-1-42213	12	SB-1-42213MS	22		32	
3	MW-20-5	13	SB-1-42213MSD	23		33	
4	MW-20-4	14	SB-1-42213DUP	24		34	
5	MW-20-3**	15	MW-20-1MS	25		35	
6	MW-20-2	16	MW-20-1MSD	26		36	
7	MW-20-1	17	MW-20-1DUP	27		37	
8	MW-19-5	18	MW-19-3MS	28		38	
9	MW-19-4	19	MW-19-3MSD	29		39	PBW1
10	MW-19-3	20	MW-19-3DUP	30		40	PBW2

Notes:

LDC #: 29883A6

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 #: 29883A6

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 → 11	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, 13	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} [✓ ClO_4] ______ ______
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 ______ ______
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

Comments:

LDC #: 29883A6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: MG
2nd reviewer: ✓

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:		150.1					
Parameters:		pH					
Technical holding time:		48 hr					
Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1	09:00 4-22-13	12:47 4-25-13	(75.75 hr)				J/UJ/P
2	09:10 4-22-13	12:57 4-25-13	(75.75)				
3	10:00 4-22-13	13:02 4-25-13	(75.00)				
4	10:35 4-22-13	13:08 4-25-13	(74.50)				
5	11:10 4-22-13	13:15 4-25-13	(74.00)				
6	12:00 4-22-13	13:20 4-25-13	(73.25)				
7	12:30 4-22-13	13:26 4-25-13	(73.00)				
8	13:50 4-22-13	13:32 4-25-13	(71.75)				
9	14:20 4-22-13	13:38 4-25-13	(71.25)				
10	14:50 4-22-13	13:44 4-25-13	(71.00)				
11	11:15 4-22-13	14:07 4-25-13	(74.75)				
14	09:00 4-22-13	12:52 4-25-13	(75.75)				
21	11:15 4-22-13	14:13 4-25-13	(75.00)				

LDC #: 29883A6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** 1-4,7

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		1	2								
Cl		0.155	0.775	0.14	0.16								
SO4		0.271	1.355	0.40									

Conc. units: mg/L **Associated Samples:** 5,6,8-11 (>5x)

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		No Qual's.									
Cl		0.155	0.775										
SO4		0.291	1.455										

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	0.165		0.825										
SO4	0.357		1.785										

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# 29883A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer:

Inorganics: Method See Cover

Analyte	Concentration (mg/L)		RPD	
	5	11		
Total Alkalinity	98	99	1	
Bicarbonate	88	92	4	
Carbonate	16	14	13	
Chloride	39	39	0	
Nitrate as N	0.27	0.30	11	
pH (pH units)	9.22	9.19	0	
Sulfate	3.4	3.7	8	
TDS	180	180	0	

V:\FIELD DUPLICATES\FD_inorganic\29883A6.WPD

LDC #: 29883A6
SDG #: —

VALIDATION FINDINGS WORKSHEET
Field Blanks

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

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 ( )
pH	6.00 (pH units)
Cl	0.14 (mg/L)
SO4	0.40 (↓)

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

Analyte	Concentration Units ( )
pH	5.88 (pH units)
Cl	0.16 (mg/L)

LDC #: 29883A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer:

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of NO_2-N was recalculated. Calibration date: 4-16-13

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	NO_2-N	Blank	0.00 (mg/L)	0.009	r^2=0.999620	r^2=0.999583	Y
		Standard 1	0.02 ( )	0.019			
		Standard 2	0.05 ( )	0.035			
		Standard 3	0.10 ( )	0.062			
		Standard 4	0.50 ( )	0.268			
		Standard 5	1.00 ( )	0.549			
		Standard 6	- ( )	-			
		Standard 7	- ( )	-			
Calibration verification	Cl	0235 CCV1	49.366 (mg/L)	50.000 (mg/L)	98.7	98.7	
Calibration verification	SO_4	0235 CCV1	99.514 (mg/L)	100.00 (mg/L)	99.5	99.5	
Calibration verification	ClO_4	1635 ICV	10.981 (µg/L)	10.000 (µg/L)	110	110	

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 #: 29883A6

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:

$\%R = \frac{Found}{True} \times 100$ 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)
LCS2	Laboratory control sample	TDS	595.0 (mg/L)	586.0 (mg/L)	102	102	Y
0114 15	Matrix spike sample	NO_3-N	(SSR-SR) 5.2468 (mg/L)	5.0505 (mg/L)	104	104	↓
14	Duplicate sample	pH	6.00 (pH units)	5.87 (pH units)	2.19	2.19	↓

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 #: 29883A6

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 #5, SO_4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = Quadratic, 1x dil Recalculation:

$$SO_4 = \frac{\sqrt{4 \times 0.0001 \times (0.255 + 0.0176) + (0.0800)^2} - 0.0800}{2 \times (0.0001)} = 3.393 \text{ mg/L}$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	5	pH	9.22 (pH unit)	9.22 (pH unit)	Y
		TDS	180	180	
		Cl	39	39	
		NO_3-N	0.27	0.27	
		SO_4	3.4	3.4	
		Bicarbonate	88	88	
		Carbonate	16	16	
		Total Alk	98	98	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 23, 2013

LDC Report Date: June 17, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308285

Sample Identification

TB-2-42313
SB-2-42313
EB-2-42313
MW-19-2
MW-19-1
MW-14-5
MW-14-4
MW-14-3
MW-14-2
MW-14-1
DUP-2-2Q13
MW-14-3MS
MW-14-3MSD

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.

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.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 30.0% with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
4/28/13	Bromomethane Methyl iodide Pentachloroethane	45.8 32.2 97.6	TB-2-42313 SB-2-42313 EB-2-42313 MW-19-2 MW-19-1 MW-14-5 MW-14-4 DUP-2-2Q13	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.

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

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

Compound	Concentration (ug/L)		RPD
	MW-14-4	DUP-2-2Q13	
Chloroform	0.27	0.26	4
1,2-Dichlorobenzene	0.080	0.090	12
1,1-Dichloroethane	0.16	0.15	6
cis-1,2-Dichloroethene	0.15	0.17	13
Tetrachloroethene	0.27	0.24	12
Trichloroethene	0.28	0.27	4

XVII. Field Blanks

Sample TB-2-42313 was identified as a trip blank. No volatile contaminants were found.

Sample EB-2-42313 was identified as an equipment blank. No volatile contaminants were found.

Sample SB-2-42313 was identified as a source blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1308285

SDG	Sample	Compound	Flag	A or P	Reason
1308285	TB-2-42313 SB-2-42313 EB-2-42313 MW-19-2 MW-19-1 MW-14-5 MW-14-4	Bromomethane Methyl iodide Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308285

No Sample Data Qualified in this SDG

LDC #: 29883B1 **VALIDATION COMPLETENESS WORKSHEET** Date: 6/13/13
SDG #: 1308285 Level III Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: SW
2nd Reviewer: [signature]

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: 6/23/2013
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 ~~LCD~~	A ~~N~~	
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 = 11 + 7
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
SB = Source Blank

Validated Samples:

WATER

1	TB-2-42313	11	DUP-2-2Q13	21		31	BWD2199 - BLK1
2	SB-2-42313	12	MW-14-3MS	22		32	
3	EB-2-42313	13	MW-14-3MSD	23		33	
4	MW-19-2	14	~~MW-14-3DUP~~	24		34	
5	MW-19-1	15		25		35	
6	MW-14-5	16		26		36	
7	MW-14-4	17		27		37	
8	MW-14-3	18		28		38	
9	MW-14-2	19		29		39	
10	MW-14-1	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.
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 #: 29883B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: SW
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
	09/28/2013	28APR34.D	B	45.8	1-7, 11	J/UJ/P
			METHYL IODIDE	32.2		
			PENTACHLOROETHANE	97.6		

LDC#: 29883B1

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: SW
2nd Reviewer:

METHOD: GC MS Volatiles (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
	7	11	
K	0.27	0.26	4
JJJ	0.080	0.090	12
I	0.16	0.15	6
QQQ	0.15	0.17	13
AA	0.27	0.24	12
S	0.28	0.27	4

V:\FIELD DUPLICATES\29883B1.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 23, 2013

LDC Report Date: June 18, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308285

Sample Identification

SB-2-42313
EB-2-42313
MW-19-2
MW-19-1
MW-14-5
MW-14-4
MW-14-3
MW-14-2
MW-14-1
DUP-2-2Q13
MW-14-3MS
MW-14-3MSD
MW-14-3DUP

Introduction

This data review covers 13 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Methods 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 metal contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Iron	13.114 ug/L	All samples in SDG 1308285
ICB/CCB	Iron	8.6929 ug/L	All samples in SDG 1308285

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
SB-2-42313	Iron	11 ug/L	11U ug/L
MW-14-4	Iron	25 ug/L	25U ug/L
MW-14-2	Iron	62 ug/L	62U ug/L
DUP-2-2Q13	Iron	16 ug/L	16U ug/L

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-14-3MS/MSD (All samples in SDG 1308285)	Iron	144 (75-125)	-	33.4 (≤20)	J (all detects) UJ (all non-detects)	A

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-14-4 and DUP-2-2Q13 were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-14-4	DUP-2-2Q13	
Calcium	80 mg/L	82 mg/L	2
Chromium	2.1 ug/L	5.0 ug/L	82
Iron	25 ug/L	16 ug/L	44
Magnesium	28 mg/L	29 mg/L	4
Potassium	2.5 mg/L	2.5 mg/L	0
Sodium	33 mg/L	34 mg/L	3

XV. Field Blanks

Sample EB-2-42313 was identified as an equipment blank. No metal contaminants were found.

Sample SB-2-42313 was identified as a source blank. No metal contaminants were found with the following exceptions:

Blank ID	Analyte	Concentration
SB-2-42313	Iron Chromium Calcium Magnesium Sodium	11 ug/L 1.0 ug/L 0.032 mg/L 0.021 mg/L 0.23 mg/L

NASA JPL
Metals - Data Qualification Summary - SDG 1308285

SDG	Sample	Analyte	Flag	A or P	Reason
1308285	SB-2-42313 EB-2-42313 MW-19-2 MW-19-1 MW-14-5 MW-14-4 MW-14-3 MW-14-2 MW-14-1	Iron	J (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)(RPD)

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1308285

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308285	SB-2-42313	Iron	11U ug/L	A
1308285	MW-14-4	Iron	25U ug/L	A
1308285	MW-14-2	Iron	62U ug/L	A
1308285	DUP-2-2Q13	Iron	16U ug/L	A

LDC #: 29883B4 **VALIDATION COMPLETENESS WORKSHEET** Date: 6-14-13
SDG #: 1308285 Level III Page: 1 of 1
Laboratory: BC Laboratories, Inc. 9M4 Reviewer: MG
2nd Reviewer: [signature]

METHOD: Metals (EPA Method 200.8) / 200.7

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: 4-23-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	SW	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 = 6 + 10
XV	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:
all Water

1	SB-2-42313	11	MW-14-3MS	21		31	
2	EB-2-42313	12	MW-14-3MSD	22		32	
3	MW-19-2	13	MW-14-3DUP	23		33	
4	MW-19-1	14		24		34	
5	MW-14-5	15		25		35	
6	MW-14-4	16		26		36	
7	MW-14-3	17		27		37	
8	MW-14-2	18		28		38	
9	MW-14-1	19		29	PBW 1	39	
10	DUP-2-2Q13	20		30	PBW 2	40	

Notes: _____

LDC #: 29883B4

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

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

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→10	W	Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Si, CN^-,
QC 11→13	↓	Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Analysis Method
ICP	W	Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Si, CN^-,
ICP-MS	↓	Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-

Comments: Mercury by CVAA if performed

LDC #: 29883B4
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: all

Reviewer: MG
2nd Reviewer: ✓

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Limit	1	6	8	10						
Fe		13.114	8.6929	65.57	11	25	62	16						

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 #: 29883B4

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

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 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	11/12	water	Fe	144 (75-125)		33.4 (≤ 20)	all	J/UJ/A

Comments: _____

LDC#: 29883B4

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [signature]

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	10		
Calcium (mg/L)	80	82	2	
Chromium	2.1	5.0	82	
Iron	25	16	44	
Magnesium (mg/L)	28	29	4	
Potassium (mg/L)	2.5	2.5	0	
Sodium (mg/L)	33	34	3	

LDC #: 29883B4

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) SB (circle one)

Analyte	Concentration Units ( )
Fe	11 (mg/L)
Cr	1.0 (↓)
Ca	0.032 (mg/L)
Mg	0.021 (↓)
Na	0.23 (↓)

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

Analyte	Concentration Units ( )

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 23, 2013

LDC Report Date: June 18, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308285

Sample Identification

SB-2-42313
EB-2-42313
MW-19-2
MW-19-1
MW-14-5
MW-14-4
MW-14-3
MW-14-2
MW-14-1
DUP-2-2Q13
MW-14-3MS
MW-14-3MSD
MW-14-3DUP
MW-14-1DUP

Introduction

This data review covers 14 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per Standard Method 2320B for Alkalinity, 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, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
SB-2-42313 EB-2-42313	pH	58.75 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-19-2	pH	56.25 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-19-1	pH	55.00 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-14-5	pH	53.00 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-14-4	pH	52.75 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-14-3	pH	52.00 hours	48 hours	J (all detects) UJ (all non-detects)	P
MW-14-2 MW-14-1 MW-14-1DUP	pH	51.50 hours	48 hours	J (all detects) UJ (all non-detects)	P
DUP-2-2Q13	pH	53.50 hours	48 hours	J (all detects) UJ (all non-detects)	P

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 Sulfate	0.260 mg/L 0.260 mg/L	All samples in SDG 1308285
ICB/CCB	Chloride Sulfate	0.219 mg/L 0.316 mg/L	All samples in SDG 1308285

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
SB-2-42313	Chloride Sulfate	0.27 mg/L 0.37 mg/L	0.27U mg/L 0.37U mg/L
EB-2-42313	Chloride	0.49 mg/L	0.49U 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-14-4 and DUP-2-2Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-14-4	DUP-2-2Q13	
Total alkalinity	180 mg/L	180 mg/L	0
Bicarbonate	210 mg/L	210 mg/L	0
Chloride	65 mg/L	65 mg/L	0
Hexavalent chromium	0.0014 mg/L	0.0012 mg/L	15
Nitrate as N	13 mg/L	13 mg/L	0
Perchlorate	0.81U ug/L	3.0 ug/L	200
pH	8.05 units	7.99 units	1
Sulfate	69 mg/L	69 mg/L	0
Total dissolved solids	460 mg/L	470 mg/L	2

XI. Field Blanks

Sample EB-2-42313 was identified as an equipment blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-2-42313	pH Chloride	5.06 units 0.49 mg/L

Sample SB-2-42313 was identified as a source blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
SB-2-42313	pH Chloride Sulfate	5.80 units 0.27 mg/L 0.37 mg/L

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1308285

SDG	Sample	Analyte	Flag	A or P	Reason
1308285	SB-2-42313 EB-2-42313 MW-19-2 MW-19-1 MW-14-5 MW-14-4 MW-14-3 MW-14-2 MW-14-1 DUP-2-2Q13	pH	J (all detects) UJ (all non-detects)	P	Technical holding times

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 1308285

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308285	SB-2-42313	Chloride Sulfate	0.27U mg/L 0.37U mg/L	A
1308285	EB-2-42313	Chloride	0.49U mg/L	A

LDC #: 29883B6
SDG #: 1308285
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6-14-13
Page: 1 of 1
Reviewer: MG
2nd Reviewer: M.H.

METHOD Alkalinity (SM2320B), Chloride, Sulfate, ~~Nitrite-N~~, Nitrate-N (EPA Method 300.0), Perchlorate (EPA Method 314.0), Nitrite-N (EPA Method 353.2), Hexavalent Chromium (EPA SW846 Method 7196), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	SW	Sampling dates: 4-23-13
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 = 6+10
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: all water

1	SB-2-42313	11	MW-14-3MS	21		31	
2	EB-2-42313	12	MW-14-3MSD	22		32	
3	MW-19-2	13	MW-14-3DUP	23		33	
4	MW-19-1	14	MW-14-1DUP	24		34	
5	MW-14-5	15		25		35	
6	MW-14-4	16		26		36	
7	MW-14-3	17		27		37	
8	MW-14-2	18		28		38	
9	MW-14-1	19		29	PBW1	39	
10	DUP-2-2Q13	20		30	PBW2	40	

Notes:

LDC #: 29883B6

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	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, 12	↓	pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4]
↓ 13	↓	pH [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4]
↓ 14	↓	[✓ 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 #: 29883B6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: MG
2nd reviewer: V

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:	150.1					
Parameters:	pH					
Technical holding time:	48 hr					

Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1	07:00 4-23-13	17:44 4-25-13	(58.75 hr)				J/UJ/P
2	07:10 4-23-13	17:50 4-25-13	(58.75)				
3	07:45 4-23-13	16:03 4-25-13	(56.25)				
4	09:45 4-23-13	16:39 4-25-13	(55.00)				
5	11:10 4-23-13	16:11 4-25-13	(53.00)				
6	11:40 4-23-13	16:19 4-25-13	(52.75)				
7	12:30 4-23-13	16:26 4-25-13	(52.00)				
8	13:05 4-23-13	16:33 4-25-13	(51.50)				
9	13:35 4-23-13	17:04 4-25-13	(51.50)				
10	11:45 4-23-13	17:17 4-25-13	(53.50)				
14	13:35 4-23-13	17:10 4-25-13	(51.50)				

LDC #: 29883B6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** all

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		1	2								
Cl	0.260	0.219	1.300	0.27	0.49								
SO4	0.260	0.316	1.580	0.37									

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# 29883B6

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: MG
2nd Reviewer: ✓

Inorganics: Method See Cover

Analyte	Concentration (mg/L)		RPD	
	6	10		
Total Alkalinity	180	180	0	
Bicarbonate	210	210	0	
Chloride	65	65	0	
Hexavalent Chromium	0.0014	0.0012	15	
Nitrate as N	13	13	0	
Perchlorate (ug/L)	0.81U	3.0	200	
pH (pH units)	8.05	7.99	1	
Sulfate	69	69	0	
TDS	460	470	2	

V:\FIELD DUPLICATES\FD_inorganic\29883B6.WPD

LDC #: 29883B6
SDG #: —

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd reviewer: \

METHOD: Inorganics, EPA Method See cover

(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 (circle one) (SB)

Analyte	Concentration Units ( )
pH	5.80 (pH units)
Cl	0.27 (mg/L)
SO4	0.37 (↓)

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

Analyte	Concentration Units ( )
pH	5.06 (pH units)
Cl	0.49 (mg/L)

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 24, 2013

LDC Report Date: June 17, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308396

Sample Identification

TB-3-42413
EB-3-42413
MW-18-5
MW-18-4
MW-18-3**
MW-18-2
MW-18-1
MW-25-5
MW-25-4
MW-25-3
MW-25-2
MW-25-1
MW-25-1MS
MW-25-1MSD

**Indicates sample underwent EPA Level IV review

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.

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
4/18/13	Bromomethane	54.6	All samples in SDG 1308396	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.

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-3-42413 was identified as a trip blank. No volatile contaminants were found.

Sample EB-3-42413 was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1308396

SDG	Sample	Compound	Flag	A or P	Reason
1308396	TB-3-42413 EB-3-42413 MW-18-5 MW-18-4 MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1	Bromomethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308396

No Sample Data Qualified in this SDG

LDC #: 29883C1 **VALIDATION COMPLETENESS WORKSHEET** Date: 6/14/13
SDG #: 1308396 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: SW
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: 04/24/2013
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~~ 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	TB-3-42413	+ 11	MW-25-2	21		31	BWD2200-BLK1
− 2	EB-3-42413	+ 12	MW-25-1	22		32	
− 3	MW-18-5	13	MW-25-1MS	23		33	
+ 4	MW-18-4	14	MW-25-1MSD	24		34	
+ 5	MW-18-3**	15		25		35	
− 6	MW-18-2	16		26		36	
− 7	MW-18-1	17		27		37	
− 8	MW-25-5	18		28		38	
− 9	MW-25-4	19		29		39	
+ 10	MW-25-3	20		30		40	

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.
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 #: 29088C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: SW
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
	04/18/2013	29APR02.D	B	54.6	All	J/UJ/P

LDC#: 29083c1

VALIDATION FINDINGS

Initial Calibration Calculation

Reviewer: SW
2nd Reviewer: d

Method: GC/MS Volatiles (EPA Method 524.2)

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

RRF = (Ax)(Cis)/(Ais)(Cx)

average RRF = sum of the RRFs/number of standards

%RSD = 100 * (S/X)

Ax = Area of compound Ais = Area of associated internal standard

Cx = Concentration of compound Cis = Concentration of internal standard

S = Standard deviation of the RRFs X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (IS)	Reported RRF (1.0 std)	Recalculated RRF (1.0 std)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
1	1304018	4/18/2013 7:00	Chloroform (1st Internal Standard)	0.9494644	0.949464	0.8715995	0.87160	5.52	5.52
			Trichloroethene (2nd Internal Standard)	0.3501367	0.350137	0.3301203	0.33012	4.71	4.71
			Ethylbenzene (3rd Internal Standard)	2.070344	2.070344	1.925438	1.92544	6.23	6.23

#	Cis	Cx	Ax	Ais
1	10	1	30059	316589
	10	1	16474	470502
	10	1	23828	115092

Conc	Chloroform	Trichloroethene	Ethylbenzene	
0.5	0.887630	0.342823	2.043477	
1	0.949464	0.350137	2.070344	
10	0.883325	0.334311	1.887303	
25	0.866537	0.328386	1.915085	
50	0.826447	0.314617	1.897387	
100	0.816194	0.310449	1.739031	
X	0.871600	0.330120	1.925438	
S	0.048149	0.015556	0.120022	

= Not used in average calculation

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

LDC#: 29883C1

VALIDATION FINDINGS

Continuing Calibration Results Verification

Reviewer: SW
2nd Reviewer:

Method: GC/MS Volatiles (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 = (Ax)(Cis)/(Ais)(Cx)

Ax = Area of compound

Cx = Concentration of compound

ave. RRF = initial calibration average RRF

Ais = Area of associated internal standard

Cis = Concentration of internal standard

RRF = continuing calibration RRF

#	Standard ID	Calibration Date	Compound (IS)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	29APR02.D	4/29/2013	Chloroform (1st Internal Standard)	0.8716	0.9406	0.9406	7.90	7.91
	29APR03.D	7:10	Trichloroethene (2nd Internal Standard)	0.3301	0.3333	0.3333	1.00	0.97
			Ethylbenzene (3rd Internal Standard)	1.9254	1.9720	1.9720	2.40	2.42
2								

#	Cis	Cx	Ax	Ais
1	10	25	778022	330877
	10	25	431650	517977
	10	25	665971	135083
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 #: 29882a

Page: 1 of 1

Reviewer: SW

2nd reviewer:

VALIDATION FINDINGS WORKSHEET

Surrogate Results Verification

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: 5

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.000	10.33	103	103.2684	0
Bromofluorobenzene	↓	9.24	92.4	92.4316	0
1,2-Dichlorobenzene-d4	↓	10.73	107	107.3347	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 #: 29883C1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: SW
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: BWD2200-BS1

Compound	Spike Added (µg/L)		Spiked Sample Concentration (µg/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
TRICHLOROETHENE	25.000	-	25.990	-	104	103.97	-	-	-	-

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 #: 29003C1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: SW
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. 5, CHLOROFORM

Conc. = $\frac{(42848)(10.00)(1)}{(324625)(0.87160)(/)(/)}$

= 1.5144 µg/L

#	Sample ID	Compound	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Qualification
	5	TRICHLOROETHENE	0.73	0.7280	—
		ETHYL BENZENE	ND	—	—

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 24, 2013

LDC Report Date: June 18, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308396

Sample Identification

EB-3-42413
MW-18-5
MW-18-4
MW-18-3**
MW-18-2
MW-18-1
MW-25-5
MW-25-4
MW-25-3
MW-25-2
MW-25-1
MW-25-1MS
MW-25-1MSD
MW-25-1DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 14 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Methods 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 metals contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Potassium	0.13735 mg/L	MW-18-5 MW-18-4 MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1
ICB/CCB	Iron	8.5921 ug/L	MW-18-5 MW-18-4 MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1
ICB/CCB	Potassium	0.22549 mg/L	EB-3-42413

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
MW-18-3**	Iron	35 ug/L	35U ug/L
MW-25-5	Iron	12 ug/L	12U ug/L
MW-25-3	Iron	9.6 ug/L	9.6U ug/L

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-3-42413 was identified as an equipment blank. No metal contaminants were found.

NASA JPL
Metals - Data Qualification Summary - SDG 1308396

No Sample Data Qualified in this SDG

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1308396

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308396	MW-18-3**	Iron	35U ug/L	A
1308396	MW-25-5	Iron	12U ug/L	A
1308396	MW-25-3	Iron	9.6U ug/L	A

LDC #: 29883C4 **VALIDATION COMPLETENESS WORKSHEET** Date: 6-14-13

SDG #: 1308396 Level III/IV Page: 1 of 1

Laboratory: BC Laboratories, Inc. Reviewer: MG

2nd Reviewer: ✓

MH.

METHOD: Metals (EPA Method 200.8) / 200.7

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: 4-24-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS/MSD Ca-4x
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	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-3-42413	11	MW-25-1	21		31	
2	MW-18-5	12	MW-25-1MS	22		32	
3	MW-18-4	13	MW-25-1MSD	23		33	
4	MW-18-3**	14	MW-25-1DUP	24		34	
5	MW-18-2	15		25		35	
6	MW-18-1	16		26		36	
7	MW-25-5	17		27		37	
8	MW-25-4	18		28		38	
9	MW-25-3	19		29	PBW1	39	
10	MW-25-2	20		30	PBW2	40	

Notes:

LDC #: 29883C4

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 #: 29883C4

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 #: 29883C4

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

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

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 11	W	Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca, Cr], Co, Cu, [✓ Fe, Pb, Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Si, CN^-,
QC12→14	↓	Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca, Cr], Co, Cu, [✓ Fe, Pb, Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,

Analysis Method

ICP	W	Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Si, CN^-,
ICP-MS	↓	Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-,

Comments: Mercury by CVAA if performed

LDC #: 29883C4
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: MG
2nd Reviewer:

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L (* K in mg/L) Associated Samples: 2-11

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (ug/L)	Action Limit	4	7	9							
Fe			8.5921	42.96	35	12	9.6							
K		0.13735*		0.6868*										

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: 1 (ND)

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Limit	No Qual.									
K			0.22549	1.1274										

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 #: 29883C4

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)
1049 ICV	ICP (Initial calibration)	Na	50720	50000	101	101	Y
1105 ICV	ICP/MS (Initial calibration)	Cr	49.675	50.000	99.4	99.4	
	CVAA (Initial calibration)						
1255 CCV2	ICP (Continuing calibration)	K	49050	50000	98.1	98.1	
1826 CCV9	ICP/MS (Continuing calibration)	As	97.863	100.00	97.9	97.9	
	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 #: 29883C4

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)
1817 IFB	ICP interference check	Fe	188.5 (mg/L)	200.00 (mg/L)	94.2	94.2	Y
1758 LCS1	Laboratory control sample	Cr	39.824 (mg/L)	40.000 (mg/L)	99.6	99.6	
1813 12	Matrix spike	Pb	(SSR-SR) 94.481 (mg/L)	100.00 (mg/L)	94.5	94.5	
1238/1240 14	Duplicate	Mg	32.00 (mg/L)	32.89 (mg/L)	2.74	2.75	
—	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 #: 29883C4

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 # 4, Fe were recalculated and verified using the following equation:

Concentration = (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:

$$\frac{(0.0355\ mg/L)(0.050\ L)(1000\ \mu g/mg)}{0.050\ L} = 35.5\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	4	Fe	35	36	Y
		Cr	2.2	2.2	↓
			(mg/L)	(mg/L)	
		Ca	63	63	
		Mg	19	19	
		Na	24	24	
		K	3.1	3.1	↓

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 24, 2013

LDC Report Date: June 18, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308396

Sample Identification

EB-3-42413
MW-18-5
MW-18-4
MW-18-3**
MW-18-2
MW-18-1
MW-25-5
MW-25-4
MW-25-3
MW-25-2
MW-25-1
EB-3-42413MS
EB-3-42413MSD
EB-3-42413DUP
MW-18-5DUP
MW-18-4MS
MW-18-4MSD
MW-18-4DUP
MW-18-3MS
MW-18-3MSD
MW-18-3DUP
MW-25-1MS
MW-25-1MSD
MW-25-1DUP
MW-18-1DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 25 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per Standard Method 2320B for Alkalinity, 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, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
EB-3-42413 MW-18-5 MW-18-4 MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1 MW-18-1DUP	pH	>5 days	48 hours	J (all detects) UJ (all non-detects)	P

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	Sulfate	0.266 mg/L	All samples in SDG 1308396
PB (prep blank)	Chloride	0.142 mg/L	EB-3-42413
ICB/CCB	Chloride	0.202 mg/L	EB-3-42413

Method Blank ID	Analyte	Concentration	Associated Samples
ICB/CCB	Chloride	0.206 mg/L	MW-18-5 MW-18-4 MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1

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
EB-3-42413	Chloride	0.27 mg/L	0.27U 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-25-1MS/MSD (EB-3-42413 MW-18-5 MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1)	Nitrite as N	-	113 (90-110)	-	J (all detects)	A
MW-25-1MS/MSD (MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1)	Hexavalent chromium	-	84.8 (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-3-42413 was identified as an equipment blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-3-42413	pH Chloride Nitrate as N	5.54 units 0.27 mg/L 0.22 mg/L

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1308396

SDG	Sample	Analyte	Flag	A or P	Reason
1308396	EB-3-42413 MW-18-5 MW-18-4 MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1	pH	J (all detects) UJ (all non-detects)	P	Technical holding time
1308396	EB-3-42413 MW-18-5 MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1	Nitrite as N	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
1308396	MW-18-3** MW-18-2 MW-18-1 MW-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1	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 1308396

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308396	EB-3-42413	Chloride	0.27U mg/L	A

LDC #: 29883C6 **VALIDATION COMPLETENESS WORKSHEET** Date: 6-17-13
SDG #: 1308396 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: MG
2nd Reviewer: ✓

9m.M.

METHOD: Alkalinity (SM2320B), Chloride, Sulfate, ~~Nitrite-N~~, Nitrate-N (EPA Method 300.0), Perchlorate (EPA Method 314.0), Nitrite-N (EPA Method 353.2), Hexavalent Chromium (EPA SW846 Method 7196), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	SW	Sampling dates: 4-24-13
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	A	Not reviewed for Level III validation.
IX.	Overall assessment of data	A	
X.	Field duplicates	N	
XI	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-3-42413	11	MW-25-1	21	MW-18-3DUP	31	
2	MW-18-5	12	EB-3-42413MS	22	MW-25-1MS	32	
3	MW-18-4	13	EB-3-42413MSD	23	MW-25-1MSD	33	
4	MW-18-3**	14	EB-3-42413DUP	24	MW-25-1DUP	34	
5	MW-18-2	15	MW-18-5DUP	25	MW-18-1DUP	35	
6	MW-18-1	16	MW-18-4MS	26		36	
7	MW-25-5	17	MW-18-4MSD	27		37	
8	MW-25-4	18	MW-18-4DUP	28		38	
9	MW-25-3	19	MW-18-3MS	29		39	PBW 1
10	MW-25-2	20	MW-18-3MSD	30		40	PBW 2

Notes: _____

LDC #: 29883C6

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
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 #: 29883C6

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 → 11	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		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
19 → 21		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} [✓ ClO_4]
22, 23		pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4]
24		pH [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] PO_4 ALK CN^- NH_3 TKN TOC [✓ CR^{6+}] [✓ ClO_4]
↓ 25	↓	[✓ 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 #: 29883C6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

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

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:	150.1					
Parameters:	pH					
Technical holding time:	48 hr					

Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1	07:00 4-24-13	15:01 4-29-13	>5 days				J/UJ/P
2	07:30 4-24-13	15:06 4-29-13					
3	08:05 4-24-13	15:12 4-29-13					
4	10:20 4-24-13	15:18 4-29-13					
5	10:50 4-24-13	15:25 4-29-13					
6	11:20 4-24-13	15:48 4-29-13					
7	12:35 4-24-13	16:02 4-29-13					
8	13:05 4-24-13	16:08 4-29-13					
9	13:35 4-24-13	16:15 4-29-13					
10	14:05 4-24-13	16:21 4-29-13					
11	14:40 4-24-13	16:27 4-29-13					
25	11:20 4-24-13	15:55 4-29-13					

LDC #: 29883C6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** all (>5x or ND)

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		No Qual's.									
SO4		0.266	1.330										

Conc. units: mg/L **Associated Samples:** 1

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		1									
Cl	0.142	0.202	1.010	0.27									

Conc. units: mg/L **Associated Samples:** 2-11 (>5x)

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		No Qual's.									
Cl		0.206	1.030										

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 #: 29883C6

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?
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	22/23	water	NO2-N		113 (90-110)		1, 2, 4→11	J dets / A
	↓	↓	Cr VI		84.8 (85-115)		4 → 11	J/UJ /A

Comments:

LDC #: 29883C6
SDG #: —

VALIDATION FINDINGS WORKSHEET
Field Blanks

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

METHOD: Inorganics, EPA Method _____

(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) (EB)

Analyte	Concentration Units ( )
pH	5.54 (pH units)
Cl	0.27 (mg/L)
NO3-N	0.22 (↓)

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

Analyte	Concentration Units ( )

LDC #: 29883C6

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: 4-22-13

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=0.999892	r^2=0.999819	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 (↓)	0.077			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	Cl	0812 CCV3	51.676 (mg/L)	50.000 (mg/L)	103	103	
Calibration verification	NO_2-N	0917 CCV1	0.478 (mg/L)	0.500 (mg/L)	95.6	95.6	
Calibration verification	ClO_4	1259 CCV1	8.964 (µg/L)	10.000 (µg/L)	89.6	89.6	

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 #: 29883C6

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)
1619 LCS	Laboratory control sample	ClO_4	10.455 (ug/L)	10.000 (ug/L)	105	105	Y
0923 22	Matrix spike sample	NO_2-N	(SSR-SR) 0.5815 (mg/L)	0.52632 (mg/L)	110	110	↓
0651/0705 24	Duplicate sample	SO_4	134.14 (mg/L)	133.73 (mg/L)	0.306	0.308	↓

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 #: 29883C6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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 #4, 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 = 2x

Recalculation:

$$0.020 = 0.0011\left(\frac{x}{2}\right) - 0.0000$$

$$36.364\ \mu g/L = x$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	4	pH	8.03 (pH unit)	8.03 (pH unit)	Y
		TDS	320	320	
		Cl	20	20	
		NO_3-N	1.8	1.8	
		SO_4	37	37	
		ClO_4	36 (µg/L)	36 (µg/L)	
		Cr VI	0.00095	0.00095	
		Bicarbonate	240	240	
		Total Alk	200	200	

Note:

Laboratory Data Consultants, Inc.

7750 El Camino Real, Ste. 2L Carlsbad, CA 92009

Phone 760.634.0437 **Web** www.lab-data.com **Fax** 760.634.0439

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

July 1, 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 June 20, 2013. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 29932:

SDG #	Fraction
1308499, 1308571 1308887, 1309034 1309146	Volatiles, 1,4-Dioxane, Metals, Wet Chemistry

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

- 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,

ERauto

Erlinda T. Rauto
Operations Manager/Senior Chemist

1 WEEK TAT

Attachment 1

90/10 (client select)

LDC #29932 (Battelle-San Diego / NASA JPL)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (524.2)		1,4-Dioxane (8270C)		Metals (200.8/ 200.7)		Alk (2320B)		Cl, SO_4 NO_3-N (300.0)		NO_2-N (353.2)		O-PO_4 (365.1)		CLO_4 (314.0)		Cr(VI) (7196)		TDS (160.1)		pH (150.1)											
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	1308499	06/20/13	06/27/13	11	0	1	0	16	0	11	0	13	0	16	0	-	-	16	0	16	0	11	0	11	0										
A	1308499	06/20/13	06/27/13	2	0	0	0	2	0	2	0	2	0	2	0	-	-	2	0	2	0	2	0	2	0										
B	1308571	06/20/13	06/27/13	10	0	1	0	13	0	8	0	10	0	10	0	-	-	10	0	10	0	8	0	8	0										
B	1308571	06/20/13	06/27/13	1	0	0	0	1	0	1	0	1	0	1	0	-	-	1	0	1	0	1	0	1	0										
C	1308887	06/20/13	06/27/13	17	0	-	-	18	0	13	0	18	0	18	0	4	0	18	0	18	0	14	0	13	0										
D	1309034	06/20/13	06/27/13	9	0	1	0	9	0	7	0	9	0	9	0	6	0	6	0	9	0	6	0	7	0										
E	1309146	06/20/13	06/27/13	10	0	1	0	10	0	7	0	10	0	10	0	4	0	10	0	10	0	7	0	7	0										
Total	T/LR			60	0	4	0	69	0	49	0	63	0	66	0	14	0	63	0	66	0	49	0	49	0	0	0	0	0	0	0	0	0	0	552

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: April 25, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308499

Sample Identification

TB-4-42513
EB-4-42513
MW-22-5**
MW-22-4
MW-22-3
MW-22-2
MW-22-1**
MW-4-5
MW-4-4
MW-4-3
MW-4-2
MW-4-1
DUP-3-2Q13

**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
4/28/13	Bromomethane	45.8	All samples in SDG 1308499	J (all detects) UJ (all non-detects)	P
4/28/13	Methyl iodide Pentachloroethane	38.3 97.7	All samples in SDG 1308499	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.

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) analysis was not required by the method.

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-22-3 and DUP-3-2Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-22-3	DUP-3-2Q13	
Chloroform	0.15	0.16	6
Trichloroethene	0.11	0.13	17

XVII. Field Blanks

Sample TB-4-42513 was identified as a trip blank. No volatile contaminants were found.

Sample EB-4-42513 was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1308499

SDG	Sample	Compound	Flag	A or P	Reason
1308499	TB-4-42513 EB-4-42513 MW-22-5** MW-22-4 MW-22-3 MW-22-2 MW-22-1** MW-4-5 MW-4-4 MW-4-3 MW-4-2 MW-4-1 DUP-3-2Q13	Bromomethane Methyl iodide Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308499

No Sample Data Qualified in this SDG

LDC #: 29932A1 **VALIDATION COMPLETENESS WORKSHEET** Date: 6/21/13
SDG #: 1308499 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: FT
2nd Reviewer: [signature]

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: 4/25/13
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	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	N	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 = 5, 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 1	TB-4-42513	11 2	MW-4-2	21 1	BWD2198	31	
2 1	EB-4-42513	12 2	MW-4-1	22 2	BWD2199	32	
3 1	MW-22-5**	13 2	DUP-3-2Q13 D	23	1305501-CCB2	33	
4 1	MW-22-4	14		24		34	
5 1	MW-22-3	15		25		35	
6 1	MW-22-2 D	16		26		36	
7 1	MW-22-1**	17		27		37	
8 1	MW-4-5	18		28		38	
9 2	MW-4-4	19		29		39	
10 2	MW-4-3	20		30		40	

LDC #: 29932A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [signature]

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 #: 29932A1

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.
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 #: 29932A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: EB
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
	4/22/13 19:44	1305501-CCV3	B	45.8	All	J/UJ/p
	4/22/13 20:06	1305501-CCV4	Methyl Iodide	38.3	↓	↓
			Pentachloroethane	97.7		

LDC#: 29932A1 **VALIDATION FINDINGS WORKSHEET**
Field Duplicates

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

METHOD: GC/MS VOA (EPA 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
	5	13	
K	0.15	0.16	6
S	0.11	0.13	17

V:\FIELD DUPLICATES\templates\29932A1.wpd

LDC #: 29932A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

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

METHOD: GC/MS VOA (EPA Method 524.2)

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (std)	Recalculated RRF (std)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported %RSD	Recalculated %RSD
1	ICAL	4/18/13	Acetone (160) (1st Internal Standard)	3.056215×10^{-2}	0.03056	2.805742×10^{-2}	0.028057	7.107243 ~~4.473303~~	7.107
			Methyl Metacrylate (40) (2nd Internal Standard)	7.66857×10^{-2}	0.07668	7.123823×10^{-2}	0.071238	4.473303	4.473
			Pentachloroethane (8) (3rd Internal Standard)	0.551458	0.55145	0.544712	0.54471	5.854311	5.854
2	ICAL	4/18/13	C (10) (1st Internal Standard)	0.903516	0.90335	0.8086408	0.86864	10.66688	10.667
			S (10) (2nd Internal Standard)	0.3343105	0.33431	0.3301203	0.33012	4.712199	4.7122
			EE (10) (3rd Internal Standard)	1.887303	1.88730	1.925438	1.92544	6.233496	6.233
3			(1st Internal Standard)						
			(2nd Internal Standard)						
			(3rd Internal Standard)						
4			(1st Internal Standard)						
			(2nd Internal Standard)						
			(3rd Internal Standard)						

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

LDC #: 27932A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: R

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	4/24/13	4/28/13	Acetone (1st Internal Standard)	2.805742×10^{-2}	0.0283168	0.0283168	0.9	0.9
	0804		Methyl Methacrylate (2nd Internal Standard)	7.123823×10^{-2}	0.0712211	0.0712211	0.02	0.02
	CCV		Pentachloroethane (3rd Internal Standard)	0.5447112	0.4415269	0.4415269	18.9	18.9
2			C (1st Internal Standard)	0.8686408	0.9425032	0.9425032	8.5	8.5
			S (2nd Internal Standard)	0.3301203	0.3204304	0.3204304	2.9	2.9
			EE (3rd Internal Standard)	1.925438	1.973215	1.973215	2.5	2.5
3	CCV	4/28/13	(1st Internal Standard)	↓	~~0.03156332~~ 2.872798×10^{-2}	0.02872198	F1 ~~12.5~~ 2.4	2.4
	1944		(2nd Internal Standard)		~~0.0790772~~ 7.400425×10^{-2}	0.07400425	~~11.0~~ 3.9	3.9
			(3rd Internal Standard)		~~0.01317714~~ 1.250324×10^{-2}	0.01250324	~~97.6~~ 97.7	97.7
4			(1st Internal Standard)		0.9541326	0.9541326	9.8	9.8
			(2nd Internal Standard)		0.3526925	0.3526925	6.8	6.8
			(3rd Internal Standard)	↓	1.928373	1.928373	0.2	0.2

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 #: 29932A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample 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 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: BWD2198-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	26.040	NA	104	104				
Trichloroethene			25.200		101	101				
Benzene			26.490		106	106				
Toluene			25.910		104	104				
Chlorobenzene			25.440		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 #: 29932A)

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: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.0	10.07	101	101	0
Bromofluorobenzene	↓	9.27	92.7	92.7	↓
1,2-Dichlorobenzene-d4		11.09	111	111	
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 #: 29932A1

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. #3 , G :

Conc. = (24940)(10)( )
(323815)(1.393535)( )

=

0.55 ug/L

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 25, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: 1,4-Dioxane

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308499

Sample Identification

MW-4-1

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8270C for 1,4-Dioxane.

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.

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.

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

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No 1,4-Dioxane was 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

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and RLs

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

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

No field blanks were identified in this SDG.

NASA JPL
1,4-Dioxane - Data Qualification Summary - SDG 1308499

No Sample Data Qualified in this SDG

NASA JPL
1,4-Dioxane - Laboratory Blank Data Qualification Summary - SDG 1308499

No Sample Data Qualified in this SDG

LDC #: 29932A2
SDG #: 1308499
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/21/13
Page: 1 of 1
Reviewer: FT
2nd Reviewer: ~

METHOD: GC/MS 1,4-Dioxane (EPA SW 846 Method 8270C ~~SIM~~)

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

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 4/25/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	~~%R SD ≤ 30~~ F7 r^2
IV.	Continuing calibration/ICV	A	ICV/CCV ± 25
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
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	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: water

1	MW-4-1	11	BWE0259-BLK1	21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 25, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308499

Sample Identification

EB-4-42513
MW-22-5**
MW-22-4
MW-22-3
MW-22-2
MW-22-1**
MW-4-5
MW-4-4
MW-4-3
MW-4-2
MW-4-1
DUP-3-2Q13
EB-4-42513MS
EB-4-42513MSD
EB-4-42513DUP
MW-22-1MS
MW-22-1MSD
MW-22-1DUP

**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 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 metals contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Iron	17.608 ug/L	EB-4-42513 MW-22-4 MW-22-3 MW-22-2 MW-22-1** MW-4-5 MW-4-4 MW-4-3 MW-4-2
ICB/CCB	Iron	0.0069302 mg/L	EB-4-42513 MW-22-4 MW-22-3 MW-22-2 MW-22-1** MW-4-5 MW-4-4 MW-4-3 MW-4-2

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-4-42513	Iron	7.8 ug/L	7.8U ug/L
MW-22-4	Iron	14 ug/L	14U ug/L
MW-22-3	Iron	19 ug/L	19U ug/L
MW-22-2	Iron	40 ug/L	40U ug/L

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-22-3 and DUP-3-2Q13 were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-22-3	DUP-3-2Q13	
Calcium	62 mg/L	61 mg/L	2
Chromium	2.1 ug/L	2.0 ug/L	5
Iron	19 ug/L	6.5U ug/L	200
Magnesium	21 mg/L	20 mg/L	5
Potassium	2.3 mg/L	2.3 mg/L	0
Sodium	41 mg/L	40 mg/L	2

XV. Field Blanks

Sample EB-4-42513 was identified as an equipment blank. No metal contaminants were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-4-42513	Iron	7.8 ug/L

NASA JPL
Metals - Data Qualification Summary - SDG 1308499

No Sample Data Qualified in this SDG

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1308499

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308499	EB-4-42513	Iron	7.8U ug/L	A
1308499	MW-22-4	Iron	14U ug/L	A
1308499	MW-22-3	Iron	19U ug/L	A
1308499	MW-22-2	Iron	40U ug/L	A

LDC #: 29932A4
SDG #: 1308499
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 6/20/13
Page: 1 of 1
Reviewer: CR
2nd Reviewer: V

METHOD: Metals (EPA Method 200.7/200.8)

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: 4/25/13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS/D
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	
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	(4,12)
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

1	EB-4-42513	11	MW-4-1	21		31	
2	MW-22-5**	12	DUP-3-2Q13	22		32	
3	MW-22-4	13	EB-4-42513MS	23		33	
4	MW-22-3	14	EB-4-42513MSD	24		34	
5	MW-22-2	15	EB-4-42513DUP	25		35	
6	MW-22-1**	16	MW-22-1MS	26		36	
7	MW-4-5	17	MW-22-1MSD	27		37	
8	MW-4-4	18	MW-22-1DUP	28		38	
9	MW-4-3	19		29		39	
10	MW-4-2	20		30		40	

Notes:

LDC #: 29932A4

VALIDATION FINDINGS CHECKLIST

Reviewer: CR
2nd Reviewer: W

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 #: 29932A4

VALIDATION FINDINGS CHECKLIST

Reviewer: CR
2nd Reviewer: [illegible]

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 #: 29932A4

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

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

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-12		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
QC: 13,14		Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
15		Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
16,17		Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
18		Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti

Comments: Mercury by CVAA if performed

LDC #: 29932A4

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: AL
2nd Reviewer:

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)
Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L
Associated Samples: 1, 3-10

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	1	3	4	5					
Fe		17.608	0.0069302	88.04	7.8	14	19	40					

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#: 29932A4

VALIDATION FINDINGS WORKSHEET

Field Duplicates

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

METHOD: Metals (EPA Method 6010B/7000)

Analyte	Concentration (ug/L)		RPD
	4	12	
Calcium (mg/L)	62	61	2
Chromium	2.1	2.0	5
Iron	19	6.5U	200
Magnesium (mg/L)	21	20	5
~~Potassium~~ or Na	41	40	2
~~Sodium~~ or K	2.3	2.3	0

LDC #: 29935A4

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd reviewer: W

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
Fe	7.8

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

Analyte	Concentration Units ( )

LDC #: 29932A4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: QR
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)
ICV	ICP (Initial calibration)	Fe	51.111	50	102	102	Y
ICV	ICP/MS (Initial calibration)	Cr	49.58	50	99.2	99.2	
	CVAA (Initial calibration)						
CCV3	ICP (Continuing calibration)	~~Fe 50.254~~	50.251	50.0	101	101	
CCV3	ICP/MS (Continuing calibration)	As	104	100	104	104	
	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 #: 29932A4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: QR
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)
ICSAB	ICP interference check	Ca	487.28	500	97.5	97.5	Y
LCS	Laboratory control sample	Fe	1041.8	1000	104	104	
18	Matrix spike	As	(SSR-SR) 108.71	100	109	109	
18	Duplicate	Cr	0.599	0.609	1.66	1.66	
N	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 #: 29938A4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: QR
2nd reviewer: W

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 Ca 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:

Raw Data = 5.469 mg/L

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
	2	Fe	16	16	Y
		Ca (mg/L)	5.5	5.5	
		Mg	1.3	1.3	
		Na	66	66	
		K	0.73	0.73	

Note: _____

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 25, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308499

Sample Identification

EB-4-42513
MW-22-5**
MW-22-4
MW-22-3
MW-22-2
MW-22-1**
MW-4-5
MW-4-4
MW-4-3
MW-4-2
MW-4-1
DUP-3-2Q13
EB-4-42513MS
EB-4-42513MSD
EB-4-42513DUP
MW-22-5MS
MW-22-5MSD
MW-22-5DUP
MW-22-3MS
MW-22-3MSD
MW-22-3DUP
MW-22-2DUP
MW-4-1MS
MW-4-1MSD
MW-4-1DUP
DUP-3-2Q13MS
DUP-3-2Q13MSD
DUP-3-2Q13DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 28 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per Standard Method 2320B for Alkalinity, 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, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
EB-4-42513 MW-22-5** MW-22-4 MW-22-3 MW-22-2 MW-22-1** MW-4-5 MW-4-4 MW-4-3 MW-4-2 MW-4-1 DUP-3-2Q13 MW-22-3DUP	pH	5 days	48 hours	J (all detects) UJ (all non-detects)	P

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	0.151 mg/L	MW-4-1 DUP-3-2Q13

Method Blank ID	Analyte	Concentration	Associated Samples
PB (prep blank)	Chloride	0.179 mg/L	EB-4-42513 MW-22-5** MW-22-4 MW-22-3 MW-22-2 MW-22-1** MW-4-5 MW-4-4 MW-4-3 MW-4-2
ICB/CCB	Chloride	0.167 mg/L	All samples in SDG 1308499

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
EB-4-42513	Chloride	0.26 mg/L	0.26U 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

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-22-3 and DUP-3-2Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-22-3	DUP-3-2Q13	
pH (units)	8.15 units	8.20 units	1
TDS	400 mg/L	390 mg/L	3
Chloride	49 mg/L	49 mg/L	0
Nitrate as N	9.6 mg/L	9.7 mg/L	1
Sulfate	52 mg/L	52 mg/L	0
Perchlorate	2.3 ug/L	2.6 ug/L	12
Hexavalent Chromium	0.0015 mg/L	0.0013 mg/L	14
Total Alkalinity	160 mg/L	160 mg/L	0
Bicarbonate Alkalinity	200 mg/L	200 mg/L	0

XI. Field Blanks

Sample EB-4-42513 was identified as an equipment blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-4-42513	pH Chloride	6.17 units 0.26 mg/L

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1308499

SDG	Sample	Analyte	Flag	A or P	Reason
1308499	EB-4-42513 MW-22-5** MW-22-4 MW-22-3 MW-22-2 MW-22-1** MW-4-5 MW-4-4 MW-4-3 MW-4-2 MW-4-1 DUP-3-2Q13	pH	J (all detects) UJ (all non-detects)	P	Technical holding times

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 1308499

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308499	EB-4-42513	Chloride	0.26U mg/L	A

LDC #: 29932A6
SDG #: 1308499
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 6/21/13
Page: 1 of 1
Reviewer: CR
2nd Reviewer: [illegible]

METHOD: Alkalinity (SM2320B), 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), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	SW	Sampling dates: 4/25/13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/D
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	(4,12)
XI	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
water

1	EB-4-42513	11	MW-4-1	21	MW-22-3DUP	31	
2	MW-22-5**	12	DUP-3-2Q13	22	MW-22-2DUP	32	
3	MW-22-4	13	EB-4-42513MS	23	MW-4-1MS	33	
4	MW-22-3	14	EB-4-42513MSD	24	MW-4-1MSD	34	
5	MW-22-2	15	EB-4-42513DUP	25	MW-4-1DUP	35	
6	MW-22-1**	16	MW-22-5MS	26	DUP-3-2Q13MS	36	
7	MW-4-5	17	MW-22-5MSD	27	DUP-3-2Q13MSD	37	
8	MW-4-4	18	MW-22-5DUP	28	DUP-3-2Q13DUP	38	
9	MW-4-3	19	MW-22-3MS	29		39	
10	MW-4-2	20	MW-22-3MSD	30		40	

Notes: _____

LDC #: 29932A6

VALIDATION FINDINGS CHECKLIST

Reviewer: QR
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 #: 29932A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Parameter
1 -12	[✓ pH] [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 [✓ Alk] CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 13	pH TDS Cl F NO_3 [✓ NO_2] SO_4 O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
14	pH TDS Cl F NO_3 [✓ NO_2] SO_4 O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
15	pH TDS Cl F NO_3 [✓ NO_2] SO_4 O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
16	pH TDS [✓ Cl] F [✓ NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
17	pH TDS [✓ Cl] F [✓ NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
18	pH TDS [✓ Cl] F [✓ NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
19	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
20	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
21	[✓ pH] TDS Cl F NO_3 NO_2 SO_4 O-PO_4 [✓ Alk] CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
22	pH [✓ TDS] Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
23	pH TDS Cl F NO_3 [✓ NO_2] SO_4 O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
24	pH TDS Cl F NO_3 [✓ NO_2] SO_4 O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
25	pH TDS Cl F NO_3 [✓ NO_2] SO_4 O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
26	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
27	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
28	pH TDS Cl F NO_3 ~~NO_2~~ SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 29932A6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: QR
2nd reviewer:

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:	150.1					
Parameters:	pH					
Technical holding time:	48hrs					

Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1-12,21	4/25/13	4/30/13	(5 days)				J/UJ/P

LDC #: 29932A6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer:
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** 11, 12

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		No Qualifiers								
Cl	0.151		0.755									

Conc. units: mg/L **Associated Samples:** 1-10

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		1								
Cl	0.179		0.895	0.26								

Conc. units: mg/L **Associated Samples:** All

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		1								
Cl		0.167	0.835	See PB								

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# 29932A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

Inorganics: Method See Cover

Analyte	Concentration (mg/L)		RPD
	4	12	
pH (units)	8.15	8.20	1
TDS	400	390	3
Chloride	49	49	0
Nitrate as N	9.6	9.7	1
Sulfate	52	52	0
Perchlorate (ug/L)	2.3	2.6	12
Hexavalent Chromium	0.0015	0.0013	14
Total Alkalinity	160	160	0
Bicarbonate Alkalinity	200	200	0

LDC #: 29932A6
SDG #: —

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: A
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) (EB)

Analyte	Concentration Units (mg/L)
pH (units)	6.17
Cl	0.26

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

Analyte	Concentration Units ( )

LDC #: 29932A6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

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

Method: Inorganics, Method Seacam

The correlation coefficient (r) for the calibration of Cl was recalculated. Calibration date: 4/26/13

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	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial Calibration Verification	Cl	s1	0	0	*1.000*	0.997	Y
		s2	5	0.697			
		s3	20	3.145			
		s4	50	9.455			
		s5	100	20.57			
		s6	200	43.443			
Calibration verification	Cl	CCV	10	10.113	101	101	
Calibration verification	NO_2-N	↓	0.5	0.4663	93.2	93.2	
Calibration verification	SO_4	↓	0.05	0.051757	104	104	↓

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 #: 29932

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: GR
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)
LCS	Laboratory control sample	TOS	565	586	96.4	96.4	Y
16	Matrix spike sample	NO3N	(SSR-SR) 5.1475	5.050S	102	102	
21	Duplicate sample	pH	8.15	8.19	0.49	0.49	

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 #: 20053A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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 SO4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = $y = 0.0001x^2 + 0.1226x - 0.03$

Recalculation:

$$\frac{\sqrt{4(0.0001)(4787 + 0.03) + (0.1226)^2} - 0.1226}{2(0.0001)} = 38.1 \text{ mg/L}$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
	2	pH (units)	9.11	9.11	Y
		TDS	210	210	
		Cl	7.2	7.2	
		SO4	38	38	
		Total Alk	96	96	
		Bicarb	82	82	
		Carb.	18	18	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 26, 2013

LDC Report Date: June 24, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308571

Sample Identification

TB-5-42613
EB-5-42613
MW-17-5
MW-17-4
MW-17-3
MW-17-2
MW-17-1**
MW-26-2
MW-26-1
EB-5-42613MS
EB-5-42613MSD

Introduction

This data review covers 11 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.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 30.0% with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
4/29/13	Bromomethane	51.9	All samples in SDG 1308571	J (all detects) UJ (all non-detects)	P
4/29/13	Pentachloroethane	32.1	All samples in SDG 1308571	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.

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

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-5-42613 was identified as a trip blank. No volatile contaminants were found.

Sample EB-5-42613 was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1308571

SDG	Sample	Compound	Flag	A or P	Reason
1308571	TB-5-42613 EB-5-42613 MW-17-5 MW-17-4 MW-17-3 MW-17-2 MW-17-1** MW-26-2 MW-26-1	Bromomethane Pentachloroethane	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308571

No Sample Data Qualified in this SDG

LDC #: 29932B1 **VALIDATION COMPLETENESS WORKSHEET** Date: 6/21/13
SDG #: 1308571 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: 4/26/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	%RSD ≤ 30, 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	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 N FT	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	TB-5-42613	11	EB-5-42613MSD	21	BWD231 2	31	
2	EB-5-42613	12		22		32	
3	MW-17-5	13		23		33	
4	MW-17-4	14		24		34	
5	MW-17-3	15		25		35	
6	MW-17-2	16		26		36	
7	MW-17-1**	17		27		37	
8	MW-26-2	18		28		38	
9	MW-26-1	19		29		39	
10	EB-5-42613MS	20		30		40	

LDC #: 29932B 1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: V

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? F7	✓		✓	
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? F7	✓		✓	
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.
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 #: 29932 B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FD
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
	4/29/13 19:13	1305507-CCV3	B	51.9	All	J/UJ/P
	4/29/13 19:59	1305507-CCV4	Pentachloroethane	32.1	↓	J/UJ/P

LDC #: 29932A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (std)	Recalculated RRF (std)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported %RSD	Recalculated %RSD
1	ICAL	4/18/13	Acetone (160) (1st Internal Standard)	3.056215×10^{-2}	0.03056	2.805742×10^{-2}	0.028057	~~7.107243~~ ~~4.473303~~	7.107
			Methyl Metacrylate (40) (2nd Internal Standard)	7.66857×10^{-2}	0.07668	7.123823×10^{-2}	0.071238	4.473303	4.473
			Pentachloroethane (8) (3rd Internal Standard)	0.551458	0.55145	0.5447112	0.54471	5.854311	5.854
2	ICAL	4/18/13	C (10) (1st Internal Standard)	0.9033516	0.90335	0.8086408	0.86864	10.66688	10.667
			S (10) (2nd Internal Standard)	0.3343105	0.33431	0.3301203	0.33012	4.712199	4.7122
			EE (10) (3rd Internal Standard)	1.887303	1.88730	1.925438	1.92544	6.233496	6.233
3			(1st Internal Standard)						
			(2nd Internal Standard)						
			(3rd Internal Standard)						
4			(1st Internal Standard)						
			(2nd Internal Standard)						
			(3rd Internal Standard)						

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

LDC #: 29932-B1

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	dcv	4/29/13	Acetone (1st Internal Standard)	2.405742×10^{-1}	2.821777×10^{-2}	0.0282177	0.6	0.6
			Methyl methacrylate (2nd Internal Standard)	7.123823×10^{-2}	7.341894×10^{-2}	0.0734189	3.1	3.1
			Pentachloroethane (3rd Internal Standard)	0.5447112	0.3700894	0.370089	32.1	32.1
2			c (1st Internal Standard)	0.8686408	0.9950631	0.9950631	14.6	14.6
			S (2nd Internal Standard)	0.3301203	0.3322576	0.3322576	0.6	0.6
			EE (3rd Internal Standard)	1.925438	1.980674	1.980674	2.9	2.9
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 #: 29932B1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method ~~8260~~) 524.2 ✓7

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 - MSDC I * 2/(MSC + MSDC) MSC = Matrix spike percent recovery MSDC = Matrix spike duplicate percent recovery

MS/MSD sample: 10 + 11

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	25.800	26.240	103	103	105	105	1.69	1.69
Trichloroethene	↓	↓	↓	25.320	25.190	101	101	101	101	0.515	0.515
Benzene	↓	↓	↓	26.890	27.290	108	108	109	109	1.48	1.48
Toluene	↓	↓	↓	26.590	26.510	106	106	106	106	0.301	0.301
Chlorobenzene	↓	↓	↓	25.800	26.030	103	103	104	104	0.888	0.888

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 #: 29932B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample 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 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: BWD2312-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	27.13U	NA	109	109				
Trichloroethene			28.76U		115	115				
Benzene			28.06U		112	112				
Toluene			27.92U		112	112				
Chlorobenzene			26.58U		106	106	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 #: 29932B1

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	10.09	101	101	0
Bromofluorobenzene	↓	9.19	91.9	91.9	↓
1,2-Dichlorobenzene-d4		11.10	111	111	
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 #: 29932B /

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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. _____ , _____:

Conc. = ( ) ( ) ( ) / ( ) ( ) ( ) ( )

= MD

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 26, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: 1,4-Dioxane

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308571

Sample Identification

MW-17-4

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8270C for 1,4-Dioxane.

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.

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.

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

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No 1,4-Dioxane was 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

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and RLs

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

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

No field blanks were identified in this SDG.

NASA JPL
1,4-Dioxane - Data Qualification Summary - SDG 1308571

No Sample Data Qualified in this SDG

NASA JPL
1,4-Dioxane - Laboratory Blank Data Qualification Summary - SDG 1308571

No Sample Data Qualified in this SDG

LDC #: 29932B2
SDG #: 1308571
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/21/13
Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS 1,4-Dioxane (EPA SW 846 Method 8270C-SIM)

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

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 4/26/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	r^2
IV.	Continuing calibration/ICV	A	ICV/CCV ≤ 25
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
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	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:
Water

1	MW-17-4	11	BWE0259-BLK1	21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 26, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308571

Sample Identification

EB-5-42613
MW-17-5
MW-17-4
MW-17-3
MW-17-2
MW-17-1**
MW-26-2
MW-26-1
EB-5-42613MS
EB-5-42613MSD
EB-5-42613DUP
MW-17-1MS
MW-17-1MSD
MW-17-1DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 14 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Methods 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 metals contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Iron	0.010409 mg/L	MW-17-1** MW-26-2 MW-26-1
ICB/CCB	Potassium	0.23256 mg/L	EB-5-42613 MW-17-5 MW-17-4 MW-17-3 MW-17-2

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.

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-5-42613 was identified as an equipment blank. No metal contaminants were found.

NASA JPL
Metals - Data Qualification Summary - SDG 1308571

No Sample Data Qualified in this SDG

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1308571

No Sample Data Qualified in this SDG

LDC #: 29932B4
SDG #: 1308571
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 6/21/13
Page: 1 of 1
Reviewer: CA
2nd Reviewer: W

METHOD: Metals (EPA Method 200.7/200.8)

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: 4/26/13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS/D ~~(Na, K >4x)~~ a (Ca >4x)
VII.	Duplicate Sample Analysis	N	
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	Not reviewed for level III
X.	Furnace Atomic Absorption QC	N	
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

water

1	EB-5-42613	11	EB-5-42613DUP	21		31	
2	MW-17-5	12	MW-17-1MS	22		32	
3	MW-17-4	13	MW-17-1MSD	23		33	
4	MW-17-3	14	MW-17-1DUP	24		34	
5	MW-17-2	15		25		35	
6	MW-17-1**	16		26		36	
7	MW-26-2	17		27		37	
8	MW-26-1	18		28		38	
9	EB-5-42613MS	19		29		39	
10	EB-5-42613MSD	20		30		40	

Notes:

LDC #: 29932B4

VALIDATION FINDINGS CHECKLIST

Reviewer: CR
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 #: 29932B4

VALIDATION FINDINGS CHECKLIST

Reviewer: CR
2nd Reviewer: VV

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 #: 29932B1

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

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

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-8		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca, Cr], Co, Cu, [✓ Fe, Pb, Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
QC: 9, 10, 11		Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, ~~Fe~~, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
12-14		Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Analysis Method
ICP		Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti

Comments: Mercury by CVAA if performed

LDC #: 29932B4

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: AL
2nd Reviewer: AL

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: 6-8

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	No qualifiers								
Fe			0.010409	52.045									

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: 1-5

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	No qualifiers								
K			0.23256	1.1628									

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 #: 29932B4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: QR
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 / True x 100 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)
ICV	ICP (Initial calibration)	Mg	49.486	50	99.0	99.0	Y
↓	ICP/MS (Initial calibration)	Cr	49.042	50	98.1	98.1	
	CVAA (Initial calibration)						
CCV	ICP (Continuing calibration)	Ca	50.609	50	101	101	
↓	ICP/MS (Continuing calibration)	Pb	99.727	100	99.7	99.7	↓
	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 #: 29932B4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

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

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)
ICSAB	ICP interference check	Mg	508.51	500	102	102	Y
LCS	Laboratory control sample	Pb	107.56	100	108	108	↓
9	Matrix spike	As	(SSR-SR) 103.08	100	103	103	↓
14	Duplicate	Fe	279.82	299.98	6.95	6.95	↓
N	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 #: 29932B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: CR
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 Fe 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:

0.2798 mg/L (1000) = 279.8 mg/L

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
	6	Fe	280	280	Y
		Ca (mg/L)	59	59	
		Mg	20	20	
		Na	20	20	
		K	2.9	2.9	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 26, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308571

Sample Identification

EB-5-42613
MW-17-5
MW-17-4
MW-17-3
MW-17-2
MW-17-1**
MW-26-2
MW-26-1
MW-17-5MS
MW-17-5MSD
MW-17-5DUP
MW-17-1MS
MW-17-1MSD
MW-17-1DUP
MW-26-1DUP

**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 Standard Method 2320B for Alkalinity, 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, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
EB-5-42613 MW-17-5 MW-17-4 MW-17-3 MW-17-2 MW-17-1** MW-26-2 MW-26-1 MW-26-1DUP	pH	6 days	48 hours	J (all detects) UJ (all non-detects)	P

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	Chloride	0.155 mg/L	EB-5-42613 MW-17-5 MW-17-4 MW-17-3
ICB/CCB	Chloride Sulfate	0.240 mg/L 0.269 mg/L	MW-17-2 MW-17-1** MW-26-2 MW-26-1

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
EB-5-42613	Chloride	0.33 mg/L	0.33U 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

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-5-42613 was identified as an equipment blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-1-42613	pH Chloride Sulfate Total Alkalinity Bicarbonate Alkalinity	6.10 units 0.33 mg/L 0.35 mg/L 4.1 mg/L 5.0 mg/L

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1308571

SDG	Sample	Analyte	Flag	A or P	Reason
1308571	EB-5-42613 MW-17-5 MW-17-4 MW-17-3 MW-17-2 MW-17-1** MW-26-2 MW-26-1	pH	J (all detects) UJ (all non-detects)	P	Technical holding times

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 1308571

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308571	EB-5-42613	Chloride	0.33U mg/L	A

LDC #: 29932B6
SDG #: 1308571
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 6/21/13
Page: 1 of 1
Reviewer: AR
2nd Reviewer: W

METHOD: Alkalinity (SM2320B), 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), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	SW	Sampling dates: 4/26/13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/D
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	N	
XI	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

water

1	EB-5-42613	11	MW-17-5DUP	21		31	
2	MW-17-5	12	MW-17-1MS	22		32	
3	MW-17-4	13	MW-17-1MSD	23		33	
4	MW-17-3	14	MW-17-1DUP	24		34	
5	MW-17-2	15	MW-26-1DUP	25		35	
6	MW-17-1**	16		26		36	
7	MW-26-2	17		27		37	
8	MW-26-1	18		28		38	
9	MW-17-5MS	19		29		39	
10	MW-17-5MSD	20		30		40	

Notes: _____

LDC #: 07993286

VALIDATION FINDINGS CHECKLIST

Reviewer: QR
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 #: 29932B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Parameter
1-8	[✓ pH] [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC-9,10	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
11	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
12,13	pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
14	pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
15	[✓ pH] [✓ TDS] Cl F NO_3 NO_2 SO_4 O-PO_4 [✓ Alk] CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 21993B6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: QR
2nd reviewer: ✓

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:		1So.1					
Parameters:		pH					
Technical holding time:		48 hrs					
Sample ID	**Sampling date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Qualifier**
1-8, 15	4/26/13	5/2/13	(6days)				J/UJ/P

LDC #: 29932B6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: [illegible]
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** 1-4

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		1								
Cl		0.155	0.775	0.33								

Conc. units: mg/L **Associated Samples:** 5-8

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		No Qualifiers								
Cl		0.240	1.2									
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 #: 29932B6
SDG #: —

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: AL
2nd reviewer: _____

METHOD: Inorganics, EPA Method See Cover

(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 (circle one) (EB)

Analyte	Concentration Units (mg/L)
pH (units)	6.10
Cl	0.33
SO4	0.35
Total Alkalinity	4.1
Bicarbonate Alkalinity	5.0

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

Analyte	Concentration Units ( )

LDC #: 29932B6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: QR
2nd Reviewer:

Method: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of Cl was recalculated. Calibration date: 4/22/13

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

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

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

Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial Calibration Verification	Cl	0	0	0.000	*0.99985*	0.99856	Y
		s1	0.5	0.051			
		s2	5	0.541			
		s3	20	2.283			
		s4	50	6.992			
		s5	100	15.271			
		s6	200	32.641			
Calibration verification	SO4	ICV	100	99.704	100	100	
Calibration verification	ClO4	CCV	10	10.195	102	102	
Calibration verification	NO2-N	↓	0.5	0.47526	95.1	95.1	↓

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 #: 29932B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: CR
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)
LCS	Laboratory control sample	SO4	100.19	100	100	100	Y
9	Matrix spike sample	Cl4	(SSR-SR) 8.6691	10.101	85.8	85.8	↓
15	Duplicate sample	TDS	643.33	636.66	1.04	1.04	↓

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 #: 29932B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: QR
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 TDS reported with a positive detect were recalculated and verified using the following equation:

Concentration = Dry-Tare / Vol

Recalculation: $\frac{45.0442g - 45.029g}{50mL} \times 1000000 = 304 mg/L$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
	6	pH(units)	7.55	7.55	Y
		TDS	300	300	
		Cl	16	16	
		NO_3-N	1.7	1.7	
		SO_4	29	29	
		Total Alk	200	200	
		Bicarb. Alk.	250	250	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 1, 2013

LDC Report Date: June 24, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308887

Sample Identification

TB-8-5113
EB-8-5113
MW-11-5
MW-11-4
MW-11-3
MW-11-2
MW-11-1
MW-21-5
MW-21-4
MW-21-3
MW-21-2
MW-21-1
DUP-5-2Q13
MW-11-4MS
MW-11-4MSD
MW-21-2MS
MW-21-2MSD

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.

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.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 30.0% with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
5/2/13	Bromomethane	40.8	All samples in SDG 1308887	J (all detects) UJ (all non-detects)	P
5/2/13	Methyl iodide	31.0	All samples in SDG 1308887	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.

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

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-11-1 and DUP-5-2Q13 were identified as field duplicates. No volatiles were detected in any of the samples.

XVII. Field Blanks

Sample TB-8-5113 was identified as a trip blank. No volatile contaminants were found.

Sample EB-8-5113 was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1308887

SDG	Sample	Compound	Flag	A or P	Reason
1308887	TB-8-5113 EB-8-5113 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1 MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1 DUP-5-2Q13	Bromomethane Methyl iodide	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308887

No Sample Data Qualified in this SDG

LDC #: 29932C1
SDG #: 1308887
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/21/13
Page: 1 of 1
Reviewer: FJ
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: 5/1/13
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	ND	D = 7, 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: water

1 1	TB-8-5113	11 2	MW-21-2	21 1	BWE0123	31	
2 1	EB-8-5113	12 1	MW-21-1	22 2	BWE0125	32	
3 1	MW-11-5	13 1	DUP-5-2Q13 P	23		33	
4 1	MW-11-4	14 1	MW-11-4MS	24		34	
5 1	MW-11-3	15 1	MW-11-4MSD	25		35	
6 1	MW-11-2	16 2	MW-21-2MS	26		36	
7 1	MW-11-1 D	17 2	MW-21-2MSD	27		37	
8 1	MW-21-5	18		28		38	
9 1	MW-21-4	19		29		39	
10 1	MW-21-3	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.
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 #: 29932C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: PD
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
	5/2/13 07:33	1305749-ccv1	B	40.8	All	J/UJ/P
	5/2/13 7:56	1305749-ccv2	Methyl Iodide	31.0	↓	↓

CONCAL.1S5

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 1, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308887

Sample Identification

EB-8-5113
MW-11-5
MW-11-4
MW-11-3
MW-11-2
MW-11-1
MW-21-5
MW-21-4
MW-21-3
MW-21-2
MW-21-1
DUP-5-2Q13
MW-11-4MS
MW-11-4MSD
MW-11-4DUP
MW-21-2MS
MW-21-2MSD
MW-21-2DUP

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 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 metal contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Iron	0.011822 mg/L	EB-8-5113 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1
ICB/CCB	Iron	0.015878 mg/L	MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1 DUP-5-2Q13
PB (prep blank)	Iron	9.8807 ug/L	MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1
PB (prep blank)	Iron Magnesium	10.382 ug/L 0.018072 mg/L	DUP-5-2Q13
PB (prep blank)	Potassium	0.12285 mg/L	EB-8-5113 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Magnesium	0.019475 mg/L	MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1

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
MW-11-4	Iron	9.7 ug/L	9.7U ug/L
MW-21-5	Iron	31 ug/L	31U ug/L
MW-21-3	Iron	64 ug/L	64U ug/L
MW-21-2	Iron	18 ug/L	18U ug/L
MW-21-1	Iron	40 ug/L	40U ug/L

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-11-1 and DUP-5-2Q13 were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-11-1	DUP-5-2Q13	
Arsenic	1.8 ug/L	0.70U ug/L	200
Calcium	59 mg/L	59 mg/L	0
Chromium	0.51 ug/L	0.50U ug/L	200
Iron	130 ug/L	130 ug/L	0
Magnesium	19 mg/L	19 mg/L	0
Potassium	3.2 mg/L	3.1 mg/L	3
Sodium	26 mg/L	25 mg/L	4

XV. Field Blanks

Sample EB-8-5113 was identified as an equipment blank. No metal contaminants were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-8-5113	Chromium	1.0 ug/L

NASA JPL
Metals - Data Qualification Summary - SDG 1308887

No Sample Data Qualified in this SDG

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1308887

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308887	MW-11-4	Iron	9.7U ug/L	A
1308887	MW-21-5	Iron	31U ug/L	A
1308887	MW-21-3	Iron	64U ug/L	A
1308887	MW-21-2	Iron	18U ug/L	A
1308887	MW-21-1	Iron	40U ug/L	A

LDC #: 29932C4
SDG #: 1308887
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/21/13
Page: 1 of 1
Reviewer: AR
2nd Reviewer: [signature]

METHOD: Metals (EPA Method 200.7/200.8)

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: 5/1/13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS/D (16/17: Ca, Mg, Na24/x)
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	
XI.	ICP Serial Dilution	N	not performed
XII.	Sample Result Verification	N	
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	(6, 12)
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: water

1	EB-8-5113	11	MW-21-1	21		31	
2	MW-11-5	12	DUP-5-2Q13	22		32	
3	MW-11-4	13	MW-11-4MS	23		33	
4	MW-11-3	14	MW-11-4MSD	24		34	
5	MW-11-2	15	MW-11-4DUP	25		35	
6	MW-11-1	16	MW-21-2MS	26		36	
7	MW-21-5	17	MW-21-2MSD	27		37	
8	MW-21-4	18	MW-21-2DUP	28		38	
9	MW-21-3	19		29		39	
10	MW-21-2	20		30		40	

Notes: _____

LDC #: ~~2A484A4a~~ 29a32C4

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

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

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-12		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
QC: 13-15		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti,
16-18		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], ~~Cr~~, Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,

Analysis Method

ICP		Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti,
ICP-MS		Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti

Comments: Mercury by CVAA if performed

LDC #: 29932C4

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: AL
2nd Reviewer: M

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)
Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L
Associated Samples: 1-6

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/l)	Maximum ICB/CCB[a] (mg/l)	Action Level	3								
Fe			0.011822	59.11	9.7								

Sample Concentration units, unless otherwise noted: ug/L
Associated Samples: 7-12

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/l)	Maximum ICB/CCB[a] (mg/l)	Action Level	7	9	10	11					
Fe			0.015878	79.39	31	64	18	40					

Sample Concentration units, unless otherwise noted: ug/L
Associated Samples: 7-11

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/l)	Maximum ICB/CCB[a] (mg/l)	Action Level	7	10	11						
Fe		9.8807		49.4035	See ICB	See ICB	See ICB						

Sample Concentration units, unless otherwise noted: ug/L
Associated Samples: 12

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/l)	Maximum ICB/CCB[a] (mg/l)	Action Level	No qualifiers								
Fe		10.382		51.91									

Sample Concentration units, unless otherwise noted: mg/L
Associated Samples: 1-6

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/l)	Maximum ICB/CCB[a] (ug/l)	Action Level	No qualifiers								
K		0.12285		0.61425									

LDC #: 29932C4

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: CR
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)
Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: mg/L
Associated Samples: 7-11

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/l)	Maximum ICB/CCB[a] (mg/l)	Action Level	No qualifiers								
Mg			0.019475	0.09738									

Sample Concentration units, unless otherwise noted: mg/L
Associated Samples: 12

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/l)	Maximum ICB/CCB[a] (ug/l)	Action Level	No qualifiers								
Mg		0.018072		0.09036									

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#: 29932C4

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: CV
2nd Reviewer:

METHOD: Metals (EPA Method 6010B/7000)

Analyte	Concentration (ug/L)		RPD
	6	12	
Arsenic	1.8	0.70U	200
Calcium (mg/L)	59	59	0
Chromium	0.51	0.50U	200
Iron	130	130	0
Magnesium (mg/L)	19	19	0
~~Potassium~~ or Na	26	25	4
~~Sodium~~ or K	3.2	3.1	3

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LDC #: 29932C4

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 2 of 1
Reviewer: AL
2nd reviewer: LW

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)
Cr	1.0

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

Analyte	Concentration Units (____)

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 1, 2013

LDC Report Date: June 24, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308887

Sample Identification

EB-8-5113
MW-11-5
MW-11-4
MW-11-3
MW-11-2
MW-11-1
MW-21-5
MW-21-4
MW-21-3
MW-21-2
MW-21-1
DUP-5-2Q13
MW-11-4MS
MW-11-4MSD
MW-11-4DUP
MW-11-1MS
MW-11-1MSD
MW-11-1DUP
MW-21-5DUP
MW-21-2MS
MW-21-2MSD
MW-21-2DUP

Introduction

This data review covers 22 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per Standard Method 2320B for Alkalinity, 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, EPA Method 365.1 for Orthophosphate as Phosphorus, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
EB-8-5113 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1 MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1 DUP-5-2Q13 MW-21-5DUP	pH	6 days	48 hours	J (all detects) UJ (all non-detects)	P

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	0.097 mg/L	EB-8-5113 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1

Method Blank ID	Analyte	Concentration	Associated Samples
PB (prep blank)	Chloride	0.135 mg/L	MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1 DUP-5-2Q13
ICB/CCB	Chloride	0.149 mg/L	EB-8-5113 MW-11-5
ICB/CCB	Chloride Sulfate	0.173 mg/L 0.292 mg/L	MW-11-4 MW-11-3 MW-11-2 MW-11-1 MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1 DUP-5-2Q13
ICB/CCB	Orthophosphate as phosphorus	0.0088410 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
EB-8-5113	Chloride	0.12 mg/L	0.12U mg/L
MW-11-1	Orthophosphate as phosphorus	0.033 mg/L	0.033U 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-11-4MS/MSD (EB-8-5113 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1 MW-21-5 MW-21-4 DUP-5-2Q13)	Hexavalent chromium	81.7 (85-115)	81.7 (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

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-11-1 and DUP-5-2Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-11-1	DUP-5-2Q13	
pH (units)	7.97 units	7.91 units	1
TDS	310 mg/L	340 mg/L	9
Chloride	16 mg/L	16 mg/L	0
Nitrate as N	0.35 mg/L	0.36 mg/L	3
Sulfate	34 mg/L	34 mg/L	0

Analyte	Concentration		RPD
	MW-11-1	DUP-5-2Q13	
Total Alkalinity	210 mg/L	210 mg/L	0
Bicarbonate Alkalinity	250 mg/L	250 mg/L	0

XI. Field Blanks

Sample EB-8-5113 was identified as an equipment blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-8-5113	pH Chloride Nitrate as N	6.21 units 0.12 mg/L 0.062 mg/L

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1308887

SDG	Sample	Analyte	Flag	A or P	Reason
1308887	EB-8-5113 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1 MW-21-5 MW-21-4 MW-21-3 MW-21-2 MW-21-1 DUP-5-2Q13	pH	J (all detects) UJ (all non-detects)	P	Technical holding times
1308887	EB-8-5113 MW-11-5 MW-11-4 MW-11-3 MW-11-2 MW-11-1 MW-21-5 MW-21-4 DUP-5-2Q13	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 1308887

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308887	EB-8-5113	Chloride	0.12U mg/L	A
1308887	MW-11-1	Orthophosphate as phosphorus	0.033U mg/L	A

LDC #: 29932C6
SDG #: 1308887
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/24/13
Page: 1 of 1
Reviewer: CR
2nd Reviewer: W

METHOD: Alkalinity (SM2320B), 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), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	SW	Sampling dates: 5/1/13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	SW	MS/P
VI.	Duplicates	A	D,P
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	N	
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	(6,12)
XI	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: water

1	EB-8-5113	11	MW-21-1	21	MW-21-2MSD	31	
2	MW-11-5	12	DUP-5-2Q13	22	MW-21-2DUP	32	
3	MW-11-4	13	MW-11-4MS	23		33	
4	MW-11-3	14	MW-11-4MSD	24		34	
5	MW-11-2	15	MW-11-4DUP	25		35	
6	MW-11-1	16	MW-11-1MS	26		36	
7	MW-21-5	17	MW-11-1MSD	27		37	
8	MW-21-4	18	MW-11-1DUP	28		38	
9	MW-21-3	19	MW-21-5DUP	29		39	
10	MW-21-2	20	MW-21-2MS	30		40	

Notes:

LDC #: 29932C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Parameter
1-12	[✓ pH] [✓ TDS] [✓ Cl] F [✓ NO$_3$] [✓ NO$_2$] [✓ SO$_4$] ~~O-PO$_4$~~ [✓ Alk] CN NH$_3$ TKN TOC [✓ Cr6+] [✓ ClO$_4$]
6	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ [✓ O-PO$_4$] Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
QC:13,14	pH TDS [✓ Cl] F [✓ NO$_3$] [✓ NO$_2$] [✓ SO$_4$] O-PO$_4$ Alk CN NH$_3$ TKN TOC [✓ Cr6+] [✓ ClO$_4$]
15	pH [✓ TDS] [✓ Cl] F [✓ NO$_3$] [✓ NO$_2$] [✓ SO$_4$] O-PO$_4$ Alk CN NH$_3$ TKN TOC [✓ Cr6+] [✓ ClO$_4$]
16,17	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ [✓ O-PO$_4$] Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
18	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ [✓ O-PO$_4$] Alk CN NH$_3$ TKN TOC Cr6+ ~~ClO$_4$~~
19	[✓ pH] TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ [✓ Alk] CN NH$_3$ TKN TOC Cr6+ ClO$_4$
20,21	pH TDS [✓ Cl] F [✓ NO$_3$] [✓ NO$_2$] [✓ SO$_4$] O-PO$_4$ Alk CN NH$_3$ TKN TOC [✓ Cr6+] [✓ ClO$_4$]
22	pH [✓ TDS] [✓ Cl] F [✓ NO$_3$] [✓ NO$_2$] [✓ SO$_4$] O-PO$_4$ Alk CN NH$_3$ TKN TOC [✓ Cr6+] [✓ ClO$_4$]
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$
	pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ O-PO$_4$ Alk CN NH$_3$ TKN TOC Cr6+ ClO$_4$

Comments:

LDC #: 29932C6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: QR
2nd reviewer: [illegible]

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:	150.1					
Parameters:	pH					
Technical holding time:	48hrs)					

Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1-12, 19	5/1/13	5/7/13	(6days)				J/UJ/P

LDC #: 29932C6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: CR
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** 1-6

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		1								
Cl	0.097		0.485	0.12								

Conc. units: mg/L **Associated Samples:** 7-12

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		No Qualifiers								
Cl	0.135		0.675									

Conc. units: mg/L **Associated Samples:** 1, 2

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		No Qualifiers								
Cl		0.149	0.745									

Conc. units: mg/L **Associated Samples:** 3-12

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		No Qualifiers								
Cl		0.173	0.865									
SO4		0.292	1.46									

Conc. units: mg/L **Associated Samples:** 6

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		6								
0-PO4-P		0.0088410	0.044205	0.033								

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 #: 09982C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

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

METHOD: Inorganics, EPA Method_____

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~~ 85-115? 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
	13/14	W	Cr^{6+}	81.7	81.7		1-8,12	J/UJ/A

Comments:_____

LDC# 29932C6

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: [signature]
2nd Reviewer: [signature]

Inorganics: Method See Cover

Analyte	Concentration (mg/L)		RPD
	6	12	
pH (units)	7.97	7.91	1
TDS	310	340	9
Chloride	16	16	0
Nitrate as N	0.35	0.36	3
Sulfate	34	34	0
Total Alkalinity	210	210	0
Bicarbonate Alkalinity	250	250	0

\\LDCFILESERVER\Validation\FIELD DUPLICATES\FD_inorganic\29932C6.wpd

LDC #: 29932C6
SDG #: —

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: 02
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) (EB)

Analyte	Concentration Units (mg/L)
pH (units)	6.21
Cl	0.12
NO_3N	0.062

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

Analyte	Concentration Units ( )

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 2, 2013

LDC Report Date: June 24, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1309034

Sample Identification

TB-9-5213
MW-13
MW-15
MW-9
MW-8
MW-7
DUP-6-2Q13
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.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 30.0% with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
5/3/13	Bromomethane	42.3	All samples in SDG 1309034	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.

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

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-7 and DUP-6-2Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-7	DUP-6-2Q13	
Bromodichloromethane	2.9	3.0	3

Compound	Concentration (ug/L)		RPD
	MW-7	DUP-6-2Q13	
Carbon tetrachloride	1.0	1.0	0
Chloroform	9.5	9.8	3
1,1-Dichloroethene	0.19	0.19	0
Tetrachloroethene	1.9	1.9	0
Trichloroethene	0.11	0.12	9

XVII. Field Blanks

Sample TB-9-5213 was identified as a trip blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1309034

SDG	Sample	Compound	Flag	A or P	Reason
1309034	TB-9-5213 MW-13 MW-15 MW-9 MW-8 MW-7 DUP-6-2Q13	Bromomethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1309034

No Sample Data Qualified in this SDG

LDC #: 29932D1 **VALIDATION COMPLETENESS WORKSHEET** Date: 6/21/13
SDG #: 1309034 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: 5/2/13
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 = 6, 7
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-9-5213	11	BWE0320	21		31	
2	MW-13	12		22		32	
3	MW-15	13		23		33	
4	MW-9	14		24		34	
5	MW-8	15		25		35	
6	MW-7 D	16		26		36	
7	DUP-6-2Q13 D	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.
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 #: 29932D1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FM
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 FM
	5/3/13	1305832-ccv1	B	42.3	All	J/UJ/A P
			~~GGGG~~ M	~~31.3~~ P	↓	↓

LDC#: 29932D1 **VALIDATION FINDINGS WORKSHEET** Page: 1 of 1
Field Duplicates Reviewer: FJ
2nd Reviewer:

METHOD: GC/MS VOA (EPA 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
	6	7	
P	2.9	3.0	3
O	1.0	1.0	0
K	9.5	9.8	3
H	0.19	0.19	0
AA	1.9	1.9	0
S	0.11	0.12	9

V:\FIELD DUPLICATES\templates\29932D1.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NASA JPL
Collection Date:	May 2, 2013
LDC Report Date:	June 24, 2013
Matrix:	Water
Parameters:	1,4-Dioxane
Validation Level:	EPA Level III
Laboratory:	BC Laboratories, Inc.
Sample Delivery Group (SDG):	1309034

Sample Identification

MW-13

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8270C for 1,4-Dioxane.

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.

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.

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

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No 1,4-Dioxane was 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

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and RLs

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

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

No field blanks were identified in this SDG.

NASA JPL
1,4-Dioxane - Data Qualification Summary - SDG 1309034

No Sample Data Qualified in this SDG

NASA JPL
1,4-Dioxane - Laboratory Blank Data Qualification Summary - SDG 1309034

No Sample Data Qualified in this SDG

LDC #: 29932D2
SDG #: 1309034
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/21/13
Page: 1 of 1
Reviewer: B
2nd Reviewer: V

METHOD: GC/MS 1,4-Dioxane (EPA SW 846 Method 8270C-~~SIM~~)

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

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 5/2/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	~~%~~ ~~RS~~ F7 r^2
IV.	Continuing calibration/ICV	A	ICV/CCV ≤ 25
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
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	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: water

1	MW-13	11	BWE0669	21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 2, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1309034

Sample Identification

MW-13
MW-15
MW-9
MW-8
MW-7
DUP-6-2Q13
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 Methods 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
5/14/13	CCVC(18:39)	Chromium	113 (90-110)	All samples in SDG 1309034	J (all detects)	P

IV. Blanks

Method blanks were reviewed for each matrix as applicable. No metal contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Iron	0.0089287 mg/L	All samples in SDG 1308499
PB (prep blank)	Potassium	0.15134 mg/L	All samples in SDG 1308499
ICB/CCB	Potassium	0.15885 mg/L	MW-13
ICB/CCB	Potassium	0.12559 mg/L	MW-15 MW-9 MW-8 MW-7 DUP-6-2Q13

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
MW-13	Iron	29 ug/L	29U ug/L
MW-9	Iron	32 ug/L	32U ug/L
MW-7	Iron	8.1 ug/L	8.1U ug/L
DUP-6-2Q13	Iron	14 ug/L	14U ug/L

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-7 and DUP-6-2Q13 were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-7	DUP-6-2Q13	
Arsenic	0.88 ug/L	0.87 ug/L	1
Calcium	72 mg/L	70 mg/L	3
Chromium	16 ug/L	17 ug/L	6
Iron	8.1 ug/L	14 ug/L	53
Magnesium	24 mg/L	24 mg/L	0
Potassium	4.1 mg/L	4.0 mg/L	3
Sodium	40 mg/L	39 mg/L	2

XV. Field Blanks

No field blanks were identified in this SDG.

NASA JPL
Metals - Data Qualification Summary - SDG 1309034

SDG	Sample	Analyte	Flag	A or P	Reason
1309034	MW-13 MW-15 MW-9 MW-8 MW-7 DUP-6-2Q13	Chromium	J (all detects)	P	Calibration (CCV %R)

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1309034

SDG	Sample	Analyte	Modified Final Concentration	A or P
1309034	MW-13	Iron	29U ug/L	A
1309034	MW-9	Iron	32U ug/L	A
1309034	MW-7	Iron	8.1U ug/L	A
1309034	DUP-6-2Q13	Iron	14U ug/L	A

LDC #: 29932D4 **VALIDATION COMPLETENESS WORKSHEET** Date: 6/21/13
SDG #: 1309034 Level III Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: CC
2nd Reviewer: W

METHOD: Metals (EPA Method 200.7/200.8)

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: 5/2/13
II.	ICP/MS Tune	A	
III.	Calibration	SW	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS/D
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	
XI.	ICP Serial Dilution	N	Not performed
XII.	Sample Result Verification	N	
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	(5,6)
XV	Field Blanks	N	

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

Validated Samples: water

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

Notes:

LDC #: 29932D4

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

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

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-6		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca, Cr,] Co, Cu, [✓ Fe, Pb, Mg,] Mn, Hg, Ni, [✓ K,] Se, Ag, [✓ Na,] Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
QC79		Al, Sb, As, Ba, Be, Cd, [✓ Ca,] Cr, Co, Cu, [✓ Fe,] Pb, [✓ Mg,] Mn, Hg, Ni, [✓ K,] Se, Ag, [✓ Na,] Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Analysis Method
ICP		Al, Sb, As, Ba, Be, Cd, [✓ Ca,] Cr, Co, Cu, [✓ Fe,] Pb, [✓ Mg,] Mn, Hg, Ni, [✓ K,] Se, Ag, [✓ Na,] Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr,] Co, Cu, Fe, [✓ Pb,] Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,

Comments: Mercury by CVAA if performed

LDC #: 09932D4

VALIDATION FINDINGS WORKSHEET
Calibration

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

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 Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?
Y N N/A Are all correlation coefficients ≥0.995?
Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
	5/14/13	CCVC (18:39)	Cr	113	All	J det/P

Comments:

LDC #: 29932D4

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: a
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)
Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L
Associated Samples: All

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	1	3	5	6					
Fe			0.0089287	44.6435	29	32	8.1	14					
K		0.15134		0.7567									

Sample Concentration units, unless otherwise noted: mg/L
Associated Samples: 1

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	No qualifiers								
K			0.15885	0.79425									

Sample Concentration units, unless otherwise noted: mg/L
Associated Samples: 2-6

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	No qualifiers								
K			0.12559	0.62795									

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#: 29932D4

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Page: 1 of ___
Reviewer: CN
2nd Reviewer: V

METHOD: Metals (EPA Method 6010B/7000)

Analyte	Concentration (ug/L)		RPD
	5	6	
Arsenic	0.88	0.87	1
Calcium (mg/L)	72	70	3
Chromium	16	17	6
Iron	8.1	14	53
Magnesium (mg/L)	24	24	0
~~Potassium~~ Na	40	39	3
~~Sodium~~ K	4.1	4.0	2

\\LDCFILESERVER\Validation\FIELD DUPLICATES\FD_inorganic\29932D4.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 2, 2013

LDC Report Date: June 24, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1309034

Sample Identification

MW-13
MW-15
MW-9
MW-8
MW-7
DUP-6-2Q13
MW-13MS
MW-13MSD
MW-13DUP
DUP-6-2Q13DUP

Introduction

This data review covers 10 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per Standard Method 2320B for Alkalinity, 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, EPA Method 365.1 for Orthophosphate as Phosphorus, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
MW-13 MW-15 MW-9 MW-8 MW-7 DUP-6-2Q13 DUP-6-2Q13DUP	pH	7 days	48 hours	J (all detects) UJ (all non-detects)	P

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	0.143 mg/L	All samples in SDG 1309034
ICB/CCB	Chloride	0.143 mg/L	All samples in SDG 1309034

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.

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-7 and DUP-6-2Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-7	DUP-6-2Q13	
pH (units)	7.38 units	7.65 units	4
TDS	400 mg/L	410 mg/L	2
Chloride	65 mg/L	66 mg/L	2
Nitrate as N	1.4 mg/L	1.3 mg/L	7
Sulfate	39 mg/L	40 mg/L	3
Perchlorate	260 ug/L	260 ug/L	0
Hexavalent Chromium	0.014 mg/L	0.013 mg/L	7
Total Alkalinity	190 mg/L	200 mg/L	5
Bicarbonate Alkalinity	240 mg/L	240 mg/L	0

XI. Field Blanks

No field blanks were identified in this SDG.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1309034

SDG	Sample	Analyte	Flag	A or P	Reason
1309034	MW-13 MW-15 MW-9 MW-8 MW-7 DUP-6-2Q13	pH	J (all detects) UJ (all non-detects)	P	Technical holding times

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 1309034

No Sample Data Qualified in this SDG

LDC #: 29932D6
SDG #: 1309034
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/21/13
Page: 1 of 1
Reviewer: AR
2nd Reviewer: V

METHOD: Alkalinity (SM2320B), 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), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	SW	Sampling dates: 5/2/13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/D
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	(5,6)
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: water

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

Notes:

LDC #: 29932D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Parameter
1-6	[✓ pH] [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 [✓ Alk] CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
1,4,5	pH TDS Cl F NO_3 NO_2 SO_4 [✓ O-PO_4] Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC 7,8	pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] [✓ O-PO_4] Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
9	pH ~~TDS~~ [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] [✓ O-PO_4] Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
10	[✓ pH] TDS Cl F NO_3 NO_2 SO_4 O-PO_4 [✓ Alk] CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 29983206

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: QR
2nd reviewer: [illegible]

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:	150.1					
Parameters:	pH					
Technical holding time:	48hrs					

Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1-6, 10	5/2/13	5/9/13	(7days)				J/UJ/P

LDC #: 29932D6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer:
2nd Reviewer:

METHOD: Inorganics, Method See Cover
Conc. units: mg/L **Associated Samples:** All

Analyte	Blank ID	Blank ID	Blank Action Limit									
	PB	ICB/CCB (mg/L)		No Qualifiers								
Cl	0.143	0.143	0.715									

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# 29932D6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: OV
2nd Reviewer: V

Inorganics: Method See Cover

Analyte	Concentration (mg/L)		RPD
	5	6	
pH (units)	7.38	7.65	4
TDS	400	410	2
Chloride	65	66	2
Nitrate as N	1.4	1.3	7
Sulfate	39	40	3
Perchlorate (ug/L)	260	260	0
Hexavalent Chromium	0.014	0.013	7
Total Alkalinity	190	200	5
Bicarbonate Alkalinity	240	240	0

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 7, 2013

LDC Report Date: June 24, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1309146

Sample Identification

TB-10-5313
MW-6
MW-1
MW-16
MW-10
MW-5
DUP-7-2Q13
DUP-8-2Q13
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.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 30.0% with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
5/6/13	Hexachloroethane	38.5	All samples in SDG 1309146	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.

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

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-6 and DUP-7-2Q13 and MW-1 and DUP-8-2Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-6	DUP-7-2Q13	
Chloroform	0.73	0.78	7
1,1-Dichloroethane	0.27	0.29	7
1,1-Dichloroethene	0.29	0.29	0
cis-1,2-Dichloroethene	0.090	0.100	11
trans-1,2-Dichloroethene	0.22	0.23	4
Tetrachloroethene	1.2	1.2	0
Trichloroethene	4.1	4.0	2

XVII. Field Blanks

Sample TB-10-5313 was identified as a trip blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1309146

SDG	Sample	Compound	Flag	A or P	Reason
1309146	TB-9-5213 MW-13 MW-15 MW-9 MW-8 MW-7 DUP-6-2Q13	Bromomethane Acrylonitrile	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1309146

No Sample Data Qualified in this SDG

LDC #: 29932E1 **VALIDATION COMPLETENESS WORKSHEET** Date: 6/21/13
SDG #: 1309146 Level III Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: F
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: 5/3/13
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 = 2, 7 * 3, 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	TB-10-5313	11	BWE0369	21		31	
2	MW-6 D1	12		22		32	
3	MW-1 D	13		23		33	
4	MW-16	14		24		34	
5	MW-10	15		25		35	
6	MW-5	16		26		36	
7	DUP-7-2Q13 D1	17		27		37	
8	DUP-8-2Q13 D	18		28		38	
9	MW-1MS	19		29		39	
10	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.
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 #: 29932E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FZ
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
	5/6/13 06:37	1305889-ccv1	Hexachloroethane	38.5	All	J/UJ/P

LDC#: 29932E1 **VALIDATION FINDINGS WORKSHEET**
Field Duplicates

Page: 1 of 1
Reviewer: EZ
2nd Reviewer: [signature]

METHOD: GC/MS VOA (EPA 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
	2	7	
K	0.73	0.78	7
I	0.27	0.29	7
H	0.29	0.29	0
QQQ	0.090	0.100	11
PPP	0.22	0.23	4
AA	1.2	1.2	0
S	4.1	4.0	2

V:\FIELD DUPLICATES\templates\29932E1.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 3, 2013

LDC Report Date: June 21, 2013

Matrix: Water

Parameters: 1,4-Dioxane

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1309146

Sample Identification

MW-16

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8270C for 1,4-Dioxane.

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.

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.

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

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No 1,4-Dioxane was 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

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and RLs

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

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

No field blanks were identified in this SDG.

NASA JPL
1,4-Dioxane - Data Qualification Summary - SDG 1309146

No Sample Data Qualified in this SDG

NASA JPL
1,4-Dioxane - Laboratory Blank Data Qualification Summary - SDG 1309146

No Sample Data Qualified in this SDG

LDC #: 29932E2
SDG #: 1309146
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/21/13
Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS 1,4-Dioxane (EPA SW 846 Method 8270C ~~SIM~~)

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

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 5/3/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	r^2
IV.	Continuing calibration/ICV	A	ICV/CCV ≤ 25
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
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	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: Water

1	MW-16	11	BWE0669	21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 3, 2013

LDC Report Date: June 24, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1309146

Sample Identification

MW-6
MW-1
MW-16
MW-10
MW-5
DUP-7-2Q13
DUP-8-2Q13
MW-6MS
MW-6MSD
MW-6DUP

Introduction

This data review covers 10 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Methods 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 metal contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Iron Potassium	10.209 ug/L 0.26526 mg/L	All samples in SDG 1309146
ICB/CCB	Iron Sodium Potassium	0.011358 mg/L 0.21456 mg/L 0.37037 mg/L	MW-6 MW-1
ICB/CCB	Iron Potassium	0.0077539 mg/L 0.12090 mg/L	MW-16 MW-10 MW-5 DUP-7-2Q13 DUP-8-2Q13

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
MW-1	Iron	8.2 ug/L	8.2U ug/L

Sample	Analyte	Reported Concentration	Modified Final Concentration
MW-16	Iron	26 ug/L	26U ug/L
MW-10	Iron	32 ug/L	32U ug/L
MW-5	Iron	16 ug/L	16U ug/L
DUP-7-2Q13	Iron	37 ug/L	37U ug/L
DUP-8-2Q13	Iron	7.5 ug/L	7.5U ug/L

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-6 and DUP-7-2Q13 and samples MW-1 and DUP-8-2Q13 were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-6	DUP-7-2Q13	
Calcium	140 mg/L	140 mg/L	0
Chromium	5.1 ug/L	1.1 ug/L	129
Iron	78 ug/L	37 ug/L	71
Magnesium	46 mg/L	46 mg/L	0
Potassium	2.8 mg/L	2.8 mg/L	0
Sodium	47 mg/L	46 mg/L	2

Analyte	Concentration		RPD
	MW-1	DUP-8-2Q13	
Arsenic	1.4 ug/L	1.1 ug/L	24
Calcium	55 mg/L	55 mg/L	0
Iron	8.2 ug/L	7.5 ug/L	9
Magnesium	17 mg/L	17 mg/L	0
Potassium	3.6 mg/L	3.1 mg/L	15
Sodium	28 mg/L	28 mg/L	0

XV. Field Blanks

No field blanks were identified in this SDG.

NASA JPL
Metals - Data Qualification Summary - SDG 1309146

No Sample Data Qualified in this SDG

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1309146

SDG	Sample	Analyte	Modified Final Concentration	A or P
1309146	MW-1	Iron	8.2U ug/L	A
1309146	MW-16	Iron	26U ug/L	A
1309146	MW-10	Iron	32U ug/L	A
1309146	MW-5	Iron	16U ug/L	A
1309146	DUP-7-2Q13	Iron	37U ug/L	A
1309146	DUP-8-2Q13	Iron	7.5U ug/L	A

LDC #: 29932E4
SDG #: 1309146
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/21/13
Page: 1 of 1
Reviewer: CR
2nd Reviewer: W

METHOD: Metals (EPA Method 200.7/200.8)

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: 5/3/13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS/D
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	
XI.	ICP Serial Dilution	N	Not performed
XII.	Sample Result Verification	N	
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	(1,6) (2,7)
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: water

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

Notes: _____

LDC #: 29932E4

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

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

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-7		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
QC: 8-10		Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___

Analysis Method

ICP		Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti

Comments: Mercury by CVAA if performed

LDC #: 29932E4

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: A
2nd Reviewer:

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: All

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	2	3	4	5	6	7			
Fe		10.209		51.045	8.2	26	32	16	37	7.5			
K		0.26526 mg/L		1.3263									

Sample Concentration units, unless otherwise noted: ug/L Associated Samples: 1, 2

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	2								
Fe			0.011358	56.79	See PB								
Na			0.21456	1.0728									
K			0.37037	1.85185									

Sample Concentration units, unless otherwise noted: ug/L Associated Samples: 3-7

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	3	4	5	6	7				
Fe			0.0077539	38.7695	See PB	See PB	See PB	See PB	See PB				
K			0.12090	0.6045									

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#: 29932E4

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: SV
2nd Reviewer: LA

METHOD: Metals (EPA Method 6010B/7000)

Analyte	Concentration (ug/L)		RPD
	1	6	
Calcium (mg/L)	140	140	0
Chromium	5.1	1.1	129
Iron	78	37	71
Magnesium (mg/L)	46	46	0
~~Potassium~~ Na (mg/L)	47	46	2
~~Sodium~~ K (mg/L)	2.8	2.8	0

Analyte	Concentration (ug/L)		RPD
	2	7	
Arsenic	1.4	1.1	24
Calcium (mg/L)	55	55	0
Iron	8.2	7.5	9
Magnesium (mg/L)	17	17	0
~~Potassium~~ Na (mg/L)	28	28	0
~~Sodium~~ K (mg/L)	3.6	3.1	15

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: May 3, 2013

LDC Report Date: June 24, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1309146

Sample Identification

MW-6
MW-1
MW-16
MW-10
MW-5
DUP-7-2Q13
DUP-8-2Q13
MW-6MS
MW-6MSD
MW-6DUP
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 Standard Method 2320B for Alkalinity, 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, EPA Method 365.1 for Orthophosphate as Phosphorus, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
MW-6 MW-1 MW-16 MW-10 MW-5 DUP-7-2Q13 DUP-8-2Q13	pH	6 days	48 hours	J (all detects) UJ (all non-detects)	P

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	0.171 mg/L	All samples in SDG 1309146
ICB/CCB	Chloride	0.175 mg/L	All samples in SDG 1309146
ICB/CCB	Hexavalent Chromium	0.000718 mg/L	MW-6 MW-1 MW-16 MW-10 MW-5
ICB/CCB	Hexavalent Chromium	0.000729 mg/L	DUP-7-2Q13 DUP-8-2Q13

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	0.0016 mg/L	0.0016U mg/L
DUP-7-2Q13	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.

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-6 and DUP-7-2Q13 and samples MW-1 and DUP-8-2Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-6	DUP-7-2Q13	
pH (units)	7.29 units	7.29 units	0

Analyte	Concentration		RPD
	MW-6	DUP-7-2Q13	
TDS	760 mg/L	780 mg/L	3
Chloride	130 mg/L	130 mg/L	0
Nitrate as N	12 mg/L	12 mg/L	0
Sulfate	200 mg/L	200 mg/L	0
Perchlorate	3.2 ug/L	3.5 ug/L	9
Hexavalent Chromium	0.0016 mg/L	0.0014 mg/L	13
Total Alkalinity	200 mg/L	200 mg/L	0
Bicarbonate Alkalinity	240 mg/L	240 mg/L	0

Analyte	Concentration		RPD
	MW-1	DUP-8-2Q13	
pH (units)	7.97 units	7.77 units	3
TDS	270 mg/L	290 mg/L	7
Chloride	13 mg/L	13 mg/L	0
Nitrate as N	0.097 mg/L	0.11 mg/L	13
Sulfate	29 mg/L	29 mg/L	0
Total Alkalinity	210 mg/L	210 mg/L	0
Bicarbonate Alkalinity	260 mg/L	260 mg/L	0

XI. Field Blanks

No field blanks were identified in this SDG.

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1309146

SDG	Sample	Analyte	Flag	A or P	Reason
1309146	MW-6 MW-1 MW-16 MW-10 MW-5 DUP-7-2Q13 DUP-8-2Q13	pH	J (all detects) UJ (all non-detects)	P	Technical holding times

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 1309146

SDG	Sample	Analyte	Modified Final Concentration	A or P
1309146	MW-6	Hexavalent Chromium	0.0016U mg/L	A
1309146	DUP-7-2Q13	Hexavalent Chromium	0.0014U mg/L	A

LDC #: 29932E6
SDG #: 1309146
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III

Date: 6/21/13
Page: 1 of 1
Reviewer: AC
2nd Reviewer: W

METHOD: Alkalinity (SM2320B), 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), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	SW	Sampling dates: 5/3/13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/D
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	(1,6) (2,7)
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: water

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

Notes: _____

LDC #: 29932E6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Parameter
1-7	[✓ pH] [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 [✓ Alk] CN NH_3 TKN TOC [✓ Cr6+] ClO_4
3	pH TDS Cl F NO_3 NO_2 SO_4 [✓ O-PO_4] Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:8,9	pH TDS Cl F NO_3 [✓ NO_2] SO_4 [✓ O-PO_4] Alk CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
10	pH TDS Cl F NO_3 [✓ NO_2] SO_4 [✓ O-PO_4] Alk CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
11,12	pH TDS [✓ Cl] F [✓ NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
13	pH TDS [✓ Cl] F [✓ NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 24993266

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: QR
2nd reviewer: ✓

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:	150.1					
Parameters:	pH					
Technical holding time:	48hrs					

Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1-7	5/3/13	5/9/13	(6days)				J/UJ/P

LDC #: 29932E6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: G
2nd Reviewer: W

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** All

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		No Qualifiers									
Cl	0.171	0.175	0.875										

Conc. units: mg/L **Associated Samples:** 1-5

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		1									
Cr6+		0.000718	0.00359	0.0016									

Conc. units: mg/L **Associated Samples:** 6, 7

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		6									
Cr6+		0.000729	0.003645	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# 29932E6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

Inorganics: Method See Cover

Analyte	Concentration (mg/L)		RPD
	1	6	
pH (units)	7.29	7.29	0
TDS	760	780	3
Chloride	130	130	0
Nitrate as N	12	12	0
Sulfate	200	200	0
Perchlorate (ug/L)	3.2	3.5	9
Hexavalent Chromium	0.0016	0.0014	13
Total Alkalinity	200	200	0
Bicarbonate Alkalinity	240	240	0

Analyte	Concentration (mg/L)		RPD
	2	7	
pH (units)	7.97	7.77	3
TDS	270	290	7
Chloride	13	13	0
Nitrate as N	0.097	0.11	13
Sulfate	29	29	0
Total Alkalinity	210	210	0
Bicarbonate Alkalinity	260	260	0

Laboratory Data Consultants, Inc.

7750 El Camino Real, Ste. 2L Carlsbad, CA 92009

Phone 760.634.0437 **Web** www.lab-data.com **Fax** 760.634.0439

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

July 1, 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 June 24, 2013. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 29948:

SDG #	Fraction
1308753 & 1308660	Volatiles, 1,4-Dioxane, Metals, Wet Chemistry

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

- 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,

Erlinda T. Rauto
Operations Manager/Senior Chemist

1 WEEK TAT

Attachment 1

90/10 (client select)

LDC #29948 (Battelle-San Diego / NASA JPL)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (524.2)		1,4-Dioxane (8270C)		Metals (200.8/ 200.7)		Alk (2320B)		Cl, SO_4 NO_3-N (300.0)		NO_2-N (353.2)		O-PO_4 (365.1)		CLO_4 (314.0)		Cr(VI) (7196)		TDS (160.1)		pH (150.1)											
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	1308753	06/24/13	07/01/13	16	0	1	0	17	0	12	0	17	0	13	0	4	0	13	0	17	0	13	0	12	0										
A	1308753	06/24/13	07/01/13	1	0	0	0	1	0	1	0	1	0	1	0	0	0	1	0	1	0	1	0	1	0										
B	1308660	06/24/13	07/01/13	13	0	-	-	13	0	11	0	16	0	16	0	-	-	16	0	16	0	11	0	11	0										
B	1308660	06/24/13	07/01/13	2	0	-	-	2	0	2	0	2	0	2	0	-	-	2	0	2	0	2	0	2	0										
Total	A/LR			32	0	1	0	33	0	26	0	36	0	32	0	4	0	32	0	36	0	27	0	26	0	0	0	0	0	0	0	0	0	0	285

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: April 30, 2013

LDC Report Date: June 25, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308753

Sample Identification

TB-7-43013
EB-7-43013
MW-12-5
MW-12-4
MW-12-3
MW-12-2
MW-12-1
MW-24-5**
MW-24-4
MW-24-3
MW-24-2
MW-24-1
DUP-4-2Q13
MW-12-4MS
MW-12-4MSD
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.

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
5/1/13	Bromomethane	39.4	MW-12-4 MW-12-4MS MW-12-4MSD BWE0042-MB	J (all detects) UJ (all non-detects)	P
5/1/13	Pentachloroethane	71.5	TB-7-43013 EB-7-43013 MW-12-5 MW-12-3 MW-12-2 MW-12-1 MW-24-5** MW-24-4 MW-24-3 MW-24-2 MW-24-1 DUP-4-2Q13 MW-24-2MS MW-24-2MSD BWE0043-MB	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.

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-12-2 and DUP-4-2Q13 were identified as field duplicates. No volatiles were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-12-2	DUP-4-2Q13	
Trichlorofluoromethane	0.13U	0.17	200

XVII. Field Blanks

Sample TB-7-43013 was identified as a trip blank. No volatile contaminants were found.

Sample EB-7-43013 was identified as an equipment blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1308753

SDG	Sample	Compound	Flag	A or P	Reason
1308753	MW-12-4	Bromomethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)
1308753	TB-7-43013 EB-7-43013 MW-12-5 MW-12-3 MW-12-2 MW-12-1 MW-24-5** MW-24-4 MW-24-3 MW-24-2 MW-24-1 DUP-4-2Q13	Pentachloroethane	J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308753

No Sample Data Qualified in this SDG

LDC #: 29948A1
SDG #: 1308753
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 6/24/13
Page: 1 of 1
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: 4/30/13
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	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= 6 + 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

1 3	TB-7-43013	11 2	MW-24-2	21 1	BWE0042	31	
2 3	EB-7-43013	12 3	MW-24-1	22 2	BWE0043	32	
3 3	MW-12-5	13 3	DUP-4-2Q13 D	23 3	1305677-CCB2	33	
4 1	MW-12-4	14 1	MW-12-4MS	24		34	
5 3	MW-12-3	15 1	MW-12-4MSD	25		35	
6 3	MW-12-2 D	16 2	MW-24-2MS	26		36	
7 3	MW-12-1	17 2	MW-24-2MSD	27		37	
8 3	MW-24-5**	18		28		38	
9 3	MW-24-4	19		29		39	
10 3	MW-24-3	20		30		40	

LDC #: 29948A1

VALIDATION FINDINGS CHECKLIST

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

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 #: 29948A1

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?	✓		✓	F7
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.
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 #: 29948A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FJ
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
	5/1/13	1305677-ccv1	B	39.4	BWE0042-MB, 4, 14, 15	J/UJ/P
	5/1/13	1305677-ccv2	Pentachloroethane	F 69.2 71.5	BWE0043-MB, 1305677-CCB2, 1-3, 5-13, 16, 17	J/UJ/P

CONCAL.1S5

LDC #: 29948A1

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: PR
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
	6	13	
KK	0.134	0.17	200

Compound	Concentration ( )		RPD

Compound	Concentration ( )		RPD

LDC #: 29932A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 524.2)

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (std)	Recalculated RRF (std)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported %RSD	Recalculated %RSD
1	ICAL	4/18/13	Acetone (160) (1st Internal Standard)	3.056215×10^{-2}	0.03056	2.805742×10^{-2}	0.028057	7.107243 ~~4.473303~~	7.107
			Methyl Metacrylate (40) (2nd Internal Standard)	7.66857×10^{-2}	0.07668	7.123823×10^{-2}	0.071238	4.473303	4.473
			Pentachloroethane (8) (3rd Internal Standard)	0.551458	0.55145	0.5447112	0.54471	5.854311	5.854
2	ICAL	4/18/13	C (10) (1st Internal Standard)	0.9033516	0.90335	0.8086408	0.86864	10.66688	10.667
			S (10) (2nd Internal Standard)	0.3343105	0.33431	0.3301203	0.33012	4.712199	4.7122
			EE (10) (3rd Internal Standard)	1.887303	1.88730	1.925438	1.92544	6.233496	6.233
3			(1st Internal Standard)						
			(2nd Internal Standard)						
			(3rd Internal Standard)						
4			(1st Internal Standard)						
			(2nd Internal Standard)						
			(3rd Internal Standard)						

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

LDC #: 29948A1

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	CCV	5/01/13	Acetone (1st Internal Standard)	2.805742×10^{-2}	2.879825×10^{-2}	0.028795	2.6	2.6
			Methyl Methacrylate (2nd Internal Standard)	7.123823×10^{-2}	7.299814×10^{-2}	0.072998	2.5	2.5
			Pentachloroethane (3rd Internal Standard)	0.544712	0.554513	0.5647	7/.5	7/.3
2			C (1st Internal Standard)	0.8686408	1.024996	1.024996	18.0	18.0
			S (2nd Internal Standard)	0.3301203	0.345/657	0.345/657	4.6	4.6
			EE (3rd Internal Standard)	1.925438	1.888153	1.888153	1.9	1.9
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 #: 29948A1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: F7
2nd Reviewer: 4

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 = 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
V	25.0	25.0	ND	28.780	26.680	115	115	107	107	7.57	7.57
DD	25.0	↓	↓	26.110	24.740	104	104	99.0	99	5.39	5.39
CC	25.0	↓	↓	27.460	26.530	110	110	106	106	3.45	3.45
S	25.0	↓	0.180	26.300	25.850	104	104	103	103	1.73	1.73
H	25.0	25.0	ND	~~28~~ 28.200 F7	26.190	113	113	105	105	7.39	7.39

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 #: 29948A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample 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 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: BWE0042 - 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	27.060	NA	108	108				
Trichloroethene	↓		26.930		108	108				
Benzene		↓	27.770	↓	111	111				
Toluene			27.160		109	109				
Chlorobenzene	↓	↓	24.730		98.9	98.9	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 #: 29948A1

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: #8

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.0	10.330	103	103	0
Bromofluorobenzene	↓	8.64	86.4	86.4	↓
1,2-Dichlorobenzene-d4		10.870	109	109	
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 #: 29948A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: V

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. _____ , _____:

Conc. = ( ) ( ) ( ) / ( ) ( ) ( ) ( )

= ND

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NASA JPL
Collection Date:	April 30, 2013
LDC Report Date:	June 25, 2013
Matrix:	Water
Parameters:	1,4-Dioxane
Validation Level:	EPA Level III
Laboratory:	BC Laboratories, Inc.
Sample Delivery Group (SDG):	1308753

Sample Identification

MW-24-1

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8270C for 1,4-Dioxane.

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.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r^2) was 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 25.0%.

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No 1,4-Dioxane was 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

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

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

No field blanks were identified in this SDG.

NASA JPL
1,4-Dioxane - Data Qualification Summary - SDG 1308753

No Sample Data Qualified in this SDG

NASA JPL
1,4-Dioxane - Laboratory Blank Data Qualification Summary - SDG 1308753

No Sample Data Qualified in this SDG

LDC #: 29948A2 **VALIDATION COMPLETENESS WORKSHEET** Date: 6/24/13
SDG #: 1308753 Level III Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: EJ
2nd Reviewer: [illegible]

METHOD: GC/MS 1,4-Dioxane (EPA SW 846 Method 8270C ~~SIM~~)

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

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 4/30/13
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	r^2
IV.	Continuing calibration/ICV	A	ICV/CCV ≤ 25
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
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	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: water

1	MW-24-1	11	BWE0554	21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 30, 2013

LDC Report Date: June 24, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308753

Sample Identification

EB-7-43013
MW-12-5
MW-12-4
MW-12-3
MW-12-2
MW-12-1
MW-24-5**
MW-24-4
MW-24-3
MW-24-2
MW-24-1
DUP-4-2Q13
MW-12-4MS
MW-12-4MSD
MW-12-4DUP
MW-24-2MS
MW-24-2MSD
MW-24-2DUP

**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 Methods 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 metals contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Iron	0.0085209 mg/L	EB-7-43013 MW-12-5 MW-12-4 MW-12-3 MW-12-2
ICB/CCB	Iron	0.011822 mg/L	MW-12-1 MW-24-5** MW-24-4 MW-24-3 MW-24-2 MW-24-1 DUP-4-2Q13
ICB/CCB	Lead	0.145 ug/L	All samples in SDG 1308753

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-7-43013	Iron	8.0 ug/L	8.0U ug/L
MW-12-5	Iron	27 ug/L	27U ug/L
MW-12-4	Iron	17 ug/L	17U ug/L
MW-24-5**	Iron Lead	57 ug/L 0.14 ug/L	57U ug/L 0.14U ug/L
MW-24-4	Iron	25 ug/L	25U ug/L
MW-24-3	Iron	28 ug/L	28U ug/L
MW-24-2	Iron	51 ug/L	51U ug/L

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-12-2 and DUP-4-2Q13 were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-12-2	DUP-4-2Q13	
Arsenic	0.75 ug/L	0.70U ug/L	200
Calcium	62 mg/L	65 mg/L	5
Chromium	1.1 ug/L	1.2 ug/L	9
Iron	160 ug/L	160 ug/L	0
Magnesium	20 mg/L	21 mg/L	5
Potassium	3.2 mg/L	3.4 mg/L	6
Sodium	24 mg/L	26 mg/L	8

XV. Field Blanks

Sample EB-7-43013 was identified as an equipment blank. No metal contaminants were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-7-43013	Iron Calcium	8.0 ug/L 0.018 mg/L

NASA JPL
Metals - Data Qualification Summary - SDG 1308753

No Sample Data Qualified in this SDG

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1308753

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308753	EB-7-43013	Iron	8.0U ug/L	A
1308753	MW-12-5	Iron	27U ug/L	A
1308753	MW-12-4	Iron	17U ug/L	A
1308753	MW-24-5**	Iron Lead	57U ug/L 0.14U ug/L	A
1308753	MW-24-4	Iron	25U ug/L	A
1308753	MW-24-3	Iron	28U ug/L	A
1308753	MW-24-2	Iron	51U ug/L	A

LDC #: 29948A4
SDG #: 1308753
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 6/24/13
Page: 1 of 1
Reviewer:
2nd Reviewer:

METHOD: Metals (EPA Method 200.7/200.8)

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: 4/30/13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS/D
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	
XI.	ICP Serial Dilution	N	
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	(5,12)
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

Water

1	EB-7-43013	11	MW-24-1	21		31	
2	MW-12-5	12	DUP-4-2Q13	22		32	
3	MW-12-4	13	MW-12-4MS	23		33	
4	MW-12-3	14	MW-12-4MSD	24		34	
5	MW-12-2	15	MW-12-4DUP	25		35	
6	MW-12-1	16	MW-24-2MS	26		36	
7	MW-24-5**	17	MW-24-2MSD	27		37	
8	MW-24-4	18	MW-24-2DUP	28		38	
9	MW-24-3	19		29		39	
10	MW-24-2	20		30		40	

Notes:

LDC #: 21994B4

VALIDATION FINDINGS CHECKLIST

Reviewer: CR
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?	✓			

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 #: 29948A1

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: OR
2nd reviewer: ~

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-12		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
QC 13-15		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
16-18 &67		Al, Sb, [✓ As], Ba, Be, Cd, [✓ Ca], [✓ Cr], Co, Cu, [✓ Fe], [✓ Pb], [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___

Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, [✓ Fe], Pb, [✓ Mg], Mn, Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, [✓ As], Ba, Be, Cd, Ca, [✓ Cr], Co, Cu, Fe, [✓ Pb], Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti

Comments: Mercury by CVAA if performed

LDC #: 29948A4

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: 1-5

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	1	2	3						
Fe			0.0085209	42.6045	8.0	27	17						

Sample Concentration units, unless otherwise noted: ug/L Associated Samples: 6-12

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	7	8	9	10					
Fe			0.011822	59.11	57	25	28	51					

Sample Concentration units, unless otherwise noted: ug/L Associated Samples: All

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Level	7								
Pb			0.145	0.725	0.14								

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#: 29948A4

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: [signature]
2nd Reviewer: [signature]

METHOD: Metals (EPA Method 6010B/7000)

Analyte	Concentration (ug/L)		RPD
	5	12	
Arsenic	0.75	0.70 U	200
Calcium (mg/L)	62	65	5
Chromium	1.1	1.2	9
Iron	160	160	0
Magnesium (mg/L)	20	21	5
Potassium (mg/L)	3.2	3.4	6
Sodium (mg/L)	24	26	8

LDC #: 29948A4

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: OR
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 (mg/L)
Fe	8.0
Ca (mg/L)	0.018

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

Analyte	Concentration Units ( )

LDC #: 29948A9

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

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

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

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

%R = Found x 100 / True

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
ICV	ICP (Initial calibration)	Ca	51.108	50	102	102	Y
ICV	ICP/MS (Initial calibration)	Cr	50.604	50	101	101	
	CVAA (Initial calibration)						
CCV2	ICP (Continuing calibration)	Fe	50.123	50	100	100	
CCV7	ICP/MS (Continuing calibration)	As	98.0	100	98	98	
	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 #: 29948A5

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

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

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)
ICSAB	ICP interference check	Ca	481.93	500	96.4	96.4	Y
LCS	Laboratory control sample	Fe	1053.1	1000	105	105	
13	Matrix spike	Pb	(SSR-SR) 94.633	100	94.6	94.6	
15	Duplicate	As	1.73	1.677	3.11	3.11	
N	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 #: 29948A4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: CR
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 As 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:

Raw Data = 2.416 ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	7	Fe	57	57	Y
		As	2.4	2.4	
		Cr	2.3	2.3	
		Pb	0.14	0.14	
		Ca (mg/L)	32	32	
		Mg	9.9	9.9	
		Na	41	41	
		K	1.9	1.9	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 30, 2013

LDC Report Date: June 25, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308753

Sample Identification

EB-7-43013
MW-12-5
MW-12-4
MW-12-3
MW-12-2
MW-12-1
MW-24-5**
MW-24-4
MW-24-3
MW-24-2
MW-24-1
DUP-4-2Q13
MW-12-4MS
MW-12-4MSD
MW-12-4DUP
MW-12-3DUP
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 22 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per Standard Method 2320B for Alkalinity, 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, EPA Method 365.1 for Orthophosphate as Phosphorus, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
EB-7-43013 MW-12-5 MW-12-4 MW-12-3 MW-12-2 MW-12-1 MW-24-5** MW-24-4 MW-24-3 MW-24-2 MW-24-1 DUP-4-2Q13 MW-12-3DUP	pH	3 days	48 hours	J (all detects) UJ (all non-detects)	P

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	Sulfate	0.297 mg/L	All samples in SDG 1308753
ICB/CCB	Chloride	0.128 mg/L	EB-7-43013 MW-12-5 MW-12-4 MW-12-3 MW-12-2

Method Blank ID	Analyte	Concentration	Associated Samples
ICB/CCB	Chloride	0.153 mg/L	MW-12-1 MW-24-5** MW-24-4 MW-24-3 MW-24-2
ICB/CCB	Chloride	0.159 mg/L	MW-24-1 DUP-4-2Q13
ICB/CCB	Orthophosphate as P	0.0048630 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 with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
EB-7-43013	Sulfate Chloride	0.28 mg/L 0.24 mg/L	0.28U mg/L 0.24U 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

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-12-2 and DUP-4-2Q13 were identified as field duplicates. No contaminant concentrations were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD
	MW-12-2	DUP-4-2Q13	
pH (units)	7.89 units	7.63 units	3
TDS	330 mg/L	350 mg/L	6
Chloride	19 mg/L	19 mg/L	0
Nitrate as N	2.0 mg/L	2.5 mg/L	22
Sulfate	49 mg/L	49 mg/L	0
Perchlorate	8.5 ug/L	8.7 ug/L	2
Total Alkalinity	200 mg/L	200 mg/L	0
Bicarbonate Alkalinity	250 mg/L	250 mg/L	0

XI. Field Blanks

Sample EB-7-43013 was identified as an equipment blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-7-43013	pH Chloride Sulfate	5.74 units 0.24 mg/L 0.28 mg/L

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1308753

SDG	Sample	Analyte	Flag	A or P	Reason
1308753	EB-7-43013 MW-12-5 MW-12-4 MW-12-3 MW-12-2 MW-12-1 MW-24-5** MW-24-4 MW-24-3 MW-24-2 MW-24-1 DUP-4-2Q13	pH	J (all detects) UJ (all non-detects)	P	Technical holding times

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 1308753

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308753	EB-7-43013	Sulfate Chloride	0.28U mg/L 0.24U mg/L	A

LDC #: 29948A6 **VALIDATION COMPLETENESS WORKSHEET** Date 6/24/13
SDG #: 1308753 Level III/IV Page: 1 of 1
Laboratory: BC Laboratories, Inc. Reviewer: a
2nd Reviewer: W

METHOD: Alkalinity (SM2320B), 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), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	SW	Sampling dates: 4/30/13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/D
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	(5, 12)
XI	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

water

1	EB-7-43013	11	MW-24-1	21	MW-24-1MSD	31	
2	MW-12-5	12	DUP-4-2Q13	22	MW-24-1DUP	32	
3	MW-12-4	13	MW-12-4MS	23		33	
4	MW-12-3	14	MW-12-4MSD	24		34	
5	MW-12-2	15	MW-12-4DUP	25		35	
6	MW-12-1	16	MW-12-3DUP	26		36	
7	MW-24-5**	17	MW-24-2MS	27		37	
8	MW-24-4	18	MW-24-2MSD	28		38	
9	MW-24-3	19	MW-24-2DUP	29		39	
10	MW-24-2	20	MW-24-1MS	30		40	

Notes:

LDC #: 29948A6

VALIDATION FINDINGS CHECKLIST

Reviewer: QR
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 #: 20948A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Parameter
1-12	[✓ pH] [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 [✓ Alk] CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
11	pH TDS Cl F NO_3 NO_2 SO_4 [✓ O-PO_4] Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 13,14	pH TDS [✓ Cl] F [✓ NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
15	pH [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
16	[✓ pH] TDS Cl F NO_3 NO_2 SO_4 O-PO_4 [✓ Alk] CN NH_3 TKN TOC Cr6+ ClO_4
17,18	pH TDS [✓ Cl] F [✓ NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
19	pH [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
20,21	pH TDS Cl F NO_3 NO_2 SO_4 [✓ O-PO_4] Alk CN NH_3 TKN TOC Cr6+ ClO_4
22	pH TDS Cl F NO_3 NO_2 SO_4 [✓ O-PO_4] Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 29948A6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: QR
2nd reviewer: W

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:		150.1					
Parameters:		pH					
Technical holding time:		48hrs					
Sample ID	**Sampling date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Qualifier**
1-12, 16	4/30/13	5/3/13	(3days)				J/UJ/P

LDC #: 29932A6

VALIDATION FINDINGS WORKSHEET
Blanks

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

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** All

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		1									
SO4		0.297	1.485	0.28									

Conc. units: mg/L **Associated Samples:** 1-5

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		1									
Cl		0.128	0.64	0.24									

Conc. units: mg/L **Associated Samples:** 6-10

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		No Qualifiers									
Cl		0.153	0.765										

Conc. units: mg/L **Associated Samples:** 11, 12

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		No Qualifiers									
Cl		0.159	0.795										

Conc. units: mg/L **Associated Samples:** 11

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		No Qualifiers									
oPO4-P		0.0048630	0.024315										

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# 29948A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: CN
2nd Reviewer: [signature]

Inorganics: Method See Cover

Analyte	Concentration (mg/L)		RPD
	5	12	
pH (units)	7.89	7.63	3
TDS	330	350	6
Chloride	19	19	0
Nitrate as N	2.0	2.5	22
Sulfate	49	49	0
Perchlorate (ug/L)	8.5	8.7	2
Total Alkalinity	200	200	0
Bicarbonate Alkalinity	250	250	0

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LDC #: 20748B6

SDG #: —

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: a

2nd reviewer: V

METHOD: Inorganics, EPA Method see calc

(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 (circle one) (FB)

Analyte	Concentration Units (mg/L)
pH (units)	5.74
Cl	0.24
SO_4	0.28

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

Analyte	Concentration Units ( )

LDC #: 29946A6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

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

Method: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Cl was recalculated. Calibration date: 4/30/13

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	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial Calibration Verification	Cl	0	0	0.000	*0.99985*	0.99571	Y
		s1	0.5	0.055			
		s2	5	0.484			
		s3	20	2.021			
		s4	50	6.086			
		s5	100	13.425			
		s6	200	29.276			
Calibration verification	SO4	ICV	100	101,394	101	101	
Calibration verification	ClO4	CCV	10	8.836	88.4	88.4	
Calibration verification	NO2-N	1	0.5	0.46737	93.5	93.5	

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 #: 29948A5

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: CR
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

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

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

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

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	SO4	100.77	100	101	101	Y
13	Matrix spike sample	Cl	(SSR-SR) 52.227	50.505	103	103	
16	Duplicate sample	pH	8.17	8.16	0.122	0.122	

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 #: 29949A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: QR
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 SO4 reported with a positive detect were recalculated and verified using the following equation:

Concentration =

Recalculation:

$y = 0.0001x^2 + 0.0799x - 0.0145$

$$\frac{\sqrt{4(0.0001)(1.548+0.0145)+0.0799^2}-0.0799}{2(0.0001)} = 19.099 \text{ mg/L}$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
	7	pH (units)	8.27	8.27	Y
		TDS	220	220	
		Cl	8.4	8.4	
		NO_3-N	1.1	1.1	
		SO_4	19	19	
		Ca^{2+}	0.0028	0.0028	
		Bicarb	200	200	
		Alk	160	160	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 29, 2013

LDC Report Date: June 25, 2013

Matrix: Water

Parameters: Volatiles

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308660

Sample Identification

TB-6-42913
SB-3-42913
EB-6-42913
MW-23-5**
MW-23-4
MW-23-3
MW-23-2
MW-23-1
MW-3-5
MW-3-4**
MW-3-3
MW-3-2
MW-3-1
MW-23-1MS
MW-23-1MSD

**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.

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
4/30/13 (19:05)	Bromomethane	32.8	All samples in SDG 1308660	J (all detects) UJ (all non-detects)	P
4/30/13 (19:27)	Pentachloroethane	85.4	All samples in SDG 1308660	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.

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-23-1MS/MSD (MW-23-1)	Trichloroethene	-	-	20.4 (≤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

No field duplicates were identified in this SDG.

XVII. Field Blanks

Sample TB-6-42913 was identified as a trip blank. No volatile contaminants were found.

Sample EB-6-42913 was identified as an equipment blank. No volatile contaminants were found.

Sample SB-3-42913 was identified as a source blank. No volatile contaminants were found.

NASA JPL
Volatiles - Data Qualification Summary - SDG 1308660

SDG	Sample	Compound	Flag	A or P	Reason
1308660	TB-6-42913 SB-3-42913 EB-6-42913 MW-23-5** MW-23-4 MW-23-3 MW-23-2 MW-23-1 MW-3-5 MW-3-4** MW-3-3 MW-3-2 MW-3-1	Bromomethane Pentachloroethane	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Continuing calibration (%D)
1308660	MW-23-1	Trichloroethene	J (all detects)	A	Matrix spike/Matrix spike duplicate (RPD)

NASA JPL
Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308660

No Sample Data Qualified in this SDG

LDC #: 29948B1
SDG #: 1308660
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 6/24/13
Page: 1 of 1
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: 4/29/13
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	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	N	
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-6-42913	11	MW-3-3	21	BWD2362	31	
2	SB-3-42913	12	MW-3-2	22		32	
3	EB-6-42913	13	MW-3-1	23		33	
4	MW-23-5**	14	MW-23-1MS	24		34	
5	MW-23-4	15	MW-23-1MSD	25		35	
6	MW-23-3	16		26		36	
7	MW-23-2	17		27		37	
8	MW-23-1	18		28		38	
9	MW-3-5	19		29		39	
10	MW-3-4**	20		30		40	

LDC #: 29948B1

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?	FTW	✓		
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.
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 #: 29948B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: [illegible]
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
	4/30/13 19:05	1305606-CCV3	B	32.8	All	J/UJ/P
	4/30/13 19:27	1305606-CCV4	Pentachloroethane	84. 85.4 F1	↓	J/UJ/P

CONCAL.1S5

LDC #: 29948B1

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

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

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
		14 + 15	S	( )	( )	20.4 (20)	8	J/A det
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
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				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 29932A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

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

METHOD: GC/MS VOA (EPA Method 524.2)

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (std)	Recalculated RRF (std)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported %RSD	Recalculated %RSD
1	ICAL	4/18/13	Acetone (160) (1st Internal Standard)	3.056215×10^{-2}	0.03056	2.805742×10^{-2}	0.028057	7.107243 4.473303	7.107
			Methyl Metacrylate (40) (2nd Internal Standard)	7.66857×10^{-2}	0.07668	7.123823×10^{-2}	0.071238	4.473303	4.473
			Pentachloroethane (8) (3rd Internal Standard)	0.551458	0.55145	0.547112	0.54471	5.854311	5.854
2	ICAL	4/18/13	C (10) (1st Internal Standard)	0.903316	0.90335	0.8086408	0.86864	10.66688	10.667
			S (10) (2nd Internal Standard)	0.3343105	0.33431	0.3301203	0.33012	4.712199	4.7122
			EE (10) (3rd Internal Standard)	1.887303	1.88730	1.925438	1.92544	6.233496	6.233
3			(1st Internal Standard)						
			(2nd Internal Standard)						
			(3rd Internal Standard)						
4			(1st Internal Standard)						
			(2nd Internal Standard)						
			(3rd Internal Standard)						

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

LDC #: 29948B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

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	CON2	4/30/13	Acetone (1st Internal Standard)	2.805742×10^{-2}	2.874953×10^{-2}	0.028749	2.5	2.5
			methyl Metacrylate (2nd Internal Standard)	7.123823×10^{-2}	7.378268×10^{-2}	0.073783	3.6	3.6
			pentachloroethane (3rd Internal Standard)	0.544712	7.939157×10^{-2}	0.07939	85.4	85.4
2			C (1st Internal Standard)	0.868408	1.004673	1.004673	15.7	15.7
			S (2nd Internal Standard)	0.3301203	0.340464	0.340464	3.1	3.1
			EE (3rd Internal Standard)	1.925438	1.92304	1.92304	0.1	0.1
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 #: 29948B1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method ~~8260~~ 8270) 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 = I MSC - MSDC I * 2/(MSC + MSDC) MSC = Matrix spike percent recovery MSDC = Matrix spike duplicate percent recovery

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	28.480	26.870	114	114	107	107	5.82	5.82
Trichloroethene	↓	↓	2.780J	34.110	27.800	125	125	100	100	20.4	20.4
Benzene			ND	28.770	27.350	115	115	109	109	5.06	5.06
Toluene			↓	28.450	26.720	114	114	107	107	6.27	6.27
Chlorobenzene				26.900	25.480	108	108	102	102	5.42	5.42

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 #: 29948B1

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: BW D2362 - 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	27.750	NA	111	111				
Trichloroethene			28.140		113	113				
Benzene			28.500		114	114				
Toluene			27.500		110	110				
Chlorobenzene			25.910		104	104	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 #: 27948B1

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: #4

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10	10.220	102	102	0
Bromofluorobenzene	↓	9.040	90.4	90.4	↓
1,2-Dichlorobenzene-d4		11.070	111	111	
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 #: 29948B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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. #4, Styrene

Conc. = (9653)(10)( )( ) / (119996)(2.935)( )( )

=

0.27 ug/L

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 29, 2013

LDC Report Date: June 25, 2013

Matrix: Water

Parameters: Metals

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308660

Sample Identification

SB-3-42913
EB-6-42913
MW-23-5**
MW-23-4
MW-23-3
MW-23-2
MW-23-1
MW-3-5
MW-3-4**
MW-3-3
MW-3-2
MW-3-1
MW-23-1MS
MW-23-1MSD
MW-23-1DUP

**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 Methods 200.7 and 200.8 for Metals. The metals analyzed were Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, and Sodium.

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 metals contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Iron	0.010409 mg/L	SB-3-42913 EB-6-42913
ICB/CCB	Lead	0.145 ug/L	MW-3-2 MW-3-1

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
SB-3-42913	Iron	19 ug/L	19U ug/L
MW-3-2	Lead	0.12 ug/L	0.12U ug/L

V. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

VI. Matrix Spike Analysis

Matrix spike (MS) 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-6-42913 was identified as an equipment blank. No metal contaminants were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-6-42913	Iron Calcium	84 ug/L 0.031 mg/L

Sample SB-3-42913 was identified as a source blank. No metal contaminants were found with the following exceptions:

Blank ID	Analyte	Concentration
SB-3-42913	Iron Calcium	19 ug/L 0.024 mg/L

NASA JPL
Metals - Data Qualification Summary - SDG 1308660

No Sample Data Qualified in this SDG

NASA JPL
Metals - Laboratory Blank Data Qualification Summary - SDG 1308660

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308660	SB-3-42913	Iron	19U ug/L	A
1308660	MW-3-2	Lead	0.12U ug/L	A

LDC #: 29948B4

SDG #: 1308660

Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

Date: 6/24/13

Page: 1 of 1

Reviewer: a

2nd Reviewer: w

METHOD: Metals (EPA Method 200.7/200.8)

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: 4/29/13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS/D
VII.	Duplicate Sample Analysis	A	DD
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	
X.	Furnace Atomic Absorption QC	N	
XI.	ICP Serial Dilution	N	
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	N	
XV	Field Blanks	SW	EB=2 SB=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

water

1	SB-3-42913	11	MW-3-2	21		31	
2	EB-6-42913	12	MW-3-1	22		32	
3	MW-23-5**	13	MW-23-1MS	23		33	
4	MW-23-4	14	MW-23-1MSD	24		34	
5	MW-23-3	15	MW-23-1DUP	25		35	
6	MW-23-2	16		26		36	
7	MW-23-1	17		27		37	
8	MW-3-5	18		28		38	
9	MW-3-4**	19		29		39	
10	MW-3-3	20		30		40	

Notes: _____

LDC #: 29948B4

VALIDATION FINDINGS CHECKLIST

Reviewer: CR
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 #: 29948B4

VALIDATION FINDINGS CHECKLIST

Reviewer: CR
2nd Reviewer: W

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 #: 29948B4

VALIDATION FINDINGS WORKSHEET

Sample Specific Element Reference

Page: 1 of 1

Reviewer: OR

2nd reviewer: V

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-12		Al, Sb, [✓ As] Ba, Be, Cd, [✓ Ca, Cr,] Co, Cu, [✓ Fe, Pb, Mg,] Mn, Hg, Ni, [✓ K,] Se, Ag, [✓ Na,] Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
QC:13-15		Al, Sb, [✓ As,] Ba, Be, Cd, [✓ Ca,] [✓ Cr,] Co, Cu, [✓ Fe,] [✓ Pb,] [✓ Mg,] Mn, Hg, Ni, [✓ K,] Se, Ag, [✓ Na,] Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
		Analysis Method
ICP		Al, Sb, As, Ba, Be, Cd, [✓ Ca,] Cr, Co, Cu, [✓ Fe,] Pb, [✓ Mg,] Mn, Hg, Ni, [✓ K,] Se, Ag, [✓ Na,] Tl, V, Zn, Mo, B, Sn, Ti,
ICP-MS		Al, Sb, [✓ As,] Ba, Be, Cd, Ca, [✓ Cr,] Co, Cu, Fe, [✓ Pb,] Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti

Comments: Mercury by CVAA if performed

LDC #: 29948B4

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: AR
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: 1, 2

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (mg/L)	Action Level	1								
Fe			0.010409	52.045	19								

Sample Concentration units, unless otherwise noted: ug/L Associated Samples: 11, 12

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Level	11								
Pb			0.145	0.725	0.12								

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 #: 29948B4

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: CM
2nd reviewer: [illegible]

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 (SB) (circle one)

Analyte	Concentration Units (ug/L)
Fe	19
Ca (mg/L)	0.024

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

Analyte	Concentration Units (ug/L)
Fe	84
Ca (mg/L)	0.031

LDC #: 29948B4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

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

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

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

%R = Found / True x 100 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)
ICV	ICP (Initial calibration)	Ca	49.660	50	99.3	99.3	Y
ICV	ICP/MS (Initial calibration)	Cr	49.628	50	99.3	99.3	
	CVAA (Initial calibration)						
	ICP (Continuing calibration)						
CCVC	ICP/MS (Continuing calibration)	As	100.65	100	101	101	
CCV	~~CVAA~~ ICP (Continuing calibration)	Mg	49.76	50	99.5	99.5	
	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 #: 29948B3

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: 9R
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)
ICSAB	ICP interference check	Ca	48871	500	97.7	97.7	Y
LCS	Laboratory control sample	Pb	102.6	100	103	103	↓
13	Matrix spike	As	(SSR-SR) 98.614	100	98.6	98.6	↓
15	Duplicate	Fe	493,91	457.44	7.67	7.67	↓
N	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 #: 29948B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: CR
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 Fe 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:

0.0526mg/L (1000) = 52.6ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	3	Fe	53	53	Y
		As	3.7	3.7	
		Pb	0.15	0.15	
		Ca (mg/L)	4.2	4.2	
		Mg	0.30	0.30	
		Na	88	88	
		K	1.7	1.7	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NASA JPL

Collection Date: April 29, 2013

LDC Report Date: June 25, 2013

Matrix: Water

Parameters: Wet Chemistry

Validation Level: EPA Level III & IV

Laboratory: BC Laboratories, Inc.

Sample Delivery Group (SDG): 1308660

Sample Identification

SB-3-42913	MW-3-2DUP
EB-6-42913	
MW-23-5**	
MW-23-4	
MW-23-3	
MW-23-2	
MW-23-1	
MW-3-5	
MW-3-4**	
MW-3-3	
MW-3-2	
MW-3-1	
MW-23-1MS	
MW-23-1MSD	
MW-23-1DUP	
MW-3-3MS	
MW-3-3MSD	
MW-3-3DUP	
MW-3-2MS	
MW-3-2MSD	

**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 Standard Method 2320B for Alkalinity, 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, EPA Method 160.1 for Total Dissolved Solids, and EPA Method 150.1 for pH.

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 with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
SB-3-42913 EB-6-42913 MW-23-5** MW-23-4 MW-23-3 MW-23-2 MW-23-1 MW-3-5 MW-3-4** MW-3-3 MW-3-2 MW-3-1 MW-3-3DUP	pH	3 days	48 hours	J (all detects) UJ (all non-detects)	P

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

The absolute value of the contaminant concentrations found in the initial, continuing and preparation blanks were less than the reporting limit (RL) with the following exceptions:

Method Blank ID	Analyte	Concentration	RL	Associated Samples	Flag	A or P
MB	Hexavalent chromium	-0.00495 mg/L	0.002 mg/L	SB-3-42913 EB-6-42913 MW-23-5** MW-23-4 MW-23-3 MW-23-2 MW-23-1 MW-3-5 MW-3-4**	J (all detects) UJ (all non-detects)	A

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	0.103 mg/L	All samples in SDG 1308660
ICB/CCB	Chloride	0.137 mg/L	All samples in SDG 1308660

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
SB-3-42913	Chloride	0.19 mg/L	0.19U mg/L
EB-6-42913	Chloride	0.14 mg/L	0.14U 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

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-6-42913 was identified as an equipment blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
EB-6-42913	pH Chloride Nitrate as N	5.54 units 0.14 mg/L 0.042 mg/L

Sample SB-3-42913 was identified as a source blank. No contaminant concentrations were found with the following exceptions:

Blank ID	Analyte	Concentration
SB-6-42913	pH Chloride	5.81 units 0.19 mg/L

NASA JPL
Wet Chemistry - Data Qualification Summary - SDG 1308660

SDG	Sample	Analyte	Flag	A or P	Reason
1308660	SB-3-42913 EB-6-42913 MW-23-5** MW-23-4 MW-23-3 MW-23-2 MW-23-1 MW-3-5 MW-3-4** MW-3-3 MW-3-2 MW-3-1	pH	J (all detects) UJ (all non-detects)	P	Technical holding times
1308660	SB-3-42913 EB-6-42913 MW-23-5** MW-23-4 MW-23-3 MW-23-2 MW-23-1 MW-3-5 MW-3-4**	Hexavalent chromium	J (all detects) UJ (all non-detects)	A	Blanks (negative blank)

NASA JPL
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 1308660

SDG	Sample	Analyte	Modified Final Concentration	A or P
1308660	SB-3-42913	Chloride	0.19U mg/L	A
1308660	EB-6-42913	Chloride	0.14U mg/L	A

LDC #: 29948B6
SDG #: 1308660
Laboratory: BC Laboratories, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 6/24/13
Page: 1 of 1
Reviewer: AL
2nd Reviewer: [illegible]

METHOD: Alkalinity (SM2320B), 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), Total Dissolved Solids (EPA Method 160.1), pH (EPA Method 150.1)

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	~~SW~~ SW	Sampling dates: 4/29/13
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	MS/D
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	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

water

1	SB-3-42913	11	MW-3-2	21	MW-3-2DUP	31	
2	EB-6-42913	12	MW-3-1	22		32	
3	MW-23-5**	13	MW-23-1MS	23		33	
4	MW-23-4	14	MW-23-1MSD	24		34	
5	MW-23-3	15	MW-23-1DUP	25		35	
6	MW-23-2	16	MW-3-3MS	26		36	
7	MW-23-1	17	MW-3-3MSD	27		37	
8	MW-3-5	18	MW-3-3DUP	28		38	
9	MW-3-4**	19	MW-3-2MS	29		39	
10	MW-3-3	20	MW-3-2MSD	30		40	

Notes: _____

LDC #: 29948B6

VALIDATION FINDINGS CHECKLIST

Reviewer: QR
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 #: 29948B6

VALIDATION FINDINGS WORKSHEET

Sample Specific Analysis Reference

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

All circled methods are applicable to each sample.

Sample ID	Parameter
1-17	[✓ pH] [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 [✓ Alk] CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:13,14	pH TDS [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
15	pH [✓ TDS] [✓ Cl] F [✓ NO_3] [✓ NO_2] [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] [✓ ClO_4]
16,17	pH TDS Cl F NO_3 [✓ NO_2] SO_4 O-PO_4 Alk CN NH_3 TKN TOC [✓ Cr6+] ClO_4
18	[✓ pH] TDS Cl F NO_3 [✓ NO_2] SO_4 O-PO_4 [✓ Alk] CN NH_3 TKN TOC [✓ Cr6+] ClO_4
19,20	pH TDS [✓ Cl] F [✓ NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
21	pH TDS [✓ Cl] F [✓ NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ [✓ ClO_4]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 29948B6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: QR
2nd reviewer: V

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:		150.1					
Parameters:		pH					
Technical holding time:		48hrs					
Sample ID	**Sampling date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Qualifier**
1-12, 18	4/29/13	5/2/13	(3days)				J/UJ/R

LDC #: 29948B6
SDG #: ——

VALIDATION FINDINGS WORKSHEET
Negative Blanks

Reviewer: CL
2nd Reviewer: [illegible]

METHOD: Inorganics, Method _____
The absolute value of the negative blank conentrations listed below exceeded the RL

#	Blank ID	Analyte	Negative Blank Concentration	RL	Associated Samples	Qualifications
	MB	Cr6+	-0.00495 mg/L	0.002 mg/L	1-9	J/UJ/A

Comments: _____

LDC #: 29948B6

VALIDATION FINDINGS WORKSHEET
Blanks

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

METHOD: Inorganics, Method See Cover

Conc. units: mg/L **Associated Samples:** All

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB	ICB/CCB (mg/L)		1	2								
Cl	0.103	0.137	0.685	0.19	0.14								

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 #: 29948B6
SDG #: —

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: AL
2nd reviewer: W

METHOD: Inorganics, EPA Method see coun

(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) (FB)

Analyte	Concentration Units (mg/L)
pH (units)	5.81
Cl	0.19

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

Analyte	Concentration Units (mg/L)
pH (units)	5.54
Cl	0.14
NO_3N	0.042

LDC #: 29948B6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: CN
2nd Reviewer: LC

Method: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Cl was recalculated. Calibration date: 4/29/13

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	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial Calibration Verification	Cl	0	0.15	0.013	*0.99985*	0.99654	Y
		s1	0.5	0.078			
		s2	5	0.724			
		s3	20	3.158			
		s4	50	9.641			
		s5	100	20.924			
		s6	200	21.698			
Calibration verification	SO_4	ICV	100	100.263	100	100	
Calibration verification	ClO_4	CCV1	10	9.2687	92.7	92.7	
Calibration verification	NO_2-N	CCV2	0.5	0.45852	91.7	91.7	

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

LDC #: 29948D6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: CR
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)
LCS	Laboratory control sample	TDS	586	585	99.8	99.8	Y
19	Matrix spike sample	Cl04	(SSR-SR) 8.1285	10.101	80.5	80.5	
18	Duplicate sample	pH	7.77	7.78	0.129	0.129	

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 #: 29946B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: QR
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 Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration = $y = 0.0002x^2 + 0.1774x - 0.0133$

Recalculation:

$$\frac{\sqrt{4(0.0002)(1.637+0.0133)+(0.1774)^2}-0.1774}{2(0.0002)} = 9,207 \text{ mg/L}$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
	3	pH (units)	9.61	9.61	Y
		TDS	240	240	
		Cl	9.2	9.2	
		NO_3-N	0.039	0.035	
		SO_4	8.1	8.1	
		Alk	170	170	
		Bicarb.	120	120	
		Carb.	42	42	

Note: