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 μ g/L to 5.1 μ g/L and 2.1J μ g/L to 5.0 μ g/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 $\mu g/L$.)

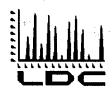
Blank Type	Sample ID Number	Sampling Location(s)	Total Chromium	Methylene Chloride	1,2,3- Trichloropropane	2-Butanone	Other Organic Compounds	TICs
EQUIPMENT BLANK	EB-1-42213	MW-19, MW-20	3 U	0.5 U	1 U	10 U		
EQUIPMENT BLANK	EB-2-42313	MW-14, MW-19	3 U	0.5 U	1 U	10 U		
EQUIPMENT BLANK	EB-3-42413	MW-18, 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-	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

June 19, 2013

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

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#	<u>Fraction</u>
1308175 1308285	Volatiles, Metals, Wet Chemistry
1308396	

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

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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:

	Concentr	ation (ug/L)	
Compound	MW-20-3**	DUP-1-2Q13	RPD
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

VALIDATION COMPLETENESS WORKSHEET LDC #: 29883A1

SDG #: 1308175

Level III/IV

Page: __of_ 1 Reviewer: __ SW 2nd Reviewer:_

Date: 6/13/13

Laboratory: BC Laboratories, Inc.

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
1.	Technical holding times	A	Sampling dates: 04/22/2013
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	PSD = 20, V2
IV.	Continuing calibration/ICV	A	104/cc4 5 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	Α_	
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

Validated Samples:** Indicates sample underwent Level IV validation

ND = No compounds detected R = Rinsate

EB = Equipment blank SB = SOUPER BLANK

D = Duplicate

TB = Trip blank

FB = Field blank

	WATER					
- 1	TB-1-42213	+ 11	MW-19-3	21	31	BND2198-BLK-1
<u>-</u> 2	SB-1-42213	† 12	DUP-1-2Q13	22	32	
	EB-1-42213	13	MW-20-1MS	23	33	
3 + 4	MW-20-5	14	MW-20-1MSD	24	34	
11	MW-20-4	15		25	35	
ት 6	MVV-20-3**	16		26	36	
۲ 7	MW-20-2	17		27	37	
† 8	MW-20-1	18		28	38	
5 +6 +7 +8 +9 +10	MW-19-5	19		29	39	
10	MW-19-4	20		30	40	

Method: Volatiles (EPA Method 524.2)

Validation Area	Yes	No	NA	Findings/Comments
1. Technical holding times	ī		I.	
All technical holding times were met.	_			
Cooler temperature criteria was met.				
II. GC/MS Instrument performance check	Ι			
Were the BFB performance results reviewed and found to be within the specified criteria?	_			
Were all samples analyzed within the 12 hour clock criteria?				The same of the sa
III. Initial calibration	r			
Did the laboratory perform a 5 point calibration prior to sample analysis?	/			
Were all percent relative standard deviations (%RSD) ≤ 20%?				2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -
IV. Continuing calibration			Г	
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	/			
Were all percent differences (%D) ≤ 30%?				710.
V. Blanks	Г		·	
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.		/		E
VI. Surrogate spikes	ı			
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	1			
Was a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for this SDG?	_			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	/			
VIII. Laboratory control samples				
Was an LCS analyzed for this SDG?	_			
Was an LCS analyzed per analytical batch?	_			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	/			

VALIDATION FINDINGS CHECKLIST

Page: 2_ of 2 Reviewer: _ sw 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	ı	1		
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				PART OF THE PROPERTY OF THE PR
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	1	1		
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 \pm 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	ı	Γ		
Overall assessment of data was found to be acceptable.	/			
XVI. Field duplicates				
Field duplicate pairs were identified in this SDG.	_			to the state of th
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.			L	

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	000. 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. lodomethane
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	день
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	www. Ethanol	9999.
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	חתחת.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

LDC#: 29883A1

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: t of l
Reviewer: SW
2nd Reviewer:

METHOD: GC MS Volatiles (EPA SW 846 Method 524.2)

<u>Øn na</u>

Were field duplicate pairs identified in this SDG?

Were target analytes detected in the field duplicate pairs?

	Concentra	tion (ug/L)	
Compound	6	12	RPD
EE	0.14	0.11	24
FF	0.41	0.33	22
AA	0.20	0.15	29
СС	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#: 29883-41

Initial Calibration Calculation **VALIDATION FINDINGS**

Page: { of } Reviewer:

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)

%RSD = 100 * (S/X)

Ax = Area of compound

Ais = Area of associated internal standard

average RRF = sum of the RRFs/number of standards

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 Recalculated Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
-	1304018	4/18/2013	4/18/2013 Carbon Disulfide (1st Internal Standard)	1.47923	1.479230	1.393525	1.39353	7.69	69'.
		7:00	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

Cx 6.4

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

= 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#: 2900341

VALIDATION FINDINGS

Continuing Calibration Results Verification

Page: 1 of 1 SW. Reviewer:

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

Ax = Area of compound

Cx = Concentration of compound

Ais = Area of associated internal standard

Cis = Concentration of internal standard

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

RRF = continuing calibration RRF ave. RRF = initial calibration average RRF

#	Standard ID	Calibration Date	Compound (IS)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
_	28APR06.D	4/28/2013	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
7								

	28	01	67			
Ais	3605	534301	1377			
Ax	1552514	435823	996629			
ŏ	32	25	25			
Cis	10	10	10			
#	-			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:	7

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	O
1,2-Dichlorobenzene-d4		10.93	109	109.34	o
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 #: 29 683A1

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

LO_l	SN	J
Lage:	Reviewer:	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

SSC = Spiked sample concentration SA = Spike added Where:

RPD = I LCSC - LCSDC | * 2/(LCSC + LCSDC)

LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

BNDZ198-BSI LCS ID:

		þed	, ,			
I CS/I CSD	RPD	Recalculated		1		
SOI	α.	Reported		ì		
- OS	lecovery	Recalc.		١		
I CSD	Percent Recovery	Reported		1		
S	ecovery	Recalc.		18.00)		
SUI	Percent Recovery	Reported		[0]		
Sample	tration /ヒ)	CSD		١	•	
Spiked S	Concentration () () ()	SOT		007.52		
ike	Added ()	LCSD				
ďS	py)	SOT		25.000		
	Compound			TRICHLOPOSTHENE		

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 #: 29883-11

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	<u>(of/</u>
Reviewer:	SIN
2nd reviewer:	-4

METHOD: GC/MS VOA (EPA Method 524.2)

A N N/A

Were all reported results recalculated and verified for all level IV samples?

OP N N/A

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

Concentration = $\frac{(A_s)(I_s)(DF)}{(A_s)(RRF)(V_o)(V_oS)}$ 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. Trian Lop of TheNE

Conc. = (4b05)(10)(1)(499507)(0.3301203)(-)(-)

= 0.2792 mg/L

	only.				
#	Sample ID	Compound	Reported Concentration (µg / L)	Calculated Concentration	Qualification
		CARBON DISULTIDE	0.64	0.6416	_
		Ethylbonzone	0.14	0.1363	
	,,_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				

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:

	Conce		
Analyte	MW-20-3**	RPD	
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	А
1308175	EB-1-42213	Iron	19U ug/L	А
1308175	MW-20-5	Iron	28U ug/L	Α
1308175	MW-20-3**	Iron	37U ug/L	А
1308175	MW-20-2	Iron	20U ug/L	А
1308175	MVV-19-5	Iron	34U ug/L	А
1308175	DUP-1-2Q13	Iron	16U ug/L	А

LDC #: 29883A4 **VALIDATION COMPLETENESS WORKSHEET** SDG #: 1308175

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Level III/IV

Page: Lof I Reviewer: MG 2nd Reviewer:

Date: 6-13-13

Laboratory: BC Laboratories, Inc.

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	Α	Sampling dates: 4-22-13
II.	ICP/MS Tune	A	
111.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	M5/MSD
VII.	Duplicate Sample Analysis	A	DUP
VIII.	Laboratory Control Samples (LCS)	Α	LCS
IX.	Internal Standard (ICP-MS)	A	not reviewed for level 111
X.	Furnace Atomic Absorption QC	7	not utilized
XI.	ICP Serial Dilution	7	not performed
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	Α	
XIV.	Field Duplicates	SW	D= 5+11
XV	Field Blanks	SW	SB=1 EB=2

Note:

all

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

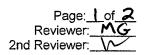
1_	SB-1-42213	11	DUP-1-2Q13	21	31
2	EB-1-42213	12	MW-20-1MS	22	32
3	MW-20-5	13	MW-20-1MSD	23	33
4	MW-20-4	14	MW-20-1DUP	24	34
5	MW-20-3**	15		25	35
11				1 1	l l

4	ED-1-42213	1 12	11010 0-20-11013	22		JZ	
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	PBWI	39	
10	MVV-19-3	20		30	PBW2	40	

Notes:				

LDC#: 29883A4

VALIDATION FINDINGS CHECKLIST



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.	V						
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.	1						
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.	1	-					
Were the MS/MSD or duplicate relative percent differences (RPD) \leq 20% for waters and \leq 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were \leq 5X the RL, including when only one of the duplicate sample values were \leq 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

Page:	2 _{of} 2
Reviewer:	
2nd Reviewer:	1

Validation Area	Yes	No	NA	Findings/Comments
VIII. Furnace Atomic Absorption QC		,	r	
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?			V	
IX. ICP Serial Dilution			,	
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		/	ļ	
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?			<u>/</u>	
XI. Regional Quality Assurance and Quality Control			·	
Were performance evaluation (PE) samples performed?		/	<u> </u>	
Were the performance evaluation (PE) samples within the acceptance limits?				
XII. Sample Result Verification		r	T	r
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	/		<u> </u>	
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	/			
XIV. Field duplicates				1
Field duplicate pairs were identified in this SDG.	/			
Target analytes were detected in the field duplicates.	<u> </u>			
XV. Field blanks				
Field blanks were identified in this SDG.	V			
Target analytes were detected in the field blanks.	/			

LDC#: 29883A4

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page:_	l of L
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 ⁻ ,
0c 12-14	J	Al, 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 ⁻ ,
<u> </u>		Analysis Method
ICP	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni K, Se, Ag, Na, Fl, V, Zn, Mo, B, Si, CN,
ICP-MS	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, Si, CN,
GEAA		Al, Sh, 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

2nd Reviewer: 🗼 Page: Reviewer:_

Analyte	Maximum PB ^a (mg/Kg)	Maximum PB ^a (ug/L)	Maximum ICB/CCB ^a (ug/L)	Action Limit	_	2	ε	9	8	
Fe		6.841		34.20	6.5	19	28	20	34	
Sample Cor	Sample Concentration units, unless otherwise noted: ug/l	nits, unless c	otherwise not	ed: ug/L	As	ssociated Samples: 1,7	mples: 1,7			
Analyte	Maximum PB³ (mg/Kg)	Maximum PB ^a (ug/L)	Maximum ICB/CCB ^a (ug/L)	Action Limit	—					
Fe			11.147	55.74	See PB					
Sample Cor	Sample Concentration units, unless otherwise noted: ug/l	ınits, unless o	otherwise no	ed: ug/L	As	ssociated Sa	sociated Samples: 2-6,8,9	6		HANDERS OF THE PROPERTY OF THE
Analyte	Maximum PB ^a (mg/Kg)	Maximum PB ^a (ug/L)	Maximum ICB/CCB* (ug/L)	Action Limit	2	3	5	9	80	
Fe			8.184	40.92	See PB	See PB	37	See PB	See PB	
Sample Cor	Sample Concentration units, unless otherwise noted: ug/L (* Mg in mg/L)	units, unless	otherwise no	ted: ug/L (*	Mg in mg/L)		Associat	Associated Samples: 10, 11	10, 11	

:		
,		
11	16	
		*6
Action Limit	87.90	.15379
	_	0
Maximum ICB/CCB ^a (ug/L)	17.581	30758
IC M		0.0
faximum PB ^a (ug/L)		0.022303* 0.030758* 0.15379*
Ma: I (L		0.0
Maximum Maximum Maximum PB* ICB/CCB* (mg/Kg) (ug/L)		
Analyte		
An	Fe	Мд

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

Page:	_of
Reviewer:	MG
2nd Reviewer:	\~\

METHOD: Metals (EPA Method 6010B/7000)

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

	Concentration (ug/L)		222	
Analyte	5	11	RPD	
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	

V:\FIELD DUPLICATES\FD_inorganic\29883A4.WPD

LDC#: 29883A4

VALIDATION FINDINGS WORKSHEET Field Blanks

Page:	of
Reviewer:_	
2nd reviewer:	

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000) Were field blanks identified in this SDG? Y) N N/A Were target analytes detected in the field blanks? SB Field Blank / Trip Blank / Rinsate / Other _(circle one) Sample: _____ Concentration Units (6.5 0.039 Field Blank / Trip Blank / Rinsate / Other EB (circle one) Sample: __ Concentration Units (Analyte Fe Ca

LDC# 3983A4

VALIDATION FINDINGS WORKSHEET Initial and Continuing Calibration Calculation Verification

Page: Lof L Reviewer: MG 2nd Reviewer: C

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 = <u>Found</u> x 100 Where, Found = concentration

True = concentration

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

					Recalculated	Reported	
Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	%R	%R	Acceptable (Y/N)
TCV 1106	ICP (Initial calibration)	Ca	50470	50000	101	101	\
1792 TCV	ICP/MS (Initial calibration)	Pb	191.847	(35.00	97.5	97.5	
	CVAA (Initial calibration)						
16:0 CCV 2	ICP (Continuing calibration)	Ma	48210	20000	46.4	4.96	
1911 CCV3	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#. 39893A4

VALIDATION FINDINGS WORKSHEET Level IV Recalculation Worksheet

Page: of 2nd Reviewer. 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). Concentration of each analyte in the source.

True =

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

 $RPD = 1S-DL \times 100$ (S+D)/2

S = Original sample concentration D = Duplicate sample concentration Where,

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

Where, I = Initial Sample Result (mg/L) SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5) %D = [I-SDR] x 100

					Recalculated	Reported	edelanisti karanta kananakan makamanakan makamanakan makamanakan kananakan kananakan kananakan kananakan kanan
Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	%R/RPD/%D	%R/RPD/%D	Acceptable (Y/N)
11.8 IFBI	ICP interference check	Ca	510.0 (mg/L)	. 0 (mg/L) 500.00 (mg/L)	102	¢01	>
1556 LCS	Laboratory control sample	X	9.531 (mg/L)	(7/8m) 000.01 (7/8m)	95.3	95.3	
1991	Matrix spike	C۴	(SSR-SR) 38.837 (Mg/L)	38.837 (mg/L) 40.000 (mg/L)	97.1	1.76	
h) 1883 / 1888	Duplicate	Fe	76.0 (Mg/L)	(4gh) 72.8 (4gh)	4.30	4.23	>
)	ICP serial dilution	١	1	1	l	1)

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

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LDC#: 29883 A4

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

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

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

tecte ıatio	ed analyte results for n:	# 5, Mg	were recalcu	lated and verified ι	ising the follow
centra	ation = \frac{(RD)(FV)(Dil)}{(In. Vol.)} = Raw data concentrat = Final volume (ml) = Initial volume (ml) or	Recalculation (6.633 mg)	9/L)(0.050L) 0.050L	= 6.633	mg/.
701.	= Dilution factor	weight.(G)	0.050 L		0, L
#	Sample ID	Analyte	Reported Concentration (Mg/L)	Calculated Concentration (MG/L)	Acceptable (Y/N)
\prod	5	Fe	37	37	Y
		As	0.96	0.96	
			(mg /L)	(mg /L)	
		Ca	6.1	6.1	
		Mq	6.6	6.6	
		Na	49	49	
		K	1.8	1.8	<u> </u>

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	рН	75.75 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-20-5 DUP-1-2Q13DUP	pH	75.00 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-20-4	рН	74.50 hours	48 hours	J (all detects) UJ (all non-detects)	P.
MW-20-3**	рН	74.00 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-20-2	рН	73.25 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-20-1	рН	73.00 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-19-5	рН	71.75 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-19-4	Hq	71.25 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-19-3	рН	71.00 hours	48 hours	J (all detects) UJ (all non-detects)	Р
DUP-1-2Q13	рН	74.75 hours	48 hours	J (all detects) UJ (all non-detects)	Р

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:

	Concentration		
Analyte	MW-20-3**	DUP-1-2Q13	RPD
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	pН	J (all detects) UJ (all non-detects)	Р	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	А
1308175	EB-1-42213	Chloride	0.16U mg/L	А

LDC #: 29883A6

SDG #: 1308175

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

Laboratory: BC Laboratories, Inc.

mA.

Date: 6-14-13 Page: Lof L Reviewer: MG 2nd Reviewer:__

METHOD: Alkalinity (SM2320B), Chloride, Sulfate, Nitrate-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
1.	Technical holding times	SW	Sampling dates: 4-22-13
11	Initial calibration	A	
111.	Calibration verification	Α	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	Α	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	Α	
X.	Field duplicates	SW	D=5+11
XI	Field blanks	SW	SB=1 EB=2

Note:

A = Acceptable

SW = See worksheet

N = Not provided/applicable

ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank

EB = Equipment blank

Validated Samples:** Indicates sample underwent Level IV validation

	all water	20				
1	SB-1-42213	11	DUP-1-2Q13	21 DUP-1-2Q13	DUP 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 PBWI	
10	MW-19-3	20	MW-19-3DUP	30	40 PBW2	

Notes:	

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	y			
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) \leq 20% for waters and \leq 35% for soil samples? A control limit of \leq CRDL(\leq 2X CRDL for soil) was used for samples that were \leq 5X the CRDL, including when only one of the duplicate sample values were \leq 5X the CRDL.	/			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	/			
Was an LCS analyzed per extraction batch?	V			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		/		
Were the performance evaluation (PE) samples within the acceptance limits?			/	

LDC#:_ 29883A6

VALIDATION FINDINGS CHECKLIST

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

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification	.,			
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	/			
Were detection limits < RL?	V			
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

All circled methods are applicable to each sample.

		Downwoods
Sample ID	<u>Matrix</u>	Parameter COCO
1->11	W	(PH)TDS)CI)F (NO)NO)SO) PO4 (ALK) CN: NH3 TKN TOC (CRE) (CIO)
QC 12,13		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN' NH ₃ TKN TOC CR ⁶⁺ (ClO ₄)
14		(PH) TDS CI F NO3 NO2 SO4 PO4 (ALK) CN NH3 TKN TOC CR6+ (CIO4)
15->17		PH TDS CI) F (NO3 (NO3 SO) PO4 ALK CN NH3 TKN TOC (CR CO) CIO4)
18-720		PH TDS CI F NO3 NO3 SO4 PO4 ALK CN NH3 TKN TOC CR CIO4
1 21	<u> </u>	PHTDS CIF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		pH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		pH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		pH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		pH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		pH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		pH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		ph tds ci f NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		PH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		PH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		pH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		ph tds ci f no3 no2 so4 po4 alk cn nh3 tkn toc cr6+ cio4
		ph TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN ⁻ NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		PH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		ph TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN ⁻ NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN ⁻ NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN ⁻ NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN ⁻ NH ₃ TKN TOC CR ⁶⁺ ClO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS C! F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ ClO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CLE NO, NO, SO, PO, ALK CN. NH, TKN TOC CR6+ CIO.

Comments:	 	

LDC#: 29883A6

VALIDATION FINDINGS WORKSHEET Technical Holding Times

Page:	_of
Reviewer:_	MG
2nd reviewer:	1

All circled dates have exceeded the technical holding time.

N N/A Were all samples preserved as applicable to each method?

N N/A Were all cooler temperatures within validation criteria?

YN N/A Were all cool	er temperatures	within validation	n criteria?				
Method:		150.1					
Parameters:		PH	-				
Technical holding ti	me:	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	(75.75 hr)				J/UJ/P
2	9-10		(75.75)				1
3	10:00	13:02	(75.00)				
4	4-22-13	4-25-13	(74.50)				
5	4-99-13	4-25-13	(74.00)				
6	12:00	4-25-13	(73.25)				
7	12:30 4-22-13 13:50	13:26	(73.00)				
8	4-22-13	4-25-13	(71.75)				
9	4-22-13	4-25-13	(71.25)				
10	4-22-13	13:44	(71.00)				
11	4-22-13	4-25-13	(74.75)				
14	29:00 4-22-13	4-25-13	(75.75)				
71	11:15	4:13	(75.00)				J

· · · · · · · · · · · · · · · · · · ·							

						3444	

LDC #: 29883A6

VALIDATION FINDINGS WORKSHEET Blanks

Page: of L Reviewer: MG 2nd Reviewer:

METHOD:Inorganics, Method See Cover

Conc. units:	: mg/L	_			Assc	Associated Samples: 14,7	
Analyte	Blank ID	Blank ID	Blank				
	PB	ICB/CCB (mg/L)	Action Limit	-	2		
Ö		0.155	0.775	0.14	0.16		
804		0.271	1.355	0.40			
Conc. units:	: mg/L				Assc	Associated Samples: 5,6,8-11 (>5x)	
Analyte	Blank ID	Blank ID	Blank				
	PB	ICB/CCB (mg/L)	Action Limit	No Qual's.			
Ö		0.155	0.775				
804		0.291	1.455				
Conc. units:	: mg/L				Assc	Associated Samples: 11 (>5x)	
Analyte	Blank ID	Blank ID	Blank				
	PB	ICB/CCB (mg/L)	Action Limit	No Qual's.			
Ö	0.165		0.825				
804	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#<u>29883A6</u>

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Page:_	of
Reviewer:_	MG
2nd Reviewer:	

Inorganics: Method See Cover

	Concentra	tion (mg/L)	555	
Analyte	. 5	11	RPD	·
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 #: SDG #:	VALIDATION FINDINGS WORKSHEET Field Blanks	Re 2nd re	Page: 1 of 1 eviewer: MG eviewer:
METHOD: Inorganics, EPA Me	thod_Seecover		V
	identified in this SDG? es detected in the field blanks?		
Sample:	Field Blank / Trip Blank / Rinsate (circle one)	SB	
	Analyte	Cond	entration
	рН	6.00	(pH units)
	Ċl	0.14	(mq/L)
	504	0.40	(1)
			`
Sample:2	Field Blank / Trip Blank / Rinsate (circle one)		
	Analyte	Cone Unit	centration
	pĦ		(pH units)
	ĊI	0.16	(mg /L)
			•

LDC# 39883A6

Initial and Continuing Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

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

METHOD: Inorganics, Method See Cover

4-10-13 _ was recalculated. Calibration date:_ The correlation coefficient (r) for the calibration of $NO_3 - N$

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

			7867	Δhc	Recalculated	Reported	
Type of Analysis	Analyte	Standard ID	Found (units)	True (units)	ror%R	r or %R	Acceptable (Y/N)
Initial calibration		Blank	(7) 6m) 00.0				
		Standard 1	0.03 (1)	0.019			
		Standard 2	0.05 ()	0.035			
	,	Standard 3	0.10	0.062		(
	N-60N	Standard 4	0.50	896.0	5-0.999620 1 3-0.999583	V 2-0.999583	>
		Standard 5	(1,000)	0.549			
		Standard 6	() -	1			
·		Standard 7	(1) -	١			
Calibration verification		0235					
	21	CCVI	49.366 (mg/L)	49.366 (mg/L) 50.000 (mg/L)	48.7	7.86	
Calibration verification		0235	(1, 2, 2)	1			
	80 ₄	CCVI	99.514 (mg/L)	99.514 (mg/L) 100.00 (mg/L)	94.5	99.5	
Calibration verification		1635					
	010 d	ICV	(7/8m) 186.01	.981 (Mg/L) 10.000 (Mg/L)	011	0 =	>

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#: 37883A6

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

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

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 x 100

Where,

Found =

concentration of each analyte <u>measured</u> 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:

Where, RPD = $|S-D|_X \times 100$ (S+D)/2

S = 0

Original sample concentration Duplicate sample concentration

					Recalculated	Reported	
Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	%R/RPD	%R/RPD	Acceptable (Y/N)
	Laboratory control sample						
LCS2		708	595.0 (mg/L) 586.0 (mg/L)	586.0 (mg/L)	102	102	>
HIIO	Matrix spike sample		(SSR-SR)				
(5		N03-N	2.2468 (mg/L) 5.0505 (mg/L)	5.0505 (mg/L)	h01	hol	
	Duplicate sample						
ヹ		± 4	6.00 (pHunits) 5.87 (PHUNITS)	5.87 (Pilmits)	9.19	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.

TO SERVE TO SE

LDC#:_ 39883A6

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:___of__ Reviewer:__ 2nd reviewer:

METHO	DD: Inorganics, Method	see cover		·	
(Y)N N	N/A Have results I N/A Are results wi	w for all questions answered "N". Not appose reported and calculated correctly? thin the calibrated range of the instrument on limits below the CRQL?		e identified as "N/A	\". . ••
Compo	ound (analyte) results fo	or # 5 , 504 g the following equation:	repo	rted with a positiv	e detect were
	ration = Quadratic				
		•			
30	V4 x 0.0001	× (0.255+0.0176)+(0.0	0800) = 0	.0800	3.393 m
JO 4 -		2 x (0.0001)			J. J. J
#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (Mg/L)	Acceptable (Y/N)
ı	5	pH	9.22 (pH unit)	9.22 (pH unit)	Y
		<u> </u>	180	180	
		CI	39	39	
		NO 3-N	0.27	0.27	
		504	3.4	3.4	
		Bicarbonate	88	88	
		Carbonate	16	16	
		Total Alk	98	98	<u> </u>
				<u> </u>	
Note:					
14016					

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:

	Concentr	ation (ug/L)	
Compound	MW-14-4	DUP-2-2Q13	RPD
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)	Р	Continuing calibration (%D)

NASA JPL

Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308285

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 29883B1

SDG #: 1308285 Laboratory: BC Laboratories, Inc. Level III

Date: b/13/13 Page: 1 of 1 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
l.	Technical holding times	A	Sampling dates: 64 / 23 / 2013
II.	GC/MS Instrument performance check	-	
III.	Initial calibration	- A	PSD = 20, r2
IV.	Continuing calibration/ICV	SW	icu / ce v = 30
V.	Blanks	^	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	Ate	
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 = Soutce BLANK

Validated Samples:

	WATER				 	
1	TB-2-42313	+ 11	DUP-2-2Q13	21	31	BWD 2199 - BLK1
2	SB-2-42313	12	MW-14-3MS	22	32	
3	EB-2-42313	13	MW-14-3MSD	23	33	
3 + 4	MW-19-2	14	MW-14-3DUP	24	34	
<u>-</u> 5	MW-19-1	15		25	 35	
	MW-14-5	16		26	 36	
† 7	MW-14-4	17		27	37	
₹ 8	MW-14-3	18		28	38	
6 +7 +8 +9 10	MW-14-2	19		29	39	
ተ 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-Butvlbenzene	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. Dibromoethane	LLL. Hexachlorobutadiene	FFF. Acrotein
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-Chiorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. lodomethane
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	рррр.
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	9999
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	חחחח.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB, tert-Amyl methyl ether	www.

LDC #: 21883B)

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Page: 1 of 1 Reviewer. 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".

Was a continuing calibration standard analyzed at least once every 12 hours for each instrument? Were all percent differences (%D) \leq 30%? N N/A

				1	<u> </u>	1	 1	1		_	<u> </u>	1	•	<u> </u>	1	<u> </u>	ı	_	_	<u> </u>	<u> </u>		_	—
Qualifications	9/ En/E																							
Associated Samples	11 ' 1-1	,																	:					
Finding %D (Limit: <30.0%)	45.8	32.2	9.17																					
Compound	В	METHYL iopide	PENTACHLORO ETHANE																					
Standard ID	28APR34.D																							
Date	5/28/2013	-																						
#									\vdash												 			

LDC#: 29883B1

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:_1_of_1_ Reviewer: SW 2nd Reviewer:

METHOD: GC MS Volatiles (EPA SW 846 Method 524.2)

ØN NA

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

	Concentration (ug/L)			
Compound	7	11	RPD	
к	0.27	0.26	4	
าาา	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:

	Conce		
Analyte	MW-14-4	DUP-2-2Q13	RPD
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-14-2	Iron ·	J (all detects) UJ (all non-detects)	А	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	Α
1308285	MVV-14-4	lron .	25U ug/L	А
1308285	MW-14-2	Iron	62U ug/L	А
1308285	DUP-2-2Q13	Iron	16U ug/L	А

LDC #:_	29883B4	VALIDATION COMPLETENESS WORKSHEET
SDG#:	1308285	Level III

Reviewer:_ 2nd Reviewer:

Laboratory: BC Laboratories, Inc.

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
l.	Technical holding times	A	Sampling dates: 4-23-13
II.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	ŚW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	SW	MS/MSD
VII.	Duplicate Sample Analysis	Α	DUP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	7	not utilized
X.	Furnace Atomic Absorption QC	7	not utilized
XI.	ICP Serial Dilution	7	not performed
XII.	Sample Result Verification	N	· · · · · · · · · · · · · · · · · · ·
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	D=6+10
ΧV	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	PBWI	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,
ØC11→13	1	Al, 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,
11 713	_*_	
		Al, 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, Ti, 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	8	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe)Pb, Mg Mn, Hg, Ni K, Se, Ag, Na, Fl, V, Zn, Mo, B, Si, CN,
ICP-MS	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, 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, R, Si, CN

Comments: Mercury by CVAA if performed

LDC #: 29883B4

SDG #: See Cover

Analyte

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

2nd Reviewer: Reviewer:

> <u></u> Associated Samples:

9 9 ω 62 25 ဖ 7 Action Limit 65.57 Maximum ICB/CCB^a 8.6929 (ng/L) Maximum PB^a (ug/L) 13.114 Maximum (mg/Kg) B

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results 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# 39883 B4

VALIDATION FINDINGS WORKSHEET Matrix Spike/Matrix Spike Duplicates

Page: __of __ 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".

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

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) $\leq 20\%$ for water samples and $\leq 35\%$ for soil samples? Y NON/A

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

LEVEL IV ONLY:

				 	 -								
Qualifications	J/UJ/A		to the second se										
Associated Samples	33.4 (£ 20) all												
RPD (Limits)	33.4 (£ 20)												
MSD %Recovery													
MS %Recovery	144 (15-125)	•									•		
	Fe												
Matrix	Water												
MS/MSD ID	11/12												
#													

Comments:

O. . .

LDC#: 29883B4

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Page: ___of_[
Reviewer: ______
2nd Reviewer: ______

METHOD: Metals (EPA Method 6010B/7000)

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

	Concentra	mm		
Analyte	6	10	RPD	
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	

V:\FIELD DUPLICATES\FD_inorganic\29883B4.WPD

LDC#: 29883134

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

Page:_	<u>lof_l</u>
Reviewer:_	MG
2nd reviewer:_	

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

(Y)N	N/A
N(Y)	N/A

Were field blanks identified in this SDG?

Were target analytes detected in the field blanks?

Sample:	l	Field Blank / Trip Blank / Rinsate / Other 58 (circle o	ne)
			

Analyte	Concentration Units (
Fe	11 (Mg/L)
Cr	1.0 (4)
Ca	0.032 (mg/L)
Mq	0.021 ()
Na	0.23 (•)

Sample:	Field Blank / Trip Blank / Rinsate / Other	Concentration		
	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	рН	58.75 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-19-2	рН	56.25 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-19-1	pН	55.00 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-14-5	рН	53.00 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-14-4	рН	52.75 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-14-3	рН	52.00 hours	48 hours	J (all detects) UJ (all non-detects)	Р
MW-14-2 MW-14-1 MW-14-1DUP	рН	51.50 hours	48 hours	J (all detects) UJ (all non-detects)	Р
DUP-2-2Q13	рН	. 53.50 hours	48 hours	J (all detects) UJ (all non-detects)	Р

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:

	Concentration		
Analyte	MW-14-4	DUP-2-2Q13	RPD
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
рН	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	pΗ	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	Α
1308285	EB-2-42313	Chloride	0.49U mg/L	Α

LDC #: 29883B6

SDG #: 1308285

VALIDATION COMPLETENESS WORKSHEET

Level III

Laboratory: BC Laboratories, Inc.

Levell

Page: lof l Reviewer: MG 2nd Reviewer: L

Date: 6-14-13

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
t.	Technical holding times	Sw	Sampling dates: 4 - 23 - 13
il	Initial calibration	A	
111.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	Α	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 hlanks	SW	SB=1 EB=2

Note: A

A = Acceptable

ND = No compounds detected

D = Duplicate TB = Trip blank

N = Not provided/applicable SW = See worksheet R = Rinsate FB = Field blank

EB = Equipment blank

Validated Samples:

all water

	all waits						
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	MVV-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	PBWI	39	
10	DUP-2-2Q13	20		30	PBW2	40	

Notes:		 	

LDC#:_29883B6

VALIDATION FINDINGS WORKSHEET Sample Specific Analysis Reference

Page:_	l_of_
Reviewer:	MG
2nd reviewer:	\ <u>\</u>

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
	W	
1→10 QC11,12	~	(pH)TDS)CI)F (NO3)NO3)SO3) PO4 (ALK)CN: NH3 TKN TOC (CR8+(CIO3)
13		pH TDS (CI)F (10)(NO)(SO) PO, ALK CN' NH, TKN TOC (CR®)(CIO)
14		pH (TDS)CI) F (NO) NO) SO) PO4 ALK CN NH3 TKN TOC (CRE) CIO4) (PH) TDS CI F NO3 NO2 SO4 PO4 (ALK) CN NH3 TKN TOC CRE+ CIO4
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN ⁻ NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CK CIO ₄
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR CIO ₄
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CK GIO ₄
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ ClO ₄
		ph TDS CLF NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ ClO ₄
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ ClO ₄
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ ClO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		ph TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ ClO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ ClO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN ⁻ NH ₃ TKN TOC CR ⁶⁺ CIO ₄
	70	pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN ⁻ NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN ⁻ NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CI F NO ₃ NO ₂ SO ₄ PO ₄ ALK CN NH ₃ TKN TOC CR ⁶⁺ CIO ₄
		pH TDS CLF NO3 NO2 SO4 PO4 ALK CN. NH3 TKN TOC CR6+ ClO4
		PH TDS CLE NO, NO, SO, PO, ALK CN: NH, TKN TOC CR6+ CIO,

Comments:	

LDC#: 29883B6

VALIDATION FINDINGS WORKSHEET Technical Holding Times

Page:_	1_of
Reviewer:	MG
2nd reviewer:	

All-circled dates have exceeded the technical holding time.

YN N/A Were all samples preserved as applicable to each method?

YN N/A Were all cooler temperatures within validation criteria? 150.1 Method: Parameters: PH 48 hr Technical holding time: Sampling **Analysis Analysis Analysis Analysis Analysis** Sample ID date date date date date date Qualifier 07:00 17:44 J/UJ/P (58.75 hr 4-23-13 4-25-13 17:50 4-25-13 16:03 4-25-13 07:10 2 4-23-13 58.75 07:45 (56.25 09:45 16:39 4 55.00 16:11 11:10 5 4-23-13 53.00 4-25-13 16:19 4-23-13 52.75 6 4-25-13 12:30 52.00 4-23-13 16:33 8 51.50 4-23-13 13:35 4-25-13 (51.50 9 11:45 4-23-13 17:17 4-25-13 (53.50 10 17:10 13:35 14 (51.50 4-23-13

gerger (1905) erweitige eine eren gereichte der Karakartt von der Weiter der der der der der der Ausbard (1905)

LDC #: 29883B6

VALIDATION FINDINGS WORKSHEET Blanks

Page: 1 of 1 Reviewer: MG

METHOD:Inorganics, Method See Cover

Associated Samples: all	
Conc. units: mg/	

Analyte	Blank ID	Blank ID	Blank			:				
	PB	ICB/CCB (mg/L)	Action Limit	-	2					
Ö	0.260	0.219	1.300	0.27	0.49					
804	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#<u>29883B6</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: of Reviewer: MG

2nd Reviewer:

Inorganics: Method See Cover

	Concentra	ition (mg/L)		
Analyte	6	10	RPD	
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 #: 20 SDG #:	1883B6 	VALIDATION FINDINGS WORKSHEET Field Blanks		Page:of eviewer: eviewer:
METHOD: I	norganics, EPA M	ethod_See cover		
⊘ N N/A ⊘ N N/A		s identified in this SDG? tes detected in the field blanks?		
Sample:		Field Blank / Trip Blank / Rinsate (circle one)	SB	
		Analyte	Conc Unit	centration ts ()
<u></u>		рн	5.80	(pit units)
		CI	0.27	(mg/L)
		S04	0.37	(,)
<u> </u>				
Sample:	2	Field Blank / Trip Blank / Rinsate (circle one)	B	
		Analyte	Con	centration ts ()
		ૃ ધ્ધ	5.06	(pHunits)
		ĊI	0.49	
	····			

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 (r²) 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)	Р

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-25-5 MW-25-4 MW-25-3 MW-25-2 MW-25-1	Bromomethane	J (all detects) UJ (all non-detects)	Р	Continuing calibration (%D)

NASA JPL

Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308396

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET

SDG #: 1308396

LDC #: 29883C1

Level III/IV

Page: 1 of 1
Reviewer: 2nd Reviewer:

Date: 6/14/13

Laboratory: BC Laboratories, Inc.

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
l.	Technical holding times	A	Sampling dates: of / 24/2013
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	RSD = 20 , 12
IV.	Continuing calibration/ICV	sN	icv/cev & 30
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	Ø 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	<u> A</u>	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	A	Not reviewed for Level III validation.
XIV.	System performance	*	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 = Acc

A = Acceptable

ND = No compounds detected

D = Duplicate

N = Not provided/applicable SW = See worksheet R = Rinsate FB = Field blank 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	BND 2200 -BLF1
<u>-</u> 2	EB-3-42413	1 12	MW-25-1	22	 32	
- 3	MW-18-5	13	MW-25-1MS	23	33	
1 4	MW-18-4	14	MW-25-1MSD	24	34	
<u>‡</u>	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.	_			III.
II. GC/MS Instrument performance check			ı	
Were the BFB performance results reviewed and found to be within the specified criteria?	_			
Were all samples analyzed within the 12 hour clock criteria?				E 19. IPERS (SHIPP) HITS
III. Initial calibration	T	ı	I	
Did the laboratory perform a 5 point calibration prior to sample analysis?	_			
Were all percent relative standard deviations (%RSD) < 20%?				50408049375
IV. Continuing calibration			Г	
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	_			
Were all percent differences (%D) ≤ 30%?				St. Parkeraterines 3 Engineer
V. Blanks			ı -	
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.		/		Average and the second
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?	_			41.44.4
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	/			as and white the same and the s
VIII. Laboratory control samples				
Was an LCS analyzed for this SDG?	_			
Was an LCS analyzed per analytical batch?	_			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	/	- :		

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2 Reviewer: SN 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				Gilderin .
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 \pm 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.			1	
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-Wethyl-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. lodomethane
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-Ethyitoluene	рррр.
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	www.

LDC #: 29 88301

VALIDATION FINDINGS WORKSHEET **Continuing Calibration**

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

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".

Was a continuing calibration standard analyzed at least once every 12 hours for each instrument? Were all percent differences (%D) \leq 30% ? ON N/A

Y (N) N/A

Qualifications	3/102/P														
Associated Samples	¥n														
Finding %D (Limit: <30.0%)	97.6														
Compound	8														
Standard ID	29APR02.D														
# Date	04/18/2013														

LDC#: 29083c/

Initial Calibration Calculation **VALIDATION FINDINGS**

Page: 1 of 1 Reviewer:

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)

Ax = Area of compound

Ais = Area of associated internal standard

average RRF = sum of the RRFs/number of standards

%RSD = 100 * (S/X)

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

#	Standard ID Calit	Calibration Date	Compound (IS)	Reported RRF (1.0 std)	Recalculated RRF (1.0 std)	Reported Average RRF (Initial)	Reported Recalculated Average RRF Average RRF (Initial)	Reported %RSD	Recalculated %RSD
_	1304018	4/18/2013	1304018 4/18/2013 Chloroform (1st Internal Standard)	0.9494644	0.949464	0.8715995	0.87160	5.52	5.52
		7:00	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

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

I				
Chb	Chloroform	Trichloroethene Ethylbenzene	Ethylbenzene	
0.8	0.887630	0.342823	2.043477	
6.0	0.949464	0.350137	2.070344	
0.8	0.883325	0.334311	1.887303	
9.0	0.866537	0.328386	1.915085	
õ	0.826447	0.314617	1.897387	
0	0.816194	0.310449	1.739031	
o	0.871600	0.330120	1.925438	
Ö	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#: 2983CI

VALIDATION FINDINGS

Continuing Calibration Results Verification

o o Page:

Reviewer:

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

Ax = Area of compound

Cx = Concentration of compound

Ais = Area of associated internal standard

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

Cis = Concentration of internal standard

RRF = continuing calibration RRF ave. RRF = initial calibration average RRF

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

S	877	226	135083			
Ais	330877	517977	135			
Ax	778022	431650	665971			
ŏ	25	25	25			
Cis	10	10	10			
#	_			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 #: 29888CI

VALIDATION FINDINGS WORKSHEET Surrogate Results Verification

Page:_	<u> </u>	
Reviewer:	SW	
2nd reviewer:	A	

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:

- 1999 A	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 #: 2988301

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

 - -	NS	d
rage:_	Reviewer:	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

\$ND2200-851 LCS ID:

CS/I CSD	RPD	Recalculated	l		
/SO I	R	Reported	1		
as as	ecovery	Recalc.	١		
I CSD	Percent Recovery	Reported	1		
	Recovery	Recalc.	103.77		
1 GS	Percent Recovery	Reported	104		
Sample	tration /c)	LCSD	١		
Spiked (Concentration ()	SOT	25:990		
ike	bed ()	CSD	1		
as	Added ()	SOT	25.000		
	Compound		TEIOHLORO ETH ENE		

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 #: 2900301

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	of
Reviewer:_	Wz,
2nd reviewer:	1

METHOD: GC/MS VOA (EPA Method 524.2)

Were all reported results recalculated and verified for all level IV samples?

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

Concentration = (A_{is})(RRF)(**y**()(%**3**5) Ą Area of the characteristic ion (EICP) for the compound to be measured Area of the characteristic ion (EICP) for the specific A_{is} internal standard Amount of internal standard added in nanograms (ng) **RRF** Relative response factor of the calibration standard. Volume or weight of sample pruged in milliliters (ml) V。 or grams (g). Df Dilution factor. Percent solids, applicable to soils and solid matrices %S

Example:	
Sample I.D. 5 , CHLORDTOPM	
Conc. = (42848) (10.00) (1) (324625) (0.87160) (1)	_
= 1.5144 kg/L	

	Offity.			· · · · · · · · · · · · · · · · · · ·	
#	Sample ID	Compound	Reported Concentration (ょった)	Calculated Concentration (معر /لـ)	Qualification
	5	TRICHLORGETHENE	0.73	0.7280	_
		ETHYL BENZENE	ND	_	_
-					
ļ					
<u> </u>				-	
11			I		

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-25-3 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-25-3 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	А
1308396	MW-25-3	Iron	9.6U ug/L	А

LDC #: 29883C4

VALIDATION COMPLETENESS WORKSHEET

Reviewer: MG 2nd Reviewer:__

SDG #: 1308396

Laboratory: BC Laboratories, Inc.

Level III/IV

METHOD: Metals (EPA Method 200.8) / 200.7

M.H.

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

	Validation Area		Comments
l.	Technical holding times	Α	Sampling dates: 4-24-13
11.	ICP/MS Tune	Α	
III.	Calibration	Α	
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 111
X.	Furnace Atomic Absorption QC	2	not utilized
XI.	ICP Serial Dilution	2	not utilized not performed
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A`	
XIV.	Field Duplicates	7	
χV	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

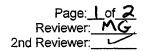
Validated Samples:** Indicates sample underwent Level IV validation

vanu	all Wate		erwerk Ecverry vandation	···			
1	EB-3-42413	11	MVV-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	PBWI	39	
10	MW-25-2	20		30	PBW 2	40	

Notes:		 	
	 		_

LDC#: 29883C4

VALIDATION FINDINGS CHECKLIST



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

Wethod Metals (EFA SW 646 Method 66165/16666526)	 -			
Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	<u> </u>			
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%?	V			
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?	/	<u> </u>		
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) \leq 20% for waters and \leq 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were \leq 5X the RL, including when only one of the duplicate sample values were \leq 5X the RL.	/			
VII. Laboratory control samples	,	,	~~~~	
Was an LCS anaylzed for this SDG?	/		<u> </u>	
Was an LCS analyzed per extraction batch?	/	ļ	-	
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

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

Validation Area	Yes	No	NA	Findings/Comments			
VIII. Furnace Atomic Absorption QC							
If MSA was performed, was the correlation coefficients > 0.995?			/				
Do all applicable analysies have duplicate injections? (Level IV only)			V				
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? (Level IV only)			V				
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%?			V				
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)		r	1				
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?			V				
XI. Regional Quality Assurance and Quality Control			1				
Were performance evaluation (PE) samples performed?		/	_				
Were the performance evaluation (PE) samples within the acceptance limits?	<u> </u>	l	/				
XII. Sample Result Verification		1	T				
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.		V	1				
Target analytes were detected in the field duplicates.	<u> </u>		1				
XV. Field blanks							
Field blanks were identified in this SDG.	\ <u>\</u>	1_	_				
Target analytes were detected in the field blanks.		1	1_				

LDC #: 29883C4

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page:_	of _
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 ⁻ ,
@C12→14	J	Al, 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	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, Si, CN ⁻ ,
GEAA		Al Sh. 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

Sample Concentration units, unless otherwise noted: ug/L (*K in mg/L) METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)

PB/ICB/CCB QUALIFIED SAMPLES Soil preparation factor applied: NA Associated Samples: 2-11

VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer: M. Page:

б	9.6	
2	12	
4	35	
Action Limit	42.96	0.6868*
Maximum ICB/CCB ^a (ug/L)	8.5921	
Maximum PB ^a (mg/L)		0.13735*
Analyte Maximum Maximum Maximum PB* ICB/CCB* (mg/Kg) (mg/L) (ug/L)		
Analyte	Fe	¥

(QN)		
nples:		
Associated Samples:		
As	No Qual.	
ted: mg/L	Action Limit	1.1274
otherwise no	Maximum ICB/CCB ^a (mg/L)	0.22549
nits, unless o	Maximum Maximum PB ^a ICB/CCB ^a (mg/L) (mg/L)	
Sample Concentration units, unless otherwise noted: mg/L	Maximum PB ^a (mg/Kg)	
Sample Con	Analyte	¥

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# 3983C4

Initial and Continuing Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

Reviewer: MG Page: (of

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 × 100 True

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

					Recatculated	Reported	
Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	%R	%R	Acceptable (Y/N)
6401 LCV	ICP (Initial calibration)	δZ	50790	50000	101	101	>
1105	ICP/MS (Initial calibration)	Cr	49.675	50.000	99.4	99.H	
	CVAA (Initial calibration)						
1355 CC V Z	ICP (Continuing calibration)	ス	03067	20000	1.86	1.86	
1826 CCV9	ICP/MS (Continuing calibration)	As	97.863	00.001	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# 3983C4

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

Page: 2nd Reviewer: 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 = Found x 100

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. Where,

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

RPD = $|S-D|_{X} \times 100$ (S+D)/2

Where,

S = Original sample concentration D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

%D = [I-SDR] x 100

Where, I = Initial Sample Result (mg/L) SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

					Recalculated	Reported	
			Found / S / 1	True / D / SDR (units)			Acceptable
Sample ID	Type of Analysis	Element	(units)		%R/RPD/%D	%R/RPD/%D	(A/A)
1917		,		1 (m)	,	7.0	
IFB	ICP interference check	ħ,	(88.5 (mg/L)	(mg/r) 300.00 (2/6)	44.2	74.8	>
(758			(' ' ' ' '	(49)			
1507	Laboratory control sample	Ç	39.824 (mg/L)	834 (mg/L) 40.000 (1914)	9.4%	74.6	
1813	Matrix snike		(SSR-SR)				
ā		26	(1/6m) 00.001 (1/6m) 18H. Hb	100.00 (mg/r)	94.5	94.5	
Ohe1/8861	17.00		(10m) 00 00	1 / ma/.	2 74	226	
Ĩ	Duplicate	Mg	32.00 (1114/1)	00 (mg/m) 33.84 (die)		۵۰.۲	د
	ICP serial dilution	• 1			•	١	1
1							

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

, e

LDC#: 29883C4

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	of
Reviewer:	MG
2nd reviewer:	

VIETH	OD: Trace Metals (EPA	A SW 846 Method 6010/60	20/7000)				
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". N N/A							
	ed analyte results for _	# 4, Fe	were re	ecalculated and verified	using the following		
	tration = (RD)(FV)(Dil) (In. Vol.)	(0.035	Recalculation: $5 \frac{\text{mg}}{L} (0.050 L) (0.050 L)$) (1000 Mg/mg)			
RD FV n. Vol. Dil	 Raw data conce Final volume (m Initial volume (m Dilution factor 	ontration il) il) or weight (G)	0.050	9 L	- 35.5 ~		
#	Sample ID	Analyte	Reported Concentrat (Mg/L)	Concentration	Acceptable (Y/N)		
1	4	Fe	35	36	Y		
		Cr	2.	2 2.2			
			(mg /1	-) (mg/L)			
		Ca	63	63			
		Mg	19	19			
		Na	24	24			
		K	3	.1 3.1	Ų		
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-18-3DUP
MW-18-5 MW-25-1MS
MW-18-4 MW-25-1MSD
MW-18-3** MW-25-1DUP
MW-18-2 MW-18-1DUP
MW-18-1 MW-25-5
MW-25-5 MW-25-3
MW-25-2

EB-3-42413MS

MW-25-1

EB-3-42413MSD

EB-3-42413DUP

MW-18-5DUP

MW-18-4MS

MW-18-4MSD

MW-18-4DUP

MW-18-3MS

MW-18-3MSD

^{**}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	рН	>5 days	48 hours	J (all detects) UJ (all non-detects)	Р

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-25-2

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)	А
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	рН	J (all detects) UJ (all non-detects)	Р	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)	Α	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	А

LDC #: 29883C6

VALIDATION COMPLETENESS WORKSHEET

Date: 6-17-	13
Page: 1 of 1	
Reviewer: MG	
2nd Reviewer:	/

SDG #: 1308396 Laboratory: BC Laboratories, Inc. Level III/IV

m.H.

METHOD: Alkalinity (SM2320B), Chloride, Sulfate, Nitrate-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
1.	Technical holding times	SW	Sampling dates: 4-24-13
- 11	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	<u> </u>	
X.	Field duplicates	N	
ΧI	Field blanks	5w	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

- unu	all wate		The state of the s				
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:					
	• • • • • • • • • • • • • • • • • • • •	 	 	 	_

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

Method: Inorganics (EPA Method See cover

Wethod Horganics (LFA Method 2001 10)				
Validation Area	Yes	No	NΑ	Findings/Comments
I. Technical holding times				
All technical holding times were met.		<u>/</u>		
Cooler temperature criteria was met.	√		<u> </u>	
II. Calibration			r	
Were all instruments calibrated daily, each set-up time?	/			
Were the proper number of standards used?	/			
Were all initial calibration correlation coefficients > 0.995?	V			
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)	/		<u> </u>	
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.		/	1_	
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	1 /			
Was an LCS anayized for this SDG?	V			
Was an LCS analyzed per extraction batch?	V	-	-	
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?		/	1_	
Were the performance evaluation (PE) samples within the acceptance limits?			/	

VALIDATION FINDINGS CHECKLIST

Page:	of 2
Reviewer:_	MG
2nd Reviewer:	سرا

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: l of l Reviewer: MG 2nd reviewer: ______

All circled methods are applicable to each sample.

Sample ID	<u>Matrix</u>	Parameter
1->11	N	(PH) TDS) CI) F (NO.) NO.) SO.) PO. (ALK) CN' NH3 TKN TOC (CRE) CIO.)
QC 12-14		pH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR CIO4
15		pH (TDS) CI F NO3 NO2 SO4 PO4 ALK CN' NH3 TKN TOC CR6+ CIO4
16→18		pH TDS CI F NO3(NO2)SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
19-721		PH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CO4
22,23		pH TDS (C)F (NO) (NO) SO) PO4 ALK CN' NH3 TKN TOC (CRETCIO)
24		pH (TDS)CDF (NO) NO) SO) PO4 ALK CN' NH3 TKN TOC (CRETCIO)
25		(CH)TDS CI F NO3 NO2 SO4 PO4 (ALK) CN NH3 TKN TOC CR6+ CIO4
		pH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		pH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		PH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		PH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		PH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		PH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		ph tds ci f NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		ph TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		pH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		pH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		ph TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR8+ CIO4
		PH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		PH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		pH TDS CLF NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		pH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR8+ CIO4
		PH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		ph tds ci f No3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ ClO4
		ph tds ci f NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		pH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR6+ CIO4
		PH TDS CI F NO3 NO2 SO4 PO4 ALK CN NH3 TKN TOC CR8+ CIO4
		pH TDS CLF NO, NO, SO, PO, ALK CN NH, TKN TOC CR6+ CIO,

Comments:			

LDC#: 29883C6

VALIDATION FINDINGS WORKSHEET Technical Holding Times

Page:_	Lof_L
Reviewer:	MG
2nd reviewer:	

All circled dates have exceeded the technical holding time.

YN N/A Were all samples preserved as applicable to each method?
N N/A Were all cooler temperatures within validation criteria?

Method:		150.1					
Parameters:		рн					
Technical holding t	ime:	48 hr					<u> </u>
Sample ID	Sampling date 07:00	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1	07:00 <u>4-24-13</u> 07:30	15:01 4-29-13	>5 days				5/UJ/P
2	4-24-13	15:06 4-29-13					
3	08:05 4-24-13	15:12					
Ч	4-24-13	15:18 4-29-13					
5	10:50 4-24-13 11:20	15:18 4-29-13 15:25 4-29-13					
6	4-24-13	4-29-13					
7	4-24-13	4-29-13					
8	13:05	4-29-13					
9	13:35	16:15				<u> </u>	
10	14:05	16:21					
11	4-24-13	4-29-13					
25	11:20	4-29-13	<u> </u>				↓ ↓
							_

LDC #: 29883C6

VALIDATION FINDINGS WORKSHEET Blanks

METHOD: Inorganics, Method See Cover

Conc. units:	s: mg/L			Assc	Associated Samples: all (>5x or ND)	ľ
Analyte	Blank ID	Blank ID	Blank			
	PB	ICB/CCB (mg/L)	Action Limit	No Qual's.		
804		0.266	1.330			
Conc. units:	s: mg/L	į		Asso	Associated Samples: 1]
Analyte	Blank ID	Blank ID	Blank			
	PB	ICB/CCB (mg/L)	Action Limit	-		
Ö	0.142	0.202	1.010	0.27		
Conc. units:	: mg/L			Assc	Associated Samples: 2-11 (>5x)] !
Analyte	Blank ID	Blank ID	Blank			
	PB	ICB/CCB (mg/L)	Action Limit	No Qual's.		
ō		0.206	1.030			
						ī

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 # 39883C6

VALIDATION FINDINGS WORKSHEET Matrix Spike/Matrix Spike Duplicates

Page: Reviewer: 2nd Reviewer:_

> 50 161 See METHOD: Inorganics, EPA Method_

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "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 Was a matrix spike analyzed for each matrix in this SDG? of 4 or more, no action was taken. N N/A N/A

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

EVEL IV ONLY:

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

					Ī				Γ					
Qualifications	J dets /A	J/07/A				The state of the s								
Associated Samples	11.2,4-711	= 1												
RPD (1 imits)														
MSD %Recovery	113(90-110)	84.8(85-115												
MS %Recovery	i													
Analyte	N-60N	Cr VI											-	
Matrix		->												
MS/MSD ID	33/33	4												ients:
#														Comments:

LDC #: SDG #:	79883C6 	VALIDATION FINDINGS WORKSHEET Field Blanks	Page: 1 of 1 Reviewer: MG 2nd reviewer:
METHOD:	Inorganics, EPA	Method	
N N/A N N/A	_ Were field bla _ Were target a	nks identified in this SDG? nlytes detected in the field blanks?	
Sample: _		Field Blank / Trip Blank / Rinsate (circle one)	EB
		Analyte	Concentration Units ()
		PH C1	5.54 (pH units)
			0.27 "(mg/L)
		NO3-N	0.22 (1)
Sample:		Field Blank / Trip Blank / Rinsate (circle one)	
		Analyte	Concentration Units ()
<u> </u>			

LDC# 39883C6

VALIDATION FINDINGS WORKSHEET Initial and Continuing Calibration Calculation Verification

Page: Lof L Reviewer: MG

METHOD: Inorganics, Method See Cover

was recalculated. Calibration date: 4-23-13 The correlation coefficient (r) for the calibration of $\frac{C \, \mathbf{v} \, \mathsf{vI}}{\mathsf{v} \, \mathsf{v}}$ An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = <u>Found</u> × 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

			(Recalculated	Reported	
			(6%0	Abs	The second secon		Acceptable
Type of Analysis	Analyte	Standard ID	Found (units)	True (units)	r or %R	ror %R	(Y/N)
Initial calibration		Blank	(1/8m) 0000	0.001			
		Standard 1	0.003	0.003			
		Standard 2	0.005 ()	0.005	13		
		Standard 3	() 500.0	0.000		C	
	> \ \)	Standard 4	0.050 ()	0.040	V 2=0.99992	- 0. 999819	>
		Standard 5	0.100 (4)	0.077			
		Standard 6	(1			
		Standard 7		١			
4 () () () () () () () () () (C180					
Calibration Verification	21	ccv3	51.676 (mg/L) 50.000 (mg/L)	50.000 (mg/L)	103	103	
Calibration verification		2160					
	N03-N	CCVI	0.478 (mg/L)	478 (mg/L) 0.500 (mg/L)	45.6	95.6	
- 11 - C		6561					-
Calibration Verification	ر10 ₄	CCVI	(2/8m) HOB:8	8.964 (Mg/L) 10.000 (Mg/L)	9.18	87.6	→

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# 39883C6

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

Page: Lof L 2nd Reviewer: 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:

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

Found = concentration of each analyte <u>measured</u> 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:

Where, RPD = $\frac{|S-D|}{(S+D)/2}$ × 100

" " "

Duplicate sample concentration Original sample concentration

					Recalculated	Reported	
Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	%R/RPD	%R/RPD	Acceptable (Y/N)
6191	Laboratory control sample						•
rcs		C104	10-455 (mg/L) 10.000 (mg/L)	10.000 (49/L)	501	105	>-
0923	Matrix spike sample		(SSR-SR)				
22		N-60N	0.5815 (mg/L) 0.53632 (mg/L)	0.53632 (mg/L)	011	110	
5010/1590	Duplicate sample	(// 6m/ == == (/6m)	1/bm/st cc;		,	
76		504	(1)0 \ b1.b51	(20.07 UT)	0. s0e	0.508	→

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:	of
Reviewer:_	MG
2nd reviewer:_	1~

METHOD:	Inorganics.	Method	See	cover	
WEIDUD.	inordanics.	MEUIOG	300	<u> </u>	

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

Have results been reported and calculated correctly? Are results within the calibrated range of the instruments? Y) N N/A

Are all detection limits below the CRQL?

Y)N N/A

Compound (analyte) results for # 4, Cloy recalculated and verified using the following equation: ____reported with a positive detect were

Concentration =

 $0.020 = 0.0011 \left(\frac{x}{2}\right) - 0.0000$ 36.364 Mg/L = xY=mx+b

where m = 0.0011 6 = 0.0000

= 6	⁾ ×				
#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (Mg/L)	Acceptable (Y/N)
	4	ρH		8.03 (pHunit)	Y
		TDS	320	320	
		CI	20	90	
		N03-N	1.8	1.8	
		5 <i>0</i> 4	37	37	
		C104	36 (Mg/L)	36 (Mg/L)	
		CrVI	0.00095	0.00095	
		Bicarbonate	740	240	
		Total Alk	200	200	

ote:	



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

Volatiles, 1,4-Dioxane, Metals, Wet Chemistry

1308887, 1309034

1309146

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

Efauto

Operations Manager/Senior Chemist

29932ST.wpd

Attachment 1

1 WEEK TAT

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a.	pH (150.1)	S /	0	0		0.	3	0	0		_	_						_							_		\vdash			\dashv	
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2	k JB)	S	0	0	0	0	0	0	0				٠																		
99.	Alk (2320)	≥	11	2	8	1	13	7	7																						49
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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 (r²) 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)	Р
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)	Р

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:

	Concentr	ation (ug/L)					
Compound	MW-22-3	DUP-3-2Q13	RPD				
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-4-3 MW-4-1 DUP-3-2Q13	Bromomethane Methyl iodide Pentachloroethane	J (all detects) UJ (all non-detects)	Р	Continuing calibration (%D)

NASA JPL

Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308499

No Sample Data Qualified in this SDG

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
l.	Technical holding times	Δ	Sampling dates: + 125 13
II.	GC/MS Instrument performance check		
III.	Initial calibration	4	% PSD 420, 12
IV.	Continuing calibration/ICV	SW	10V/CCV = 30
V.	Blanks	A	
VI.	Surrogate spikes	4	
VII.	Matrix spike/Matrix spike duplicates	Ν	
VIII.	Laboratory control samples	A	Les
IX.	Regional Quality Assurance and Quality Control	N	
_X.	Internal standards	Δ	
XI.	Target compound identification	Δ	Not reviewed for Level III validation.
XII.	Compound quantitation/RL/LOQ/LODs	Δ	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	NF	Not reviewed for Level III validation.
XIV.	System performance	4	Not reviewed for Level III validation.
XV.	Overall assessment of data	Δ	
XVI.	Field duplicates	5W	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	112	MW-4-2	21	BW D2198	31
2 1	EB-4-42513	12 2	MW-4-1	222	BW02199	32
3 1	MW-22-5**	132	DUP-3-2Q13	23	1305501-6682	33
4 1	MW-22-4	14		24		34
5	MW-22-3	15		25		35
6	MW-22-2	16		26		36
1 1	MW-22-1**	17		27		37
8 l	MW-4-5	18		28		38
9 1	MW-4-4	19		29		39
10 7	MVV-4-3	20		30		40

Method: Volatiles (EPA Method 524.2)

Validation Area	Yes	No	NA	Findings/Comments
J. Technical holding times:	<u> </u>			
All technical holding times were met.	_			
Cooler temperature criteria was met.				
II. GC/MS Instrument performance check	ı		ı	
Were the BFB performance results reviewed and found to be within the specified criteria?				
Were all samples analyzed within the 12 hour clock criteria?				22 7.45 3.74 (1981) Mr. (15 1.5 3.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1
III. Initial calibration	I		ı .	
Did the laboratory perform a 5 point calibration prior to sample analysis?				
Were all percent relative standard deviations (%RSD) ≤ 20%?				
IV Continuing calibration				(1) 基础 (7) (5) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	/			
Were all percent differences (%D) ≤ 30%?				
V. Blanks	ı			
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	1			
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	Γ			
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 #: 29932 A

VALIDATION FINDINGS CHECKLIST

Page: 2 of _	2
Reviewer: FT	
2nd Reviewer:	
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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	I			
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?	V	ŕ		
XI. Target compound identification			ı	
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 \pm 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 Chloromothono	11 4 4 9 Trichlessochhom			
C. Circlolletiale	o. I, I, z-11ichioloeulaile	UO. 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. lodomethane
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	dddd
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	9999.
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	1111.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	ບບບບ.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	ww.

LDC #. 299324/

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Page: /of

METHOD: GC/MS VOA (EPA Method 524.2)

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

Was a continuing calibration standard analyzed at least once every 12 hours for each instrument? Were all percent differences (%D) $\leq 30\%$?

		_	 		_		 		_	 	 _	 			 	 	 	
Qualifications	d/ 84/ 8	,,				7						valid validing of						
Associated Samples	1/4					4												
Finding %D (Limit: ≤30.0%)	45.8					c 97-7			And the second s									
Compound	В			/ / - / 0/ 55	Methy/ Todiale	Pentachloroethane												
Standard ID	1305501-CCV3				1305201-6004													
	4/13/13	14:61		1/53/1	4/11/3	20.06												
#								Ш	<u> </u>			 						

LDC#: 29932A/ VALIDATION FINDINGS WORKSHEET Field Duplicates

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METHOD: GC/MS VOA (EPA Method 524.2)

Y N NA Were field duplicate pairs identified in this SDG?

Were target analytes detected in the field duplicate pairs?

	Concentra	ation (ug/L)	
Compound	5	13	RPD
к	0.15	0.16	6
S	0.11	0.13	17

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

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Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

Page:_ Reviewer:I 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 = $(A_u)(C_u)/(A_u)(C_x)$ 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

					Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
	Ċ	Calibration		Omercial (Deference Internal Standard)	RRF	RRF (std)	Average RRF (initial)	Average RRF (initial)	%RSD	%RSD
#	Standard ID	Date	Compound (1)						7.107243	
*	1641	2//2//4	Acetone	(1st Internal Standard)	3.056.215x0 0.0 305c	0.030SC	2.805742Ki	0.028057	4+73503	7.107
			Methyl Met	Methyl Metacrylate (40)	7.64857×10	8.0760.0	7.123823×P	0.07/238	4-473303	4.473
			Pentachba	Pen fach to re thank (\$)	0.55 14358 0.55145		2117 Pt22.0	1 2447 /	5.85431/	5.854
,	1 647	21/81/2	2	(1st Internal Standard)	2.9033816 0.90335		80422080	0.86864	10.66688	10.667
		1) •	(01)	$\overline{}$		6.3301203	0.33012	4.712199	4.7/2.p
			PE PE	(3rd Internal Standard)		1.88730	1.887303 1.88730 1.92 5438	1 11	6.2 33496	6.233
ľ				(1st Internal Standard)						
·				(2nd Internal Standard)						
				(3rd Internal Standard)						
				(1st Internal Standard)						
4				(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#: 27932A/

Continuing Calibration Results Verification VALIDATION FINDINGS WORKSHEET

of		9
Page: _/	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 = $(A_{\nu})(C_{\nu})/(A_{\nu})(C_{\nu})$

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

 $A_{\rm ls}$ = Area of associated internal standard $C_{\rm ls}$ = Concentration of internal standard

						Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound	Compound (Reference internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0 %	Q%
_	81/20/13	4/20/13	Autore	(1st Internal Standard)	2.505.742 XV	0.0283/68	0.0283/68	6.0	6.0
	, pogo		Methy /	ر al Standard)	7.123823 XIO	11221100	0.0712211	20.0	0.07
	aer		Pentach		2112445.0	6975144.0	0.4415269	18:3	18:9
2			b		8017898.0	2505 2450	25asth 6.0	4.5	8.5
			S	(2nd Internal Standard)	0.3301203	4054 as E.O	0.3204304	5.9	6.0
			EE	(3rd Internal Standard)	1.925438	1.973215	1.9732/5	2.0-	۶-۴
က	acv	51/82/h		(1st Internal Standard)	[4	. 8	.> 0.0187498	4.5 3.4 H	2.4
	1944	•		(2nd Internal Standard)		01X X4001-6	E O.DTHOOUX	#03.9	3.9
				(3rd Internal Standard)		14.51515	0.01 15032	1.26 7.66	7.76
4				(1st Internal Standard)		0.984 1326	0.9541326	8.6	8.8
				(2nd Internal Standard)		0.3526925	0.35269W	8.9	2.7
			→	(3rd Internal Standard)	\rightarrow	1.928373 1.928373	1.928373	4:0	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# 297324/

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

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Page:	wer:	Reviewer
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	ш.	2nd

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

SSC = Spiked sample concentration SA = Spike added Where:

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

8W02198-851 LCS ID:

	S	pike	Spiked S	ample	SOI	Ş	I GSD	D	I CS/I	CS/LCSD
Compound	Α .	Added way (L)	Concentration (ration	Percent Recovery	Recovery	Percent Recovery	ecovery	R	RPD
	รวา	CSD	SOT	CSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	3,5	4 7	26.040	4 2	hol	7a_				\
Trichloroethene		-	25.200		1 01	lol				
Benzene			26.490		901	100		`		
Toluene			016.22		104	hol				
Chlorobenzene	>	→	अ.मग	->	102	701	A 3			

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:		_f /
Reviewer:	FT	
2nd reviewer:	1	
	7	

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	10	0
Bromofluorobenzene	1	9.27	92.7	92.7	1
1,2-Dichlorobenzene-d4	J	11.09	111	11)	
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#: 299 32A/

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	/of_	_
Reviewer:	FT	
2nd reviewer:	6	

METHOD: GC/MS VOA (EPA Method 524.2)

<u> </u>	N	<u>N/A</u>
Y/	N	N/A

%S

Were all reported results recalculated and verified for all level IV samples?

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

Example:

Concentration = $(A_s)(I_s)(DF)$ (A_s)(RRF)(V_o)(%S) Area of the characteristic ion (EICP) for the Ą, compound to be measured Area of the characteristic ion (EICP) for the specific internal standard Amount of internal standard added in nanograms (ng) RRF Relative response factor of the calibration standard. Volume or weight of sample pruged in milliliters (ml) V, or grams (g). Df Dilution factor.

Percent solids, applicable to soils and solid matrices

Conc. = (24940)(10)(393525)

0.55 ug/L

	only.				
#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
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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	VALIDATION COMPLETENESS WORKSHEET	Date: 6/2//
SDG #:_	1308499	Level III	Page: /of /
Laborato	ory: BC Laboratories,	Inc.	Reviewer: F2
		•	2nd Reviewer:/

METHOD: GC/MS 1,4-Dioxane (EPA SW 846 Method 8270C) SHM7

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

	Validation Area	, ,	Comments
l.	Technical holding times	A	Sampling dates: 4/x//3
11.	GC/MS Instrument performance check	Δ	
111.	Initial calibration	Δ	% RSD = 30 F7 12
IV.	Continuing calibration/ICV	Δ	101/ccv = x
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	M	client specified
VIII.	Laboratory control samples	Α	client specified
IX.	Regional Quality Assurance and Quality Control	N	/
X.	Internal standards	Δ	
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 2 3 4 5 6 7 8 9	MVV-4-1	11	BWE 0259- 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-4-5 MW-4-3 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:

	Conce		
Analyte	MW-22-3	DUP-3-2Q13	RPD
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	Α
1308499	MW-22-3	Iron	19U ug/L	Α
1308499	MW-22-2	Iron	40U ug/L	А

VALIDATION COMPLETENESS WORKSHEET LDC #: 29932A4 SDG #: 1308499

Level III/IV

Date: 6/20/1
Page: √of \
Reviewer: OL
2nd Reviewer: V

Laboratory: BC Laboratories, Inc.

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
l.	Technical holding times	A	Sampling dates: 4/05/13
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	OP
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	A	Not reviewed for levelII
X.	Furnace Atomic Absorption QC	N	
XI.	ICP Serial Dilution	\mathcal{N}	No+ performed
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	Μ,	
XIV.	Field Duplicates	Sw	(4,12)
χV	Field Blanks	54	(B=)

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

	in the					
1	EB-4-42513	11	MW-4-1	21	31	
2	MVV-22-5**	12	DUP-3-2Q13	22	32	
3	MW-22-4	13	EB-4-42513MS	23	33	
4	MVV-22-3	14_	EB-4-42513MSD	24	34	
5	MW-22-2	15	EB-4-42513DUP	25	35	
6	MVV-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	

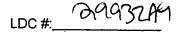
Notes:	 	 	

VALIDATION FINDINGS CHECKLIST

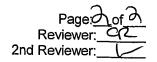
Page: Of Of Reviewer: Of Of Page: Of Officer of Officer

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.		1		
Were the MS/MSD or duplicate relative percent differences (RPD) \leq 20% for waters and \leq 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were \leq 5X the RL, including when only one of the duplicate sample values were \leq 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 FINDINGS CHECKLIST



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.		<u>-</u>	/	
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 #: 29932AY

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

	1
Page:_	<u>'_of_'</u>
Reviewer:	02
2nd reviewer:	<u>~</u>

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, Ti, V, Zn, Mo, B, Sn, Ti,
15		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu Fe, Pb, Ma, Mn, Hg, Ni (K) Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
16.77		Al, Sb, As, Ba, Be, Cd, Ca) Cr, Co, Cu(Fe, Pb(N)g, Mn, Hg, Ni(k) Se, Ag(Na) Tl, V, Zn, Mo, B, Sn, Ti,
18		Al, Sb, As, Ba, Be, Cd, Ca, Co, Cu, Fe, Ag, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
10		Al, Sb, As, Ba, Be, Cd, Ca, Co, Cu, Fe, Ph, 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
СР		Al, Sb, As, Ba, Be, Cd, Ca) Cr, Co, Cu, Fe) Pb (Mb, Mn, Hg, Ni (k) Se, Ag (Na), Tl, V, Zn, Mo, B, Sn, Ti,
CP-MS	- 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,
SEAA	1	Al Sh As Ba Re Cd Ca Cr Co Cu Fe Ph Mg Mn Hg Ni K Se Ag Na Tl V Zn Mo B Sn Ti

Comments: Mercury by CVAA if performed

LDC #: 29932A4

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:

Reviewer: Q 2nd Reviewer:

ည	40
4	19
8	4
-	7.8
Action Level	88.04
	2
Maximum ICB/CCB ^a (mq/L)	06930;
Ma ICE	0.0
aximun PB* Lug/l)	17.608 0.0069302 88.04
Ma.	
laximum PB ^a 'mq/Kq)	
May F	
Analyte Maximum Maximum PB³ ICB/CCB³ (mg/l c)	o o
■ ■	В

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 F

METHOD: Metals (EPA Method 6010B/7000)

	Concentra	ation (ug/L)	
Analyte	4	12	RPD
Calcium (mg/L)	62	61	2
Chromium	2.1	2.0	5
Iron	19	6.5U	200
Magnesium (MS/L)	21	20	5
Petassium C NS	41	40	2
Sodium a K	2.3	2.3	0

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LDC#: 0,9932AY

VALIDATION FINDINGS WORKSHEET Field Blanks

Page: of Pag

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

Y N N/A Y N N/A	Were field bla Were target a	anks identified in this SDG? analytes detected in the field blanks?		
Sample:		Field Blank / Trip Blank / Rinsate / Othe	r <u>(eg)</u> (circle	one)
		Analyte		Concentration Units WS/4
			FC	7,8
			100-100-1	
	1			
Sample:		Field Blank / Trip Blank / Rinsate / Othe	r(circ	le one)
		Analyte		Concentration Units (

LDC# 2993244

VALIDATION FINDINGS WORKSHEET Initial and Continuing Calibration Calculation Verification

Reviewer: 42

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:

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

Where, Found = concentration (in ug/L) of each analyte <u>measured</u> in the analysis of the ICV or CCV solution True = concentration (in ug/L) of each analyte in the $\overline{\text{ICV}}$ or CCV source

					Recalculated	Reported	
Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	%R	%R	Acceptable (Y/N)
JOS	ICP (Initial calibration)	7	21.11	50	101	720)
ICV	ICP/MS (Initial calibration)	4	95 85/bh	50	7,96	435	
	CVAA (Initial calibration)						
C03	CV 3 ICP (Continuing calibration)	RESURTER		50.28 go.D	701	[0]	
500	ICP/MS (Continuing calibration)	As	101	(30)	<u>ਤ</u>	(4)	
	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#_243287)

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

Page: Reviewer:_ 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 = Found x 100 True

Where, Found = Concentration of each analyte <u>measured</u> 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 = $S-D_1 \times 100$ (S+D)/2

Where,

S = Original sample concentration D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

%D = [I-SDR] × 100

Where, I = Initial Sample Result (mg/L) SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

					Recalculated	Reported	
Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	%R/RPD/%D	%R/RPD/%D	Acceptable (Y/N)
TCS AND	ICP interference check	હ	481,28	S	47.5	5'26	>-
165	Laboratory control sample	Fe	8,1401	7001	1701	FO]	
18	Matrix spike	Ars	(SSR-SR)	001	2	109	
18	Duplicate	ر ر	0,599	0,00	99'-	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 #: 1993744

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	\of_
Reviewer:	OR
2nd reviewer:	- TV

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								
Detec equati	ted analy ion:	te results for _		-	Ca	were recalcu	ulated and verified	using the following
Concer	ncentration = <u>(RD)(FV)(Dil)</u> (In. Vol.)			Recalculation:			<i>I</i> ,	
RD FV In. Vol. Dil	= = = = = = = = = = = = = = = = = = = =	Raw data conce Final volume (n Initial volume (r Dilution factor		Raw Dera= 5.469 mg/L			/L	· · .
#	Si	ample ID		Analyte		Reported Concentration (JSU)	Calculated Concentration	Acceptable (Y/N)
		>			Fe	16	16	7
					(mplu)	5,5	5,5	
					mg	1,3	1,3	
					NS	66	66	
 					<u> </u>	0.73	0.73	<u> </u>
					···			
					•		,	

		-						
<u></u>								
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

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

DUP-3-2Q13

MW-4-1

EB-4-42513MS

EB-4-42513MSD

EB-4-42513DUP

MW-22-5MS

MW-22-5MSD

MW-22-5DUP

MW-22-3MS

MW-22-3MSD

^{**}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	рН	5 days	48 hours	J (all detects) UJ (all non-detects)	Р

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 m g/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:

	Concentration		
Analyte	MW-22-3	DUP-3-2Q13	RPD
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-4-3 MW-4-1 DUP-3-2Q13	pН	J (all detects) UJ (all non-detects)	Р	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	А

LDC #: 29932A6

VALIDATION COMPLETENESS WORKSHEET

SDG #: 1308499 Laboratory: BC Laboratories, Inc. Level III/IV

Date: 6/21/13
Page:_of_
Reviewer:
2nd Reviewer:

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
1.	Technical holding times	SW	Sampling dates: 4/25/13
Ш	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
	Matrix Spike/Matrix Spike Duplicates	A	ms/0
VI.	Duplicates	A	aó
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)
Χı	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

	WKEC						
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 #: 0993246

VALIDATION FINDINGS CHECKLIST

Page: _of \overline{\Omega}
Reviewer: _\Omega \overline{\Omega}
2nd Reviewer: _\Omega \overline{\Omega}

Method: Inorganics (EPA Method See cover)

Method: morganics (EPA Method See 6000 C)	T	i	<u> </u>	1
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) \leq 20% for waters and \leq 35% for soil samples? A control limit of \leq CRDL(\leq 2X CRDL for soil) was used for samples that were \leq 5X the CRDL, including when only one of the duplicate sample values were \leq 5X the CRDL.				
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	1			
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?			7	

LDC#: 29932A6

VALIDATION FINDINGS CHECKLIST

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

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#: <u>79937</u>

VALIDATION FINDINGS WORKSHEET Sample Specific Analysis Reference

Page:	<u>1_of_</u>	1_
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All circled methods are applicable to each sample.

Sample ID	<u>Parameter</u>
1-17	PH (TDS)C) F (NO) (NO) (SO) O-PO4 (AIK ON NH3 TKN TOC (Cr6+(CIO4)
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
8 8	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
QC 13	pH TDS CI F NO3 (NO) SO4 O-PO4 AIK CN NH3 TKN TO (Cr6) CIO4
14	pH TDS CI F NO3 (NO2) SO4 O-PO4 AIK CN NH3 TKN TOC (CIG)+ CIO4
15	pH TDS CI F NO3 NO3 SO4 O-PO4 AIK CN NH3 TKN TOQ Cr6+ CIO4
16	PH TDS (C) F (NO), NO2 (SO) O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
17	PH TDS (C) F (NO) NO2 (SO4 D-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS (C) F (NO) NO2 (SO) O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
19	PH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+(CO)
30	PH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CTO4
\sim	PH) TDS CI F NO3 NO2 SO4 O-PO4 (AIR) CN NH3 TKN TOC Cr6+ (104)
99	PH (TDS) CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
33	PH TDS CI F NO3 (NO) SO4 O-PO4 AIK CN NH3 TKN TOC (CTB)+ CIO4
() <	PH TDS CI F NO3 (NO2) SO4 O-PO4 AIK CN NH3 TKN TOC (Cr6) CIO4
_ ,	PH TDS CI F NO3 (NO) SO4 O-PO4 AIK CN NH3 TKN TOO (CIG+) CIO4
	PH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+(ClO2)
$\sim C/1$	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+(ClO ₄)
28	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH_TDS_CL_F_NO ₂ _NO ₂ _SO ₄ _O-PO ₄ _Alk_CN_NH ₂ _TKN_TOC_Cr6+_ClO ₄

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Comments:_

LDC#: 09932A6

VALIDATION FINDINGS WORKSHEET Technical Holding Times

Page:_	$l_{\sf of}$	<u> </u>
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All circled dates have exceeded the technical holding time.

N N/A Were all samples preserved as applicable to each method?

N N/A Were all cooler temperatures within validation criteria?

Y N N/A vvere all cool	ci temperatures		T Chiena:		I I		
Method:		150.1					
Parameters:		9H 48K5					
Technical holding ti	me:	48hs					
Sample ID	Sampling date	Analysis datę	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1-12,21	4125/3	4/30/13	Gday				J/05/P
			0		7.77		
				· · · · · · · · · · · · · · · · · · ·			
							
					· ·		
							<u> </u>

LDC #: 29932A6

VALIDATION FINDINGS WORKSHEET Blanks

Page: of Seviewer:

METHOD: Inorganics, Method See Cover

Conc. units:	s: mg/L				Associated Samples: 11,12	
Analyte	Blank ID	Blank ID	Blank			
	PB	ICB/CCB (mg/L)	Action Limit	No Qualifiers		
ū	0.151		0.755			
Conc. units:	s: mg/L				Associated Samples: 1-10	
Analyte	Blank ID	Blank ID	Blank			
	PB	ICB/CCB (mg/L)	Action Limit	-		
ō	0.179		0.895	0.26		
Conc. units:	s: mg/L				Associated Samples: All	
Analyte	Blank ID	Blank ID	Blank			
	PB	ICB/CCB (mg/L)	Action Limit	-		
ij		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#<u>29932A6</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: _of_ Reviewer:__O 2nd Reviewer:__

Inorganics: Method See Cover

	Concentra	ition (mg/L)		
Analyte	4	12	RPD	
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	
Perchiorate (ug/L)	2.3	2.6	12	
Hexavalent Chromium	0.0015	0.0013	14	
Total Alkalinity	160	160	0	
Bicarbonate Alkalinity	200	200	0	

 $\verb|\LDCFILESERVER|\Validation|\FIELD DUPLICATES|\FD_inorganic|\29932A6.wpd|$

LDC #: SDG #:	VALIDATION FINDINGS WORKSHEET Field Blanks	Page: of Reviewer: 2nd reviewer:
YN N/A WE	ere field blanks identified in this SDG? ere target anlytes detected in the field blanks? Field Blank / Trip Blank / Rinsate (circle one	E3
	Analyte PH (units) CI	Concentration Units (Mg/L) 6.17 0.26
Sample:	Field Blank / Trip Blank / Rinsate (circle one)	
	Analyte	Concentration Units ()

LDC#: LAGSTAD

Initial and Continuing Calibration Calculation Verification Validation Findings Worksheet

2nd Reviewer: Reviewer: Page:___

Method: Inorganics, Method S@coco

The correlation coefficient (r) for the calibration of $\overline{igcirclet}$

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula: was recalculated.Calibration date: $\frac{\mathcal{A}[\mathcal{DG}]}{\mathcal{A}[\mathcal{B}]}$

%R = Found X 100

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

				!	Recalculated	Reported	Acceptable
Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	r or r²	r or r²	(N/X)
Initial Calibration		s1	0	0			
Verification		s2	5	0.697	1.000	0.997	
	(s3	20	3.145			
)	s4	50	9.455)~
	•	s5	100	20.57			. `
		9S	200	43.443			_
Calibration verification	00	α	10	0.113	101	101	
Calibration verification	NO2-N		9,0	0,5 O.46CB	931	932 93.2	
Calibration verification	\$0.00 M)	50.0	0.05 0.05/157	1,01	۲0)	\rightarrow

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#_29732#~

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

Reviewer: Cand Reviewer:

METHOD: Inorganics, Method Seconen

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

 $%R = Found \times 100$

Where,

Found =

Found = SSR (spiked sample result) - SR (sample result),

concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation,

True = concentration of each analyte in the source.

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

 $RPD = |S-D| \times 100$ (S+D)/2

Where,

:: II

Original sample concentration Duplicate sample concentration

					Recalculated	Reported	
Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	%R / RPD	%R/RPD	Acceptable (Y/N)
\$57	Laboratory control sample	705	595	985	K96	h'96	7 -
91	Matrix spike sample	NOSN	(SSR-SR)	ऽॐ०ऽ	7.0)	201	
6	Duplicate sample	+0	8.15	8,19	64.0	65.0	

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

LDC #: 299716

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page: of Reviewer: OR 2nd reviewer:

METHOD: Inorganics,	Method See C	DVC2				V
Please see qualification X N N/A Have reserved. Y N N/A Are reserved.		estions answered ted and calculate librated range of t	d correctly?		e identified as "N	/A".
Compound (analyte) re recalculated and verifie		ing equation:	SOY	rep	orted with a positi	ive detect were
Concentration =		Recalculati	ion:		··········	
=0.0001x2 +0.1726x-0.0	3	14/00001)	4787+0	03)+6.1226	21-0.1226	201
			2(0,000	03)+6.1226)	,	= 28.1mg
# Sample ID		Analyta		Reported Concentration	Calculated Concentration	Acceptable
" Sample ib		Analyte	H(2:5)	9.11	911	(Y/N)
		9	ott(units)	910	20	
			\	7.2	7,2	
		3	2	38	38	
		TOTAL F	tlK	96	96	
		Micaly		82	82	
		Carp.	1	18	18	V
					· · · · · · · · · · · · · · · · · · ·	
			7			
						·

Note:		
	"	
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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)	Р
4/29/13	Pentachloroethane	32.1	All samples in SDG 1308571	J (all detects) UJ (all non-detects)	Р

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
SDG #: 1308571	Level III/IV
Laboratory: BC Laboratories,	Inc.

Date: <u>6/21/13</u>
Page: <u>1</u> of <u>/</u>
Reviewer: <u>F7</u>
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
l.	Technical holding times	Δ	Sampling dates: $\frac{4}{26}/3$
11.	GC/MS Instrument performance check	Δ	
III.	Initial calibration	Α	% RSD = 30, 12
IV.	Continuing calibration/ICV	SW	101/cor = 30
V.	Blanks	Δ	
VI.	Surrogate spikes	Α	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	ic>
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	4	
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)	ANE	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	Δ	
XVI.	Field duplicates	\wedge	
XVII.	Field blanks	NO	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-5-42613	11	EB-5-42613MSD	21	BNP23/2	31	
2 1	EB-5-42613	12		22		32	
3 1	MW-17-5	13		23		33	
4 1	MW-17-4	14		24		34	
5 1	MW-17-3	15		25		35	
6	MW-17-2	16		26		36	
7 1	MW-17-1**	17		27		37	
8 /	MW-26-2	18		28		38	
9 1	MVV-26-1	19		29		39	
10	EB-5-42613MS	20		30		40	

Page:_		2
Reviewer:	FT	
nd Reviewer	<u></u>	

Method: Volatiles (EPA Method 524.2)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times	T	T	ı	
All technical holding times were met.			<u> </u>	
Cooler temperature criteria was met.				
II. GC/MS Instrument performance check	T		ı	\$1.5 magazza 2006 · \$200
Were the BFB performance results reviewed and found to be within the specified criteria?				
Were all samples analyzed within the 12 hour clock criteria?				and the sales an
III. Initial calibration	·			
Did the laboratory perform a 5 point calibration prior to sample analysis?				
Were all percent relative standard deviations (%RSD) ≤ 20%?				1110 P. T.
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	T			
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.			-	
M. 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	1			
Was a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for this SDG?				
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
VIII. Laboratory control samples				
Was an LCS analyzed for this SDG?				
Was an LCS analyzed per analytical batch?				
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				

VALIDATION FINDINGS CHECKLIST

Page	:of
Reviewer:_	FT
2nd Reviewe	r:

Validation Area	Yes	No	NA	Findings/Comments
IX. Regional Quality Assurance and Quality Control	163	140	IVA	Findings/Comments
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?	سمرا		_	
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	V		_	
Were chromatogram peaks verified and accounted for?				71. 10. 14.
XII. Compound quantitation/RLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	N		/	
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 \pm 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	ННН. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	000. 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. lodomethane
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	рррр.
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	ବରବର:
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	TTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-lsopropyltoluene	AAAA. Ethyl tert-butyl ether	ບບບບ.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	ww.

LDC #: 39932 B)

VALIDATION FINDINGS WORKSHEET **Continuing Calibration**

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".

Was a continuing calibration standard analyzed at least once every 12 hours for each instrument? Were all percent differences (%D) \leq 30% ? Y N N/A

			 _			_		-11					_					<u> </u>
Qualifications	J/43/12	, ,		1/12/10			-, -											
Associated Samples	114			7													i i digi kuchanan	
Finding %D (Limit: <30.0%)	5/.9			rne 32./														
Compound	B			Pentachloro e Hane			The state of the s											
Standard ID	1305507-ccv3			130507-4014														
Date	4/29/13	(9:13		1/6¢/h	19:59	,												
*		\neg												·				

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Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

Page: 2nd Reviewer:_ 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 = $(A_x)(C_s)/(A_s)(C_x)$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

 $A_{\rm ls}$ = Area of associated internal standard $C_{\rm ls}$ = Concentration of internal standard

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

					Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
#	Standard ID	Calibration Date	Compound (Ref	Compound (Reference Internal Standard)	RRF (std)	RRF (std)	Average RRF (initial)	Average RRF (initial)	%RSD	%RSD
_	1641	4/18/13	Acetone		3.056.00 0x 212505	200000	2.805742Ki	0.028057	7,107243	7.107
			Methyl Met	Methy/ Metacry/ate (40) (2nd Internal Standard)	7.61857 x10 0.07668			0.07/238	4.473303	
			Pentach bro	fen fach broe thank (g) (3rd internal Standard)	0.55 14358 0.55145	SH155.0	0.5X47112	1 4447 /		5.854
7	1692	81/81/4	b		0.9033516	0.90335	U.90335 0.86 26 408	D. 86864	88779.01	10.67
		•	り	(2nd Internal Standard)	2343105	0.33431	0.334305 0.33431 0.3301203	0.33012	4.712199	4.7/22
			EE	(3rd Internal Standard)	1.887303	1-88730	1.92 5438	1.92.44	6.2 33496	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#: 39932B

Continuing Calibration Results Verification VALIDATION FINDINGS WORKSHEET

<u>\</u>		(
Page:c	Reviewer: FT	and 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 = $(A_y)(C_y)/(A_y)(C_y)$

Where: ave. RRF = initial calibration average RRF RRF = continuing calibration RRF $A_{\rm x} = Area$ of compound, $A_{\rm is} = Area$ of $C_{\rm x} = Concentration$ of compound, $C_{\rm is} = Concent$

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

						Reported	Recalculated	Reported	Recalculated
#	Standard ID	Calibration Date	Compound (Re	Compound (Reference internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	, Q%	Q%
-	dev	1/60/13	Autone	(1st Internal <u>St</u> andard)	2. 505-742 XID	2.821777×10	0.0W2/17	90	9.0
			methy I m	methy / methacry /a 4 (2nd Internal Standard)		L	181/182	3.1	7.8
			Jentachter	ドハね <i>いし</i> かっとれるハモ (3rd Internal Standard)	0.5447/12	P6800150	0.370087	32.1	32./
2			6	(1st Internal Standard)	D.8686 YOY	0.995631	18705650	17.6	14.6
			Ŋ	(2nd Internal Standard)	0.3301203	0.3322576	36M188:0	9.0	9.0
			EE	(3rd Internal Standard)	1.925438	1.980674	1-49086-1	2.9	67
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#: 29932B/

Matrix Spike/Matrix Spike Duplicates Results Verification VALIDATION FINDINGS WORKSHEET

] of | Page:

2nd Reviewer: ______ Reviewer:

52% 2 METHOD: GC/MS VOA (EPA SW 846 Method 8269) テク

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:

SC = Sample concentration

SSC = Spiked sample concentration SA = Spike added

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

MSC = Matrix spike percent recovery

MSDC = Matrix spike duplicate percent recovery

11+ 01 MS/MSD sample:

	ďs	ike	Sample	Spiked Sample	ample	Matrix Spike	Spike	Matrix Spike Dublicate.	Duplicate	MS	MS/MSD
Compound	A A	Added (14 9 /L)	Concentration (M)	Concentration (42/4	tration	Percent Recovery	ecovery	Percent Recovery	ecovery	u-	RPD
	SW	MSD	0	MS	MSD	Reported	Recalc	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	25.0	25.0	OM	25.800	25. XV) 26.240	801	103	/0/	50/	69:1	1.69
Trichloroethene				26.320	26.320 26.190	101	/at	101	(ol	0.5/5	0-515
Benzene				26.830	26.890 27.290 108	801	801	601	601	7.48	\$\int \
Toluene				24.590	26.590 26.510	901	901	901	901	0.30/	0.30/
Chlorobenzene	1	1	J	28.800	Ed Ed 060.25 CO8.25	80/	801	104	hal	0.888	84.0

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# 29932B,

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

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

BWD2312- 651 LCS ID:

	Ś	pike	Spiked S	Sample	SOI	S	usol	Q;	I CS/	CS/I CSD
Compound	A O	Added 49/L)	Concentration	ration	Percent Recovery	ecovery	Percent Recovery	ecovery	R	RPD
	TCS	TCSD	rcs o	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	6.50	Ad	27.130	AN	109	601				
Trichloroethene	-		092.80	/	_5//	5//				,
Benzene			070.20		112	113				
Toluene	/	/	USP. 72		7/1	115				
Chlorobenzene	J	1	26.58U	1	901	701	42			

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#: 29932B)

VALIDATION FINDINGS WORKSHEET **Surrogate Results Verification**

Page:_		_of_	_
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	10 /	0
Bromofluorobenzene	,	9.19	91.9	9/.9	1
1,2-Dichlorobenzene-d4	J	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		l			
Bromofluorobenzene					
1,2-Dichlorobenzene-d4					
Dibromofluoromethane					

LDC#: 29932B)

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

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Reviewer:	FT	
2nd reviewer:	10	_

VIETHOD: GC/MS VOA	(EPA Method 524.2	١
---------------------------	-------------------	---

Y N N/A

Were all reported results recalculated and verified for all level IV samples?

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

_			
Concen	tration	$= \frac{(A_{s})(I_{s})(DF)}{(A_{is})(RRF)(V_{o})(\%S)}$	Example:
A _x	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D:
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	
l _ε	=	Amount of internal standard added in nanograms (ng)	Conc. = () () () ()
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.		·		
#	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	_ VALIDATION COMPLETEN
SDG#:	1308571	Level III

Laboratory: BC Laboratories, Inc.

NESS WORKSHEET

Level III

Reviewer:

2nd Reviewer

METHOD: GC/MS 1,4-Dioxane (EPA SW 846 Method 8270C) 91M)

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

	Validation Area		Comments
l.	Technical holding times	Δ	Sampling dates: 4/24/13
II.	GC/MS Instrument performance check	A	7
III.	Initial calibration	Δ	12
IV.	Continuing calibration/ICV	A	104/ccv = 25
V.	Blanks	A	
VI.	Surrogate spikes	Α	
VII.	Matrix spike/Matrix spike duplicates	2	client specified
VIII.	Laboratory control samples	A	ics
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	Δ	
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	\sim	

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:

	Walr					
1 2 3 4 5 6 7 8 9	MW-17-4	11	BWE0259-BLK)	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

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

Laboratory: BC Laboratories, Inc. METHOD: Metals (EPA Method 200.7/200.8)

SDG #: 1308571

Reviewer:_____ 2nd Reviewer:

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

	Validation Area		Comments
1.	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 (Ma, K >4x) a (G >4x)
VII.	Duplicate Sample Analysis	~	
VIII.	Laboratory Control Samples (LCS)	A	LCS
iX.	Internal Standard (ICP-MS)	A	Nor eviewed for level !!
X.	Furnace Atomic Absorption QC	M	
XI.	ICP Serial Dilution	N	Not personned
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	\wedge	
χv	Field Blanks	ND	EB=

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

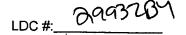
	Water				***	
1	EB-5-42613	11	EB-5-42613DUP	21	31	
2	MW-17-5	12	MW-17-1MS	22	32	
3	MW-17-4	13	MW-17-1MSD	23	33	
4	MW-17-3	14	MW-17-1DUP	24	34	
5	MW-17-2	15		25	35	
6	MVV-17-1**	16		26	36	
7	MW-26-2	17		27	37	
8	_MW-26-1	18		28	38	
9	EB-5-42613MS	19		29	39	
10	EB-5-42613MSD	20		30	40	

Notes:		

VALIDATION FINDINGS CHECKLIST

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.		<u> </u>			
Cooler temperature criteria was met.					
II. ICP/MS Tune					
Were all isotopes in the tuning solution mass resolution within 0.1 amu?		<u> </u>			
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) \leq 20% for waters and \leq 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were \leq 5X the RL, including when only one of the duplicate sample values were \leq 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 FINDINGS CHECKLIST

Page: Of A Reviewer: CC 2nd Reviewer: V

Validation Avec	Yes	No	NA	
Validation Area	res	NO	NA	Findings/Comments
VIII. Furnace Atomic Absorption QC	т		Т	
If MSA was performed, was the correlation coefficients > 0.995?				
Do all applicable analysies have duplicate injections? (Level IV only)		ļ	_	?
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 #: 7993784

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

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All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-46		Al, Sb, As Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg Mn, Hg, Ni 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,
PC= 910.		Al, 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,
12-19	4	Al, Sb(As, Ba, Be, Cd, Ca,Cl), Co, Cu, Pe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
161		Al, Sb, As, Ba, Be, Cd Ca Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, R) 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,
	1 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,
	1 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,
	I N	Al, 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,
	1 1	Al, 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,
1.11.27		Analysis Method
CP		Al, Sb, As, Ba, Be, Cd,Ca, Cr, Co, Cu(Fe) Pb,(Mg) Mn, Hg, Ni,(R) Se, Ag(Na), Tl, V, Zn, Mo, B, Sn, Ti,
CP-MS	1 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,
SFAA	[]	Al Sh 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

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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:

2nd Reviewer: Reviewer:

:		
		1-5
		Associated Samples:
		ciated S
		Asso
lifiers		
No qua		mg/L
Action Level	52.045	noted:
CB ^a	0.010409 52.045	herwise
Maximum ICB/CCB ^a	1	lless oth
Analyte Maximum Maximum Action No qualifiers PB* ICB/CCB* Level (mg/l) (mg/l)		Sample Concentration units, unless otherwise noted: mg/L
laximum M PB ^a ma/Ka)		itration (
Maximu PB*		Concer
Analyte	Fe	Sample

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

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o qual	
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Action No qualifiers Level	1.1628
Analyte Maximum Maximum PB ^a ICB/CCB ^a (mg/l) (mg/l)	0.23256
May ICB	0.2
ximum PB ^a	
Maxi P P	
Maximum PB ^a (mq/Kq)	
Maximu PB ^a (mg/K	
lyte	
Ana	¥

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".

a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element. Note

LDC# 29932(34)

VALIDATION FINDINGS WORKSHEET Initial and Continuing Calibration Calculation Verification

Page: \(\text{ of } \)
Reviewer: \(\frac{Q2}{C} \)

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:

 $%R = Found \times 100$ True

Found = concentration (in ug/L) of each analyte $\underline{\text{measured}}$ in the analysis of the ICV or CCV solution True = concentration (in ug/L) of each analyte in the ICV or CCV source Where,

					Recalculated	Reported	
Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	%R	%R	Acceptable (Y/N)
TCV	ICP (Initial calibration)	Sw WB	98h'bh	50	99,0	076)
-	ICP/MS (Initial calibration)	C	76.01	50	98 L	1,86	
	CVAA (Initial calibration)						
Cev	ICP (Continuing calibration)	હ	50.6A	S	191	101	
-)	ICP/MS (Continuing calibration)	9 d	LU'bb	100	2.30	49,7	+
	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.



VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

Reviewer:_ Page:__ 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 = Found x 100

Where, Found = Concentration of each analyte <u>measured</u> 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 = $1S-D1 \times 100$ (S+D)/2

S = Original sample concentration D = Duplicate sample concentration Where,

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

%D = [I-SDR] × 100

Where, I = Initial Sample Result (mg/L) SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

				-	Recalculated	Reported	
Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	%R/RPD/%D	%R/RPD/%D	Acceptable (Y/N)
ICSA?	ICP interference check	Mg	508.51	500	7201	7201	<u></u>
577	Laboratory control sample	Ch)	75'LOI	100	168	108	
р	Matrix spike	As	(SSR-SR) 103,08	001	W3	<u>B</u>	
14	Duplicate	76	DA B	B 299.98	569	698	\
\nearrow	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 #: 2993184

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	\of	<u> </u>
Reviewer:	OR	
2nd reviewer:		$\overline{}$

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

Please Y N Y N Y N	see qua N/A N/A N/A	alifications below for all quest Have results been reported Are results within the calibra Are all detection limits below	tions answered "N". Not appl I and calculated correctly? ated range of the instrument w the CRDL?	icable questions are	e identified as "N/ ear range of the I0	A". CP?
Detect equation		rte results for	Fe	were recalcu	lated and verified	using the following
Concent	tration =	(RD)(FV)(Dil) (In. Vol.)	Recalculation: 0,2798 mg/L Cl	mo) = 7.7	19.8ma/1	
RD	=	Raw data concentration	DICITIONS IL CI			
FV	=	Final volume (ml)	•			
In. Vol.	=	Initial volume (ml) or weight (G)				
Dil	=	Dilution factor				
				Reported	Calculated	

#	Sample ID	Analyte	Reported Concentration (UG/L-)	Calculated Concentration	Acceptable (Y/N)
ļ	6	Fe	ର ୫୦	280	7
 	*****	Cq (mg/L)	59	59	
 		mg j	20	20	
		Na	20	20	
		K J	7.9	2.9	L
	· · · · · · · · · · · · · · · · · · ·				
<u> </u>	·				
	W. W. Washing				

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-26-1	рН	6 days	48 hours	J (all detects) UJ (all non-detects)	Р

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	рН	J (all detects) UJ (all non-detects)	Р	Technical holding times

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

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

LDC #: 29932B6

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

SDG #:__1308571 Laboratory: <u>BC Laboratories, Inc.</u> Page: of \
Reviewer: 2nd Reviewer:

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
l.	Technical holding times	SW	Sampling dates: 4/76/3
11	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	ms 0
VI.	Duplicates	A	ao
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	\mathcal{N}	
Lxı	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	<u> </u>				
1	EB-5-42613	11	MW-17-5DUP	21	31	
2	MVV-17-5	12	MVV-17-1MS	22	32	
3	MVV-17-4	13	MW-17-1MSD	23	33	
4	MVV-17-3	14	MW-17-1DUP	24	34	
5	MVV-17-2	15	MW-26-1DUP	25	35	
6	MVV-17-1**	16		26	36	
7	MVV-26-2	17		27	37	
8	MVV-26-1	18		28	38	
9	MW-17-5MS	19		29	39	
10	MW-17-5MSD	20		30	40	

Notes:				

VALIDATION FINDINGS CHECKLIST

Page: of A
Reviewer: 2nd Reviewer: 1

Method:Inorganics (EPA Method See COVEN)

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

LDC #: 29937B6

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2 Reviewer: 02 2nd Reviewer: V

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#: 7993713

VALIDATION FINDINGS WORKSHEET Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: CR
2nd reviewer: \(\sum \)

All circled methods are applicable to each sample.

Sample ID	Parameter Parameter
1-8	pH TDS (C) F (NO) (NO) (SO) O-PO4 AIK CN NH3 TKN TOO (C18+) (CTO4)
	PH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
(C) 145	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
01-9,10	PH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
11	PH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
12,13	PH TDS (C) F (NO) NO() SO, O-PO, AIK CN NH3 TKN TOC (Cr6+) CIO,
1	PH TDS C F NO NO SO O-PO4 AIK CN NH3 TKN TOC CT6 CIO4
15	PH TDS CI F NO3 NO2 SO4 O-PO4 AIR CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
-	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
-	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH_TDS_CI_F_NO3_NO2_SO4_O-PO4_AIK_CN_NH3_TKN_TOC_Cr6+ CIO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	DH TDS CLF NO, NO, SO, O-PO, Alk CN NH, TKN TOC Cr6+ ClO,

Comments:		

LDC#: 0932B6

VALIDATION FINDINGS WORKSHEET Technical Holding Times

Page:_	of	<u> </u>
Reviewer:	ar	
2nd reviewer:	1	

All circled dates have exceeded the technical holding time.

N N/A Were all samples preserved as applicable to each method?

N N/A Were all cooler temperatures within validation criteria?

N N/A Were all coole	er temperatures		criteria?				
Method:		150.1					
Parameters:		QH					
Technical holding tir	ne:	48 hs					
Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1-8.15	412613	5/2/13	(Codaus)				J/WP
7			07				
					-		
					<u> </u>		

LDC #: 29932B6

VALIDATION FINDINGS WORKSHEET Blanks

Page: 1 of 1 Reviewer: 21

METHOD: Inorganics, Method See Cover

Conc. units:	s: mg/L			Associated Samples: 1-4
Analyte	Blank ID	Blank ID	Blank	
	PB	ICB/CCB (mg/L)	Action Limit	1
Ö		0.155	0.775	0.33
Conc. units:	s: mg/L			Associated Samples: 5-8
Analyte	Blank ID	Blank ID	Blank	
	PB	ICB/CCB (mg/L)	Action Limit	No Qualifiers
Ū	·	0.240	1.2	
804		0.269	1.345	
				Printing printing and the second seco

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".

DC #:	2932B6 	VALIDATION FINDINGS WORKSHEET Field Blanks	Page:of Reviewer: 2nd reviewer:
//ETHOD: Ir	norganics, EPA M	lethodS@Cover	
N N/A	Were field blank Were target anly	ks identified in this SDG? ytes detected in the field blanks?	
Sample:	. \	Field Blank / Trip Blank / Rinsate (circle one)	<u>(3)</u>
		Analyte	Concentration Units (1974
		PH (Units)	0.33
		say	0,35
		Total Alkalin.ty Bicarbonak Alkalin	4,1
	·		
Sample:		Field Blank / Trip Blank / Rinsate (circle one)	
		Analyte	Concentration Units ()

4025 By # 5007

Validation Findings Worksheet Initial and Continuing Calibration Calculation Verification

Page: of Reviewer: OR 2nd Reviewer:

Method: Inorganics, Method See could

was recalculated.Calibration date: $\sqrt{122/(12)}$ The correlation coefficient (r) for the calibration of $\overline{\mathbb{C}}$

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

%R = Found X 100

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

					Recalculated	Reported	Acceptable
Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	r or r²	r or r	(Y/N)
Initial Calibration		0	0	0.000			
Verification		s1	0.5	0.051	0.99985	0.99856	
	_	s2	5	0.541			>
	\leq	s3	20	2.283			-
	<u>,</u>	s4	20	6.992			•
		s5	100	15.271			
		9s	200	32.641			
Calibration verification	SQ	ICV	100	HOLDO	100	100	
Calibration verification	Cla	200	10	10.195	101	201	
Calibration verification	NOSCN	っ つ	0,5	915140	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# 2993208

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

2nd Reviewer: Reviewer:

METHOD: Inorganics, Method Seconer

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

 $%R = Found \times 100$

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:

Where, $RPD = |S-D| \times 100$ (S+D)/2

|| || || 0

Original sample concentration Duplicate sample concentration

		1	 	T"
	Acceptable (Y/N)	٢-		\
Reported	%R/RPD	001	858	PO.1
Recalculated	%R/RPD	8	85.8	۱'۵۲
	True / D (units)	600	10].01	636.66
	Found / S (units)	100,19	(SSR-SR)	643.33
	Element	504	्तु ठाउ	100
	Type of Analysis	Laboratory control sample	Matrix spike sample	Duplicate sample
	Sample ID	577	б	-5

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 #: 7993206

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

-	1 1
Page:_	<u> </u> of
Reviewer:_	α
2nd reviewer:	

				2nd revie	wer:
METH	OD: Inorganics, Metho	od See Cover			
Please X N I Y N I Y N I	<u>Ⅵ/A</u> Have results <u>Ⅵ/A</u> Are results w	ow for all questions answered "N". Not apple been reported and calculated correctly? within the calibrated range of the instrument tion limits below the CRQL?		e identified as "N/	'A".
	ound (analyte) results t ulated and verified usir	for	repo	orted with a positi	ve detect were
Concent	ration =	Recalculation:			
15.0442g - 45.029g x1000000 = 304mg/					Ymg/L
#	Sample ID	Analyte	Reported Concentration (Mg/L-)	Calculated Concentration (ML)	Acceptable (Y/N)
	6	of(units)	7,55	7,55	Y
		さいろ 1	300	300	
		CI	16	16	
		NO3-N	1,7	1.7	

#	Sample ID	Analyte	Concentration (Mg/L-)	Concentration	Acceptable (Y/N)
	6	pt(vnits)	7.55	7,55	Y
ļ		105	300	300	
		L CI	16	16	
		NO3-N	1,7	1.7	
		SOY	29	29	
		Total, AIK	200	200	
		Biarb, Alk,	250	750	

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

1010 0-2 1-0

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)	Р
5/2/13	Methyl iodide	31.0	All samples in SDG 1308887	J (all detects) UJ (all non-detects)	Р

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-21-5 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)	Р	Continuing calibration (%D)

NASA JPL

Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308887

No Sample Data Qualified in this SDG

LDC #:_	29932C1	VALIDATION COMPLETENESS WORKSHEET	Date: 6
SDG #:_	1308887	Level III	Page: 7
Laborato	ory: BC Laboratories,	Inc.	Reviewer:
			2nd Reviewer:

METHOD: GC/MS Volatiles (EPA Method 524.2)

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

	Validation Area		Comments
l.	Technical holding times	^	Sampling dates: 5/,//3
II.	GC/MS Instrument performance check	Δ	7.7,
III.	Initial calibration	۵	0/2 RGD 4 20, 12
IV.	Continuing calibration/ICV	SW	104/cw = 30
V.	Blanks	◁	
VI.	Surrogate spikes	Δ	
VII.	Matrix spike/Matrix spike duplicates	Ą	
VIII.	Laboratory control samples	Ą	LC >
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	Д	
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	7B = 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:

Waln

	war.			
7/	TB-8-5113	11 2 MW-21-2	21 BWF0123	31
2 1	EB-8-5113	12 / MW-21-1	21 BWF0/23 22 BWF0/25	32
3 l	MW-11-5	13 / DUP-5-2Q13 P	23	33
4 1	MW-11-4	14 / MW-11-4MS	24	34
5	MW-11-3	15 MW-11-4MSD	25	35
6 1	MW-11-2	16 2 MW-21-2MS	26	36
71	MVV-11-1 0	17 2 MW-21-2MSD	27	37
8 1	MW-21-5	18	28	38
9 /	MW-21-4	19	29	39
10 /	MW-21-3	20	30	40

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chioromethane	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-Chiorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. lodomethane
M. 2-Buţanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Difluoroethane
N. 1,1,1-Trichloroethane	HH. Vinyi acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	рррр.
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	<u>a</u> aaa.
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	บบบบ.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	ww.
I. Dibromocinoromeniane	MR. Metryr early nerone			

LDC#: 39932C /

VALIDATION FINDINGS WORKSHEET

Page: / of /

Reviewer: 2nd Reviewer:_

Continuing Calibration

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".

| N | N/A | Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
| N | N/A | Were all percent differences (%D) ≤ 30%?

	,,		 				 _	 	 	 			 		 	 -
Qualifications	d/ [n/ [//		1												
Associated Samples	//8			7												
Finding %D (Limit: <30.0%)	8.04			9/0												
Compound	8		[Methy / Iodide												
Standard ID	1305749-6011			1305749-6612												
	5/2/13	07:33		5/2/13	7:52											
) #																

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	MVV-21-5 MVV-21-4 MVV-21-3 MVV-21-2 MVV-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:

	Conce	entration	
Analyte	MW-11-1	DUP-5-2Q13	RPD
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	Α
1308887	MW-21-5	Iron	31U ug/L	Α
1308887	MW-21-3	Iron	64U ug/L	Α
1308887	MW-21-2	Iron	18U ug/L	А
1308887	MW-21-1	Iron	40U ug/L	А

LDC #: 29932C4

VALIDATION COMPLETENESS WORKSHEET

SDG #:_	1308887	
Laborate	ory: BC Laboratories, Inc.	

Level III

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
l.	Technical holding times	A	Sampling dates: 5/1/13
11.	ICP/MS Tune	A	
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MS/0 (16/17: G, Mg, Na71/X)
VII.	Duplicate Sample Analysis	A	as
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	N	not reviewed
Х.	Furnace Atomic Absorption QC	\mathcal{N}	,
XI.	ICP Serial Dilution	N	not perserned
XII.	Sample Result Verification	N	
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	(6,12)
χv	Field Blanks	SW	es=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

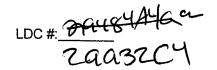
EB = Equipment blank

Validated Samples:

water

	V V V V V V V V V V				
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	MVV-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:		



VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page:_	of
Reviewer:_	ar
2nd reviewer:_	\ <u>\</u>

All circled elements are applicable to each sample.

Sample ID Matrix	Township to 15 4 (TAL)
1-12	Target Analyte List (TAL)
, , _	Al, Sl. As, Ba, Be, Cd, Ca, Cr, Co, Cu Fe, Pb, Mg, Mn, Hg, Ni, R 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,
0000	Al, 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,
QC13-18	Al, Sb(As, Ba, Be, Cd, Ca(C), Co, Cu(Fe()Pb(M), Mn, Hg, Ni(K)Se, Ag(Na, Tl, V, Zn, Mo, B, Sn, Ti,
16-18	Al, Sb, A3, Ba, Be, Cd Ca, Co, Cu Fa Pb, M3, 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 Fè Pb,Mg Mn, Hg, Ni (R)Se, Ag,Na Tl, V, Zn, Mo, B, Sn, Ti,
l ii	Al, 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,
i II	Al, Sh, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Ph, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti

Comments:_	Mercury by CVAA i	f performed				
	•			 		
			*****	 	··	

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VALIDATION FINDINGS WORKSHEET PB/ICB/CCB QUALIFIED SAMPLES Soil preparation factor applied: NA Associated Samples: 1-6

Page: Of C Reviewer: Of 2

METHO	METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000) Sample Concentration units, unless otherwise noted: ud/L	tals (EPA S	W 864 Meti	hod 6010B/ se noted:	(6020/7000) ug/L	Soil preparation factor] g .	ED SAWIFLES Reviewer: C 2nd Reviewer: 1-6
				2000000	l S			
Analyte	Maximum PB³ (mg/Kg)	Maximum PB ^a (ug/l)	Maximum ICB/CCB ^a (mg/l.)	Action Level	င			
Fe			0.011822	59.11	9.7			
Sample	Sample Concentration units, unless otherwise noted:	on units, un	less otherwi		ug/L	Associated Samples:	Samples: 7-12	-12
Analyte	Maximum PB ^a (mg/Kg)	Maximum PB ^a (ug/l)	Maximum ICB/CCB ^a (mg/l)	Action Level	7	ത	10	11
Fe			0.015878	79.39	31	64	18	40
Sample	Sample Concentration units, unless otherwise noted:	on units, un	less otherwi		ng/L	Associated	ssociated Samples: 7	7-11
Analyte	Maximum PB ^a (mq/Kq)	Maximum PB* (ug/l)	Maximum ICB/CCB ^a (mg/l)	Action Level	7	10	-	
Fe		9.8807		49.4035	See ICB	See ICB	See ICB	
Sample	Sample Concentration units, unless otherwise noted:	on units, un	less otherwi		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		3	
Fe		10.382		51.91				
Sample	Sample Concentration units, unless otherwise noted:	on units, un	less otherwi	1 11	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			
¥		0.12285		0.61425				

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METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)

VALIDATION FINDINGS WORKSHEET

PB/ICB/CCB QUALIFIED SAMPLES
Soil preparation factor applied: NA
Associated Samples: 7-11

Page: Co Reviewer: Co 2nd Reviewer: Co

ı		
s: 7-		
ample		
ssociated Samples:		
Assoc		
,	ers	
1	No qualifiers	
d: mg		88
ise note	Action Level	0.019475 0.09738
otherw	Maximum ICB/CCB ^a (ma/l)	019475
nnless	nm Mi	_
on units,	Maximum PB ^a (ma/l)	
Sample Concentration units, unless otherwise noted: mg/L	Analyte Maximum Maximum PBª ICB/CCBª (ma/lxa)	
Sample C	Analyte	Mg

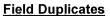
Sample Concentration units, unless otherwise noted: _mg/L	Analyte Maximum Maximum Action No qualifiers PB³ ICB/CCB³ Level	
ess otherw	Maximum ICB/CCB ^a	
ise noted:	Action Level	0.09036
mg/L	No qualifiers	
Associated Samples:		
Samples: 12		
~		

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#: 29932C4

VALIDATION FINDINGS WORKSHEET



Page:___of__ Reviewer:___

METHOD: Metals (EPA Method 6010B/7000)

	Concentr	Concentration (ug/L)		
Analyte	6	12	RPD	
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 Na	26	25	4	
Sodium K	3.2	3.1	3	

 $\verb|\LDCFILESERVER|\Validation|\FIELD DUPLICATES|\FD_inorganic|\29932C4.wpd|$

LDC #: 39932C9

VALIDATION FINDINGS WORKSHEET Field Blanks

Page: of Pag

METHOD: Tr	race Metals (E	PA SW 846 Method 6010/6020/7000)		
Y N N/A Y N N/A		blanks identified in this SDG? et analytes detected in the field blanks?		
Sample:	<u> </u>	Field Blank / Trip Blank / Rinsate / C	Other (circle o	one)
		∆nalyte		Concentration Units (以の)
			Cr	1,0
	<u></u>			
<u> </u>			\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
<u> </u>				
Sample:		Field Blank / Trip Blank / Rinsate / C	Other(circle	e 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-21-2MSD MW-11-5 MW-21-2DUP

MW-11-5 MW-11-4

MW-11-3

MW-11-2

10100-11-2

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

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	рН	6 days	48 hours	J (all detects) UJ (all non-detects)	Р

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-21-5 DUP-5-2Q13)	Hexavalent chromium	81.7 (85-115)	81.7 (85-115)	-	J (all detects) UJ (all non-detects)	А

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:

	Concentration		
Analyte	MW-11-1	DUP-5-2Q13	RPD
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

	Concentration		
Analyte	MW-11-1	DUP-5-2Q13	RPD
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	pΗ	J (all detects) UJ (all non-detects)	Р	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-21-5 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	Α
1308887	MW-11-1	Orthophosphate as phosphorus	0.033U mg/L	Α

LDC #: 29932C6

SDG #: 1308887

VALIDATION COMPLETENESS WORKSHEET

				
Laborator	۷:	BC	Laboratories, Inc.	

Level III

Page: \ of \ Reviewer: 02 2nd Reviewer:

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: 5/11/3
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	SW	ms/P
VI.	Duplicates	M	DQ
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	N	
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	(6,12)
xı_	Field blanks	We	EBI

Note:

A = Acceptable

ND = No compounds detected

D = Duplicate

N = Not provided/applicable

SW = See worksheet

R = Rinsate FB = Field blank TB = Trip blank EB = Equipment blank

Validated Samples:

MAKEN

	<u> </u>						
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	<u></u>
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#: 0993206

VALIDATION FINDINGS WORKSHEET Sample Specific Analysis Reference

Page:	1_of1	
Reviewer:	CR	
2nd reviewer	: 1	

All circled methods are applicable to each sample.

Sample ID	Parameter
1-12	PH (TDS)CI) F (NO) (NO) (SO) (AIK)CN NH3 TKN TOO (Cr6+) (CIO)
6	pH TDS CI F NO ₃ NO ₂ SO O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
QC:13,14	pH TDS(C)) F (NO) (NO) (SO) O-PO4 AIK CN NH3 TKN TOC(Cr6+(CIO4)
ו הי ו	PH (TDS)(C) F (NO) (NO) SO, O-PO, AIK CN NH3 TKN TOC (C16+)(CIO)
16.17	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
18	PH TDS CI F NO3 NO2 SO O-PO4 AIK CN NH3 TKN TOC Cr6+ (CS)
19	(D) TDS CI F NO3 NO2 SO4 O-PO4 (AIR) CN NH3 TKN TOC Cr6+ CIO4
20,21	PH TDS(O) F(NO) (SO) O-PO4 AIK CN NH3 TKN TOC(CTO) (CIO4)
22	pH(TD3 C) F (NO) (NO) (SO) O-PO4 AIK CN NH3 TKN TOQ Cr6) (CIO)
,	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	ph tds ci f no ₃ no ₂ so ₄ o-po ₄ aik cn nh ₃ tkn toc cr6+ cio ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	ph TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO, NO, SO, O-PO, Alk CN NH, TKN TOC Cr6+ ClO,

Comments:	 	

LDC#: 29932C6

VALIDATION FINDINGS WORKSHEET **Technical Holding Times**

Page:_	_of_\
Reviewer:	ar
2nd reviewer:	7

All circled dates have exceeded the technical holding time.

YN N/A

Were all samples preserved as applicable to each method?

YN N/A Were all coole	er temperatures	within validation	criteria?				,—————————————————————————————————————
Method:		150.1					
Parameters:		9H 48KS)	:				
Technical holding tir	ne:	48ks)			· · · · · · · · · · · · · · · · · · ·		
Sample ID	Sampling date	Analysis <u>date</u>	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
1-12,19	5/1/13	5/7/13	(6days)			•	J/4J/P
			0 /				
					,		
					, . .		
				_ , , , , , , , , , , , , , , , , , , ,			
					· ·		
						<u></u>	

LDC #: 29932C6

METHOD:Inorganics, Method See Cover

VALIDATION FINDINGS WORKSHEET Blanks

Page: of Reviewer: 22

1,7 3-12 7-12 ဖ 1-6 Associated Samples: Associated Samples: Associated Samples: Associated Samples: Associated Samples: No Qualifiers No Qualifiers No Qualifiers 0.033 0.12 ဖ Blank Action Limit 0.044205 0.675 0.745 0.485 0.865 1.46 0.0088410 ICB/CCB (mg/L) ICB/CCB (mg/L) ICB/CCB (mg/L) ICB/CCB (mg/L) ICB/CCB (mg/L) Blank ID Blank ID Blank ID Blank ID Blank ID 0.149 0.173 0.292 mg/L mg/L mg/L mg/l Blank ID Blank ID Blank ID Blank ID Blank ID 0.135 0.097 В РВ ВВ 8 В Conc. units: Conc. units: Conc. units: Conc. units: Conc. units: Analyte Analyte Analyte Analyte Analyte 0-PO4-P **SO4** ರ $\overline{0}$

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".

4)724BCO #501

Matrix Spike/Matrix Spike Duplicates VALIDATION FINDINGS WORKSHEET

Page: 2nd Reviewer:

METHOD: Inorganics, EPA Method

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

Was a matrix spike analyzed for each matrix in this SDG?

YON N/A

Were matrix spike percent recoveries (%R) within the control limits of 15-125-11 the sample co

Was a matrix spike analyzed for each matrix in this SDG?

Were matrix spike percent recoveries (%R) within the control limits of 75-1157. If the sample concentration exceeded the spike concentration by a factor

of 4 or more, no action was taken.

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

CEVEL IV ONLY:

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

Qualifications	5151A											
	1-8,13											
RPD (I imits)						·						
MSD %Recovery	81,7											
MS %Recovery	81,7											
ll I	ر ومد											
Matrix	3											
# MS/MSD ID	H/S1											

Comments:

LDC#<u>29932C6</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Inorganics: Method See Cover

	Concentra		
Analyte	6	12	RPD
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

DC #: 3	993266	VALIDATION FINDINGS WORKSHEET	Page: of 1
SDG #:		<u>Field Blanks</u>	Reviewer: 2nd reviewer:
METHOD: Ir	norganics, EPA N	Method_Seecon_	
Y N N/A Y N N/A		ks identified in this SDG? lytes detected in the field blanks?	_
		Field Blank / Trip Blank / Rinsate (circle one)	<u>-3</u>
		Analyte	Concentration Units (Mg/L
		pH (units)	6.21
		<u> </u>	0.17
		NO3 N	0.062
<u> </u>			
			
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

imple belivery Gloup (GDG). 190900

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)	Р

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:

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

	Concenti	ration (ug/L)	
Compound	MW-7	DUP-6-2Q13	RPD
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)	Р	Continuing calibration (%D)

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

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 29932D1 SDG #: 1309034

Level III

Page: Reviewer: 2nd Reviewer:

Laboratory: BC Laboratories, Inc.

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
1.	Technical holding times	4	Sampling dates: 5/2//3
11.	GC/MS Instrument performance check	Δ	7 /
111.	Initial calibration	Ą	% PSD = 20, 12
IV.	Continuing calibration/ICV	SY	16 1cy/ccv = 30
V.	Blanks	Δ	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	LCY
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	Δ	
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	Д	
XVI.	Field duplicates	ςW	D = 4, 7
XVII.	Field blanks	ND	TB =)

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:

	waler					
1 2 3 4 5	TB-9-5213	11	BWEOXD	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	MVV-7 D	16		26	 36	
II	DUP-6-2Q13 0	17		27	37	
7 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. lodomethane
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.1,1-Diffuoroethane
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	рррр.
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	<u>a</u> aaa.
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	unuu.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	ww.

LDC#. 29932D 7

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Page:__

2nd Reviewer:_ Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)
Pigase see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

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%?

Qualifications 🕰	J/41/AP	A														
Associated Samples	B 11	4														
Finding %D (Limit: <30.0%)	42.3	-3+3-B														
Compound	В	6669- 17													111 11 11 11 11 11 11 11 11 11 11 11 11	
Standard ID	1305832-6011			a constitution of the cons					The state of the s	The state of the s						
# Date	5/3/13															

LDC#: 29932P/ VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:	<u>/</u> o	f
Reviewer:		FI
2nd Reviewer:	(

METHOD: GC/MS VOA (EPA Method 524.2)

Y N NA

Were field duplicate pairs identified in this SDG?

YN NA

Were target analytes detected in the field duplicate pairs?

	Concentr	Concentration (ug/L)						
Compound	6	7	RPD					
Р	2.9	3.0	3					
0	1.0	1.0	0					
К	9.5	9.8	3					
н	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	VALIDATION COMPLETENESS WORI
SDG #: 1309034	Level III

KSHEET

Laboratory: BC Laboratories, Inc.

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
1.	Technical holding times	۵	Sampling dates: 5/2//3
H.	GC/MS Instrument performance check	4	
III.	Initial calibration	Δ	% PS: F7 (2
IV.	Continuing calibration/ICV	A	104/cov = 25
V.	Blanks	Δ	
VI.	Surrogate spikes	4	
VII.	Matrix spike/Matrix spike duplicates	~	client specified
VIII.	Laboratory control samples	A	LCS
IX.	Regional Quality Assurance and Quality Control	N	
<u>x.</u>	Internal standards	Δ	
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	
<u>4</u> 5		15		25	 35	
6		16		26	36	
7		17		27	 37	
7 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)	Р

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:

	Conce		
Analyte	MW-7	DUP-6-2Q13	RPD
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	Α
1309034	MW-9	Iron	32U ug/L	A
1309034	MW-7	Iron	8.1U ug/L	Α
1309034	DUP-6-2Q13	Iron	14U ug/L	А

LDC #:_	29932D4	VALIDATION COMPLE
SDG #:_	1309034	Lev

TENESS WORKSHEET Level III Reviewer:_(2nd Reviewer:

Laboratory: BC Laboratories, Inc.

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
l.	Technical holding times	A	Sampling dates: 5/7/13
II.	ICP/MS Tune	A	
111.	Calibration	84	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	mslO
VII.	Duplicate Sample Analysis	A	ao
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	Ν	Normenewer
X.	Furnace Atomic Absorption QC	N	
XI.	ICP Serial Dilution	\mathcal{N}	No+performed
XII.	Sample Result Verification	N	
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW	(5,6)
ΧV	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:



	W-(1			
1	MW-13	11	21	31
2	MW-15	12	22	32
3	MW-9	13	23	33
4	MVV-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 #: DAGABLOY

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page:_	of
Reviewer:	02
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All circled elements are applicable to each sample.

ri i i i i i i i i i i i i i i i i i i		
Sample ID	Matrix	Target Analyte Liet (TAL)
1-6		Target Analyte List (TAL)
		Al, 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,
6110		Al, 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,
de (-1		Al, 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,
	l l	Al, 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,
	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,
	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,
	li li	Al, 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,
	- 1	Al, 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,
	- 1	Al, 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,
	i)	Al, 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,
	i i	Al, 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,
	- 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,
		Analysis Method
СР		Al, 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,
CP-MS	- 11	Al, Sb,As, Ba, Be, Cd, Ca, Cn Co, Cu, Fe Pb Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti,
GFAA		Al, Sh, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, 7n, Mo, B, Sn, Ti

Comments:_	Mercury by	CVAA if performe	d				
					 	 	

LDC#: 0883204

VALIDATION FINDINGS WORKSHEET **Calibration**

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		2nd

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

Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?

Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%)? Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Note all instruments calibrated daily, each set-up time, and were the proper number of standar that the continuity of the continuity of the continuity of the continuity of the continuity on the continuity.

Y N N/A

Was a midrange cyanide standard distilled?

Are all correlation coefficients >0.995?

Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

			Ī				<u> </u>	Γ-	,	<u> </u>	Ī		
Qualification of Data	3de6/P											Total Transition of the Control of t	A Company of the Comp
Associated Samples	1941 1941												
%R	SII		2.5										
Analyte	7												
Calibration ID	(18:3d)												
# Date	SIMIS												

Comments:

LDC #: 29932D4

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

Page: of Reviewer: 2

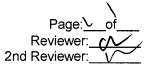
			ī					
					:			
9	14					3		
ς.	8.1		Samples: 1			Associated Samples: 2-6		
ဇ	32		Associated Samples:_			Associated		
1	29		mg/L	No qualifiers		mg/L	No qualifiers	
Action Level	44.6435	0.7567	ise noted:	Action Level	0.79425	ise noted:	Action Level	0.62795
Maximum ICB/CCB ^a (mg/L)	0.0089287		less otherw	Maximum ICB/CCB ^a (mg/L)	0.15885	less otherw	Maximum ICB/CCB ^a (mg/l.)	0.12559
Maximum PB ^a (mq/l.)		0.15134	Sample Concentration units, unless otherwise noted: mg/L	Maximum PB ^a (mg/l)		Sample Concentration units, unless otherwise noted: mg/l	Maximum PB ^a (mq/l.)	
Maximum PB ^a (mg/Kg)			Soncentration	Maximum PB ^a (mg/Kg)		Concentrati	Maximum PB ^a (mg/Kg)	
Analyte	Fe	ᅩ	Sample (Analyte	ᅩ	Sample t	Analyte	ᅩ

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



METHOD: Metals (EPA Method 6010B/7000)

	Concentra	ition (ug/L)	
Analyte	5	6	RPD
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
Potossium Na	40	39	3
Godium K	4.1	4.0	2

 $\verb|\LDCFILESERVER|\Validation|\FIELD DUPLICATES|\FD_inorganic|\29932D4.wpd|$

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	рН	7 days	48 hours	J (all detects) UJ (all non-detects)	Р

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:

	Conce	entration	
Analyte	MW-7	DUP-6-2Q13	RPD
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	рН	J (all detects) UJ (all non-detects)	Р	Technical holding times

NASA JPL

Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 1309034

No Sample Data Qualified in this SDG

LDC #: 29932D6

VALIDATION COMPLETENESS WORKSHEET

Level III

SDG #: 1309034 Laboratory: BC Laboratories, Inc.

Reviewer:_(2nd Reviewer:

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
ı.	Technical holding times	SV	Sampling dates: 5/7/13
Ш	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	mslo
VI.	Duplicates	A	0.0
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	N	
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	(CS,6)
xı	Field blanks	\sim	

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:

1.1	6	L.	∼
\sim	9	\sim	

1	MVV-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 #: 01993206

VALIDATION FINDINGS WORKSHEET Sample Specific Analysis Reference

Page:1	_of	1
Reviewer:	CF	2
2nd reviewer:_	1	

All circled methods are applicable to each sample.

Sample ID	Parameter
16	PA TDS C) F (NO3)(NO2)(SO4)D-PO4(AIK)CN NH3 TKN TOC(Cr6+)CIO4)
ا ما ا	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
7,	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
QC 7,8	PH TDS(CI)F NO NO SO O-PO AIK CN NH3 TKN TOC (CTG) CIO4
G	PH (TPS(C) F (10) (NO) (SOXO-PO) AIK CN NH3 TKN TOO (Cr6) CIO4
10	PH) TDS CI F NO3 NO2 SO4 O-PO4 (AIK) CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	PH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO ₂ NO ₂ SO ₂ O-PO ₂ Alk CN NH ₂ TKN TOC Cr6+ ClO ₂

Comments:		

LDC#: 0993206

VALIDATION FINDINGS WORKSHEET Technical Holding Times

Page:_	\bigcup_{of}	<u> </u>
Reviewer:	9	
2nd reviewer:		

All circled dates have exceeded the technical holding time.

N N/A

Were all samples preserved as applicable to each method?

<mark>⊮ N_N/A</mark> Were all coole	er temperatures	within validation	r criteria?				
Method:		150.1					
Parameters:		pH					
Technical holding tir	me:	48kg					
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)				5/05/P

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					· · · · · · · · · · · · · · · · · · ·		

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VALIDATION FINDINGS WORKSHEET

Blanks

Page: of Reviewer: 2

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Associated Samples:

mg/L Conc. units:

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METHOD:Inorganics, Method See Cover

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

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#<u>29932D6</u>

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

Page: \(of
Reviewer:	のフ
2nd Reviewer:	\overline{V}

Inorganics: Method See Cover

	Concentra		
Analyte	5	6	RPD
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

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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.
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- 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.

1. 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)	Р

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:

	Concentr	ation (ug/L)	
Compound	MW-6	DUP-7-2Q13	RPD
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)	Р	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: of
Laboratory: BC Laboratories	, Inc.	Reviewer: F7
METHOD: GC/MS Volatiles (EPA Method 524.2)	2nd Reviewer:

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

	Validation Area		Comments
1.	Technical holding times	Δ	Sampling dates: 5/3//3
<u>II.</u>	GC/MS Instrument performance check	Δ	7 7
III.	Initial calibration	4	% RSD = 20 12
IV.	Continuing calibration/ICV	SU	104/ccv = 30
V	Blanks	4	
VI.	Surrogate spikes	Ø	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	À	LCY
IX.	Regional Quality Assurance and Quality Control	N	
X .	Internal standards	Δ	
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 = /

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: Warter

	Wat wi			 		 	
1	TB-10-5313		11	BWE0369	21	31	
2	MVV-6	ρ,	12		22	32	
3	MVV-1	D	13		23	 33	
4	MVV-16		14		24	34	
5	MVV-10		15		25	35	
6	MVV-5		16		26	36	
7+	DUP-7-2Q13	ρ_{l}	17		27	37	
8	DUP-8-2Q13	0	18		28	38	
9	MVV-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	000. 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. lodomethane
M. 2-Buţanone	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	рррр.
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	םססם.
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	TIII.
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	www.

LDC# 29932 E

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Reviewer: 2nd Reviewer:_ Page:

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".

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

Y N $\overline{M/A}$ Were all percent differences (%D) \leq 30%?

Qualifications	9/12/1p			-												
Associated Samples	H11															
Finding %D (Limit: ≤30.0%)	34.5															
Compound	Hyachloroethane	•														
Standard ID	1305889-660/															
# Date	5/1/13	66:37														

LDC#: 299 32 5 / VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:	of/
Reviewer:	F
2nd Reviewer:	1/~

METHOD: GC/MS VOA (EPA Method 524.2)
Y N NA Were field duplicate pairs identified in this SDG?

Were target analytes detected in the field duplicate pairs?

	Concentra	ation (ug/L)	
Compound	2	7	RPD
К	0.73	0.78	7
I	0.27	0.29	7
н	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

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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:

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- J Indicates an estimated value.
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- 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	
-	_

VALIDATION COMPLETENESS WORKSHEET

SDG #: 1309146

Laboratory: BC Laboratories, Inc.

Level III

2nd Reviewer

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

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

			T
	Validation Area		Comments
l.	Technical holding times	Δ	Sampling dates: 5/3//3
11.	GC/MS Instrument performance check	Δ	, ,
111.	Initial calibration	A	12
IV.	Continuing calibration/ICV	Ą	ICY/CCV EDS
V.	Blanks	Д	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	\sim	client specified
VIII.	Laboratory control samples	А	LC>
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	Δ	
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	\mathcal{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:

	wac					
1	MVV-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:

	Concent		
Analyte	MW-6	DUP-7-2Q13	RPD
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

	Concer		
Analyte	MW-1	DUP-8-2Q13	RPD
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	А
1309146	MW-16	Iron	26U ug/L	A
1309146	MW-10	Iron	32U ug/L	Α
1309146	MW-5	Iron	16U ug/L	Α
1309146	DUP-7-2Q13	Iron	37U ug/L	Ą
1309146	DUP-8-2Q13	Iron	7.5U ug/L	А

LDC #:	29932E4	
SDC #-	1200146	

VALIDATION COMPLETENESS WORKSHEET

SDG #:_	1309146
Laborato	rv: BC Laboratories, Inc.

Level III

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
l.	Technical holding times	A	Sampling dates: 5/3/13
II.	ICP/MS Tune	A	, ,
III.	Calibration	A	
IV.	Blanks	8W	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	MYD
VII.	Duplicate Sample Analysis	A	ap
VIII.	Laboratory Control Samples (LCS)	A	LCS
IX.	Internal Standard (ICP-MS)	N	Notreviewed
Χ.	Furnace Atomic Absorption QC	N	
XI.	ICP Serial Dilution	N	No+performes)
XII.	Sample Result Verification	N	•
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SU	(1,6)(2,7)
ΧV	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:



1	MVV-6	11	21	31	
2	MW-1	12	22	32	
3	MW-16	13	 23	33	
4	MW-10	14	24	34	
2 3 4 5 6 7	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 #: 09932E4

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

_	1 1
Page:_	ot
Reviewer:	<u> </u>
2nd reviewer:	<u> </u>

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-7		Al, Sh, 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-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, 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,
	il	Al, 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,
	- 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,
		Al, 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,
	ii ii	Al, 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,
	ll II	Al, 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,
	li li	Al, 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,
	į į	Al, 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,
	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,
	- · · · · · · · · · · · · · · · · · · ·	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	EI .	Al, Sb(As, Ba, Be, Cd, Ca,Ci, Co, Cu, Fe, b),Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
GEAA		Al Sh As Ba Re Cd Ca Cr Co Cu Fe Ph 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 METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)

Soil preparation factor applied: NA Associated Samples:

Page: of A Reviewer: A 2nd Reviewer:

Sample (Soncentration	on units, un	Sample Concentration units, unless otherwise noted:	i 1	ng/L	Associated Samples:	11	All				
Analyte	Maximum PB ^a (mg/Kg)	Maximum PB ^a (ug/l)	Maximum ICB/CCB ^a (mg/l.)	Action Level	2	က	4	5	9	2		
Fe		10.209		51.045	8.2	26	32	16	37	7.5		
Y		0.26526 mg/L		1.3263								
Sample (Soncentratic	on units, un	Sample Concentration units, unless otherwise noted:	ise noted:	ng/L	Associated Samples:	Samples: 1,	2				
Analyte	Maximum PB ^a (mg/Kg)	Maximum PB ^a (mg/l)	Maximum ICB/CCB ^a (mg/L)	Action Level	2		·					
Fе			0.011358	56.79	See PB				,			
Na			0.21456	1.0728								
쏘			0.37037	1.85185								
Sample (Soncentration	on units, un	Sample Concentration units, unless otherwise noted:		ug/L	Associated Samples:	Samples: 3-7	.7.				
Analyte	Maximum PB ^a (mg/Kg)	Maximum PB ^a (mg/l)	Maximum ICB/CCB [®] (mg/l.)	Action Level	ε	4	5	9				
Ге			0.0077539	38.7695	See PB	See PB	See PB	See PB	See PB			
쏘			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: _of _ Reviewer: _\cdot_ nd Reviewer: __

METHOD: Metals (EPA Method 6010B/7000)

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

	Concentra	ation (ug/L)	
Analyte	2	7	RPD
Arsenic	1.4	1.1	24
Calcium (mg/L)	55	55	0
Iron	8.2	7.5	9
Magnesium (mg/L)	17	17	0
Polassium (mg/L)	28	28	0
Godium (mg/L)	3.6	3.1	15

\\LDCFILESERVER\\Validation\FIELD DUPLICATES\FD_inorganic\29932E4.wpd

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	рН	6 days	48 hours	J (all detects) UJ (all non-detects)	Р

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:

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

	Conce		
Analyte	MW-6	DUP-7-2Q13	RPD
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

	Concentration		
Analyte	MW-1	DUP-8-2Q13	RPD
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	pН	J (all detects) UJ (all non-detects)	Р	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	А
1309146	DUP-7-2Q13	Hexavalent Chromium	0.0014U mg/L	Α

LDC #: 29932E6	
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VALIDATION COMPLETENESS WORKSHEET

Level III

SDG #:	13091	46	
Lahorator	V RC	Laboratories	Inc

Laboratory: BC Laboratories, Inc.

Reviewer: 2nd Reviewer:

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: 513/13
	Initial calibration	A	
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	P	ms/0
VI.	Duplicates	A	DQ
VII.	Laboratory control samples	A	LCS
VIII.	Sample result verification	Ņ	
IX.	Overall assessment of data	A	
X.	Field duplicates	SW	(1,6)(2,7)
x_	Field blanks	\sim	

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:

maren

	W * *				 	- <u> </u>
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 #: 0,99766

VALIDATION FINDINGS WORKSHEET Sample Specific Analysis Reference

Page:	<u>1_of1_</u>
Reviewer:	CR
2nd reviewer:	: 1~

All circled methods are applicable to each sample.

Sample ID	Parameter
17	PH (TDS)C) F (NO) (SO) O-PO, (Alk)CN NH3 TKN TOO (C16+) CIO,
3	pH TDS CI F NO ₃ NO ₂ SO O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
66.8.9	pH TDS CI F NO3 (NO) SO (O-PO) AIK CN NH3 TKN TOO (Cr6+) (CIO)
[0	ph tds ci f No ₃ (No ₂) so (O-PO) Aik CN NH ₃ TKN TOC (Cr6+)ClO ₄
11,12	pH TDS (C) F (NO.) NO. (SO4)O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
(5)	pH TDS (C) F (NO) NO2 (SO4)O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
. :	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
.,	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
	ph TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	ph TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO ₂ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₂ TKN TOC Cr6+ ClO ₄

Comments:	 	 	

LDC#: <u>199</u>3266

VALIDATION FINDINGS WORKSHEET Technical Holding Times

Page:_	<u>l_of_l</u>	
Reviewer:_	ar_	
2nd reviewer:		

All circled dates have exceeded the technical holding time.

Y N N/A Were all samples preserved as applicable to each method?

N N/A Were all cooler temperatures within validation criteria?

N N/A Were all coole	r temperatures	within validation	criteria?				
Method:		150.1					
Parameters:		pH					
Technical holding tin	ne:	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)				JUJP
			07				, ,
					" '		

				·			
					·		

LDC #: 29932E6

VALIDATION FINDINGS WORKSHEET Blanks

Page: of / Reviewer: 5

METHOD:Inorganics, Method See Cover

Conc. units:	s: mg/L			Associated Samples: All
Analyte	Blank ID	Blank ID	Blank	
	PB	ICB/CCB (mg/L)	Action Limit	No Qualifiers
IJ	0.171	0.175	0.875	
Conc. units:	s: mg/L	_		Associated Samples: 1-5
Analyte	Blank ID	Blank ID	Blank	
	PB	ICB/CCB (mg/L)	Action Limit	nin 1
Cr6+		0.000718	0.00359	0.0016
Conc. units:	s: mg/L			Associated Samples: 6, 7
Analyte	Blank ID	Blank ID	Blank	
Page 1	PB	ICB/CCB (mg/L)	Action Limit	nit 6
Cr6+		0.000729	0.003645	5 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#<u>29932E6</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: of Reviewer: 2nd Reviewer:

Inorganics: Method See Cover

Analyte	Concentration (mg/L)		
	1	6	RPD
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
Bica boute Alkeli wify	240	240	a a

Bill volue of Alkeli wity	ντ ⁰		<u> </u>
Analyte	Concentration (mg/L)		RPD
	2	7	RPD
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.

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Web www.lab-data.com

Fax 760.634.0439

July 1, 2013

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

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

29948ST.wpd

Attachment 1

1 WEEK TAT

90/10 (client select)							Ď.	LDC #2994		8 (E	Satte		Sar	8 (Battelle-San Diego / NASA JPL	obe	Z	AS/	H)	(T)		H			-				_			7,77
(3) 1,4- DATE DATE VOA DIOXane SDG# REC'D DUE (524.2) (8270C)	(3) DATE VOA DUE (524.2)	VOA (524.2)			.,4 .70	ē ∵ i		Metals (200.8/ 200.7)	AIK (2320B)		CI, SO ₄ NO ₃ -N (300.0)		NO ₂ -N (353.2)		0-PO ₄ (365.1)	CLO ₄ (314.0)		Cr(VI) (7196)		TDS (160.1)		pH (150.1)									
Matrix: Water/Soil W S W S	s w	s w	s w	8	\vdash		Μ	S	8	۱s	S M	8	S	≯	S	8	S	3	S	s M	∧	S	Α	S	3	N S	S A	≥	S	3	S
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1308753 06/24/13 07/01/13 11 00 0 11	07/01/13 11 0 0 0	07/01/13 11 0 0 0	0 0 0	0 0	0			0	- Ta	0	1 0		0	0	0	Ţ	0	Υ	0	1 0		0	ed Svins			-	_				
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1308660 06/24/13 07/01/13 23 0 28	07/01/13 28 80	07/01/13 28 80	0	1		2		0	2	0	2 0	2	.0	(2)((2))		2	0	2	→ 0.	-20	数	0	(5)4/30/di			\dashv	\dashv	_			
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Total A/LR 32 0 1 0 33	0 1 0	0 1 0	0 1 0	1 0	0	33		0	56	0	36 0	32	0	4	0	32	0	36	0	27 0	56	0	0	0	0	0 0	0	0	0	0	285
							1		i		: 																				

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 (r²) 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)	Р
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)	Р

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:

	Concent	ration (ug/L)	
Compound	MW-12-2	DUP-4-2Q13	RPD
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)	Р	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)	Р	Continuing calibration (%D)

NASA JPL

Volatiles - Laboratory Blank Data Qualification Summary - SDG 1308753

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 29948A1 SDG #: 1308753

Level III/IV

Date: 6 /2	4//.
Page: /_of_/	
Reviewer:	_
2nd Reviewer:	

Laboratory: BC Laboratories, Inc.

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
l.	Technical holding times	A	Sampling dates: 4/30/13
11.	GC/MS Instrument performance check	Δ	
III.	Initial calibration	A	% RSD = 20, 12
IV.	Continuing calibration/ICV	SW	101/cor = 30
V.	Blanks	Δ	,
VI.	Surrogate spikes	Δ	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	Les
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	Δ	
XI.	Target compound identification	Δ	Not reviewed for Level III validation.
XII.	Compound quantitation/RL/LOQ/LODs	Δ	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	Ą	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	Δ	
XVI.	Field duplicates	ىسى	D= 6+/3
XVII.	Field blanks	ND	TB=1 $EB=2$

Note: A = Acceptable

N = Not provided/applicable

ND = No compounds detected

D = Duplicate TB = Trip blank

SW = See worksheet

R = Rinsate FB = Field blank

EB = Equipment blank

Validated Samples:** Indicates sample underwent Level IV validation

	water			
1 3	TB-7-43013	11 2 MW-24-2	21 / BW E0042	31
2 3	EB-7-43013	12 3 MW-24-1	22 1 BWE 00 43	32
3 3	MW-12-5	13 7 DUP-4-2Q13 D	23 3 1305677-6432	33
4	MW-12-4	14 / MW-12-4MS	24	34
5 3	MW-12-3	15 MW-12-4MSD	25	35
6 3	MW-12-2 <i>D</i>	16 7 MW-24-2MS	26	36
7 3	MW-12-1	17 2 MW-24-2MSD	27	37
83	MW-24-5**	18	28	38
9 3	MW-24-4	19	29	39
10 3	MW-24-3	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.				45.63
II. GC/MS Instrument performance check	I		i I	
Were the BFB performance results reviewed and found to be within the specified criteria?	/			
Were all samples analyzed within the 12 hour clock criteria?				Pro Stall September Continues in the Continues
ill. Initial calibration	ı	· · · · · ·		
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#: 29948 A

VALIDATION FINDINGS CHECKLIST

Page:of_2	_
Reviewer: FT	
2nd Reviewer:	7

Validation Area	Yes	No	NA	Findings/Comments
IX Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?	<u> </u>			
Were the performance evaluation (PE) samples within the acceptance limits?				A Company of the Comp
X. Internal standards				
Were internal standard area counts within +/-40% from the associated calibration standard?	/		1	1 57
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 \pm 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	ı			
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.		r		
Target compounds were detected in the field duplicates.				
XVII. Field blanks		999		
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. isopropyi 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	000. 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
1. 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. lodomethane
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	рррр.
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	2000 .
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	ບບບບ.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	ww.

LDC#: 09984A

VALIDATION FINDINGS WORKSHEET

Page: __of_

Continuing Calibration

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".

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%?

	<u> </u>		-	T	$\overline{}$	1	1 1		l l	Ι.	<u> </u>								
Qualifications	d/ [n/[9/ 5n/5											
Associated Samples	BWEDOY2 -MB	1 14 15						BWE BOUS-MB,	1305277-482	143,54/3	• 1								
Finding %D (Limit: <30.0%)	39.4							5-12 2-69 1											
Compound	B	, details,						Pentachlomethan											
Standard ID	130527-601							1305077-aev#											
# Date	5////3		10 th com.					5/1/13											
					\perp		<u> </u>					 							

LDC# 29948A /

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

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

METHOD: GC/MS VOA (EPA Method 524.2)

Υ_	Ŋ	N/A
Y	N	N/A

Were field duplicate pairs identified in this SDG?

Were target compounds detected in the field duplicate pairs?

	Concentration	n, ug/L,	
Compound	6	/3	RPD
KK	0.134	0.17	200

	Concentratio	n ()	
Compound			RPD
		·	
	*		

	Concentratio	n ()	
Compound			RPD
			-

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Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

Reviewer: FT Page: 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:

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

 $A_{\rm ls}$ = Area of associated internal standard $C_{\rm ls}$ = Concentration of internal standard

RRF = $(A_u)(C_u)/(A_u)(C_x)$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

					Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
		Ē			0000	0000	Average DDE	Average RRE		
#	Standard ID	Calibration	Compound (Reference Internal St	erence Internal Standard)	(std)	(std)	(initial)		%RSD	%RSD
	1641	4/18/13	Acetone	(1st Internal Standard)	3.05 0.0 0x 21502	0.030SC	2.805742Ki	0.028057	4-179303	7.107
			Methyl Meta	(20) (40) (20) (20) (20)	7.61857 x10 0.07668		7.123,823,x10 0.07123,8		4.473303	4.473
		,	pen factions	Pen Fach broe thank (8)	0.55 143 5B		0.55145 0.5447112	1 2442.0	5.854311	5.854
2	1 CAL	81/81/1	9		0.9033516	2.90335		0.86864	10.66688	10.667
			9	_	50/24260	8031088.0 13436 0.3301203			4.712199	4.7/22
			EE	(3rd Internal Standard)	1.887303	1.88730	1.88730 1.92 5438	1.92.84	6.2 33496	6.233
က				(1st Internal Standard)		1.			-	
				(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#. 29948A /

Continuing Calibration Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer: FT Page:

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 = $(A_{\lambda})(C_{\rm b})/(A_{\rm b})(C_{\lambda})$

Where: ave. RRF = initial calibration average RRF RRF = continuing calibration RRF $A_x = Area$ of compound, $A_s = Area$ of $C_x = Concentration$ of compound, $C_s = Concentration$

 $A_{\rm ls}$ = Area of associated internal standard $C_{\rm ls}$ = Concentration of internal standard

						Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Re	Compound (Reference internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	Q%	Q%
_	eev	5/01/13	Autone	(1st Internal Standard)	2.805 742 XID	1.87982X	0.0	e	2.6
			methy / N		7.123823x10	0/x +18662.7	8661200	2.5	15.4
			Pentachk	Pentachlerethane (3rd Internal Standard)	D.5447112		0.15647	7/-5	7/.3
2			6		0.86 408 1.02 4996	1.024996	1.024996	N.O	18:0
			8	(2nd Internal Standard)	8.3301203	0.345/657	CS 71578 0	7.6	97
			EĒ	(3rd Internal Standard)	1.925438 1.826/53	1.88/153	1-844153	1.9	1.9
က				(1st Internal Standard)					
				(2nd Internal Standard)					
				(3rd Internal Standard)					
4				(1st Internal Standard)					
				(2nd Internal Standard)					
-				(3rd Internal Standard)					

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. Comments:

LDC# 279 484/

Matrix Spike/Matrix Spike Duplicates Results Verification VALIDATION FINDINGS WORKSHEET

Page: __of_ Reviewer:__ 2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 524.2)

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

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

SSC = Spiked sample concentration SA = Spike added

Where:

MSDC = Matrix spike duplicate concentration

SC = Sample concentration

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

MSC = Matrix spike concentration

MS/MSD sample:

	Spi	ke	Sample	Spiked Sample	ample <u> </u>	Matrix Spike	Spike	Matrix Spike Duplicate	Duplicate	MS	MS/MSD
Compound	Added (May/		Concentration	Concentration	ation 2	Percent Recovery	PCOVerv	Percent Recovery	VIOVOC		RPD
			9/5		,		(:::::::		financia		
	MS	MSD		MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
>	8.0	25.0	ON	189.72 082.8c	C89.72	115	3/	201	101	72.7	72.7
Coo	X.0	_	_	Op7.45 011.25	24.740	701	101	99.0	99	5.39	5.39
ac	x. O		-3	US30 0712	26.530	2//	011	901	901	3.55	(8/8)
S	й.O	7	CR1.0	25.300 18.850	V8.85	101	hal	601	69/	1.73	7.73
Н	ンジン	K.C	dΝ	18.20 74 F7	26.190	€//	113	701	701	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# 29948A

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

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Page.	Reviewer:	2nd Raviawer

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

SSC = Spiked sample concentration SA = Spike added Where:

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

BWEOUGH - LES LCS ID:

	is is	ike	Spiked S	ample	SOI	S	I CSD	Q	I CS/	I CS/I CSD
Compound	Adde	Added Ug/L)	Concentration (Leg./L)	tration	Percent Recovery	ecovery	Percent Recovery	ecovery	R	RPD
	O SOT	LCSD	D SDT	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated _
1,1-Dichloroethene	2.0	Αď	C 20.72	ΑN	<i>Rol</i>	801				
Trichloroethene		•	26.930		801	801				
Benzene			27710		///	111				
Toluene			091.76	_	60	601				
Chlorobenzene	1	1	24.730	1	6.86	2%	45			

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#: 29948A)

VALIDATION FINDINGS WORKSHEET Surrogate Results Verification

Page:_	of_	
Reviewer:	FT	
2nd reviewer:	_v~	

METHOD: GC/MS VOA (EPA Method 524.2)

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

% Recovery: SF/SS * 100

Where: SF = Surrogate Found

SS = Surrogate Spiked

Sample ID: # ¥

	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
			Reported	Recalculated	
Toluene-d8	10.0	10.330	/03	103	0
Bromofluorobenzene	/	8.64	86.4	86.4	1
1,2-Dichlorobenzene-d4	J	10.870	109	909	
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					

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	of	
Reviewer:	FT	
2nd reviewer:	1/-	

MS VOA (EPA Method 524.2)
Were all reported results recalculated and verified for all level IV samples?
Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

\sim			
Concent	ration	=	Example:
A _x	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D:
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	
Is	=	Amount of internal standard added in nanograms (ng)	Conc. = () () () ()
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.	<i>/ ''</i>
%S	=	Percent solids, applicable to soils and solid matrices	

<u> </u>	only.				
#_	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

Labora MET H	t: 1308753 htory: <u>BC Laboratories, Inc.</u>		Level III Page:/of
METH	atory. BC Laboratories, Inc.		Davierram:
			Reviewer:2nd Reviewer:
There	OD: GC/MS 1,4-Dioxane (EPA SW 846 N	Method 82	270C/SHM)
		ch of the t	ollowing validation areas. Validation findings are noted in attache
validat	ion findings worksheets.		
	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 4/30//3
11.	GC/MS Instrument performance check	A	/
111.	Initial calibration	A	1
IV.	Continuing calibration/ICV	A	10V/CCV = 25
V.	Blanks	Δ	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	\sim	client specified
VIII.	Laboratory control samples	Α	ics /
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	
II ''''			

SW = See worksheet

EB = Equipment blank

Validated Samples:

	<u> </u>						
1 2 3 4 5	MVV-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 8		17		27		37	
8		18		28		38	
9		19		29		39	
9		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:

·	Conce		
Analyte	MW-12-2 DUP-4-2Q13		RPD
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	Α
1308753	MW-12-5	Iron	27U ug/L	А
1308753	MW-12-4	Iron	17U ug/L	А
1308753	MW-24-5**	Iron Lead	57U ug/L 0.14U ug/L	Α
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	А

LDC #: 29948A4

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

SDG #: 1308753 Laboratory: BC Laboratories, Inc.

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: 4/30/73
II.	ICP/MS Tune	Þ	, , =
III.	Calibration	A	
IV.	Blanks	SW	
V.	ICP Interference Check Sample (ICS) Analysis	A	
VI.	Matrix Spike Analysis	A	mslo
VII.	Duplicate Sample Analysis	A	Qo
VIII.	Laboratory Control Samples (LCS)	A	LCS.
IX.	Internal Standard (ICP-MS)	A	Not reviewed for level.
X.	Furnace Atomic Absorption QC	N	
XI.	ICP Serial Dilution	$ \mathcal{N} $	
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	SW,	(S,1Z)
XV	Field Blanks	50	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

	Wax	<u>~_</u>			
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:	 	 	

D994894

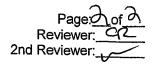
VALIDATION FINDINGS CHECKLIST

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

Yes	No	NA	Findings/Comments
			
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LDC#: 2994899

VALIDATION FINDINGS CHECKLIST



Validation Area	Yes	No	NA	Findings/Comments
VIII. Furnace Atomic Absorption QC	l	<u> </u>	<u> </u>	
If MSA was performed, was the correlation coefficients > 0.995?			1	
Do all applicable analysies have duplicate injections? (Level IV only)			5	
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.	7			
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.	1			
Target analytes were detected in the field blanks.	7			

LDC #: 2994694

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page:	l of l
Reviewer:	02
2nd reviewer:	\sim

All circled elements are applicable to each sample.

CP-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,			
Al, Sb, AS, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, V, Zn, Mo, B, Sn, Ti, Al, Sb, AS, Ba, Be, Cd, Ca, Cr,	Sample ID	Matriy	Target Analyte Liet (TAL)
Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, V, Zn, Mo, B, Sn, Ti, Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg,		IMALIA	
Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, 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, Ti, V, Zn, Mo, B, Sn, Ti, Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg,	1,19		
AI, Sb(A), Ba, Be, Cd(C), Co, Cd, Fa, Fb(M), Mn, Hg, NI(K), Se, Ad, Na, TI, V, Zn, Mo, B, Sn, TI, AI, Sb(A), Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, NI, K, Se, Ag, Na, TI, V, Zn, Mo, B, Sn, TI, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu,			Al, 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,
AI, Sb, (Sc) Ba, Be, Cd, (Ca) Cc), Co, Cu, (Fe) Pb, (Mg), Mn, Hg, Ni, (K), Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Ti, V, Zn, Mo, B, Sn, Ti, AI, Sb, As, Ba, Be, Cd,			Al, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, 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, TI, V, Zn, Mo, B, Sn, Ti, Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg,	QC13-15		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Co, Fe, Pb, Mg, Mn, Hg, Ni K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
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SEAA L JALSE As Ba Be Cd Ca Cr Co Cu Fe Ph Mg Mg Hg Ni K Se Ag Na TI V 7n Mg B Sp Ti	GFAA	1	Al Sh As Ba Be Cd Ca Cr Co Cu Fe Ph Mg Mn Hg Ni K Se Ag Na Tl V 7n Mo B Sn Ti

ELEMENTS.wpd

Comments: Mercury by CVAA if performed

LDC #: 29948A4

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000)

VALIDATION FINDINGS WORKSHEET PB/ICB/CCB QUALIFIED SAMPLES

Soil preparation factor applied: NA Associated Samples: 1-5 Associated Samples:

Page: of Reviewer: Other

Sample	Sample Concentration units, unless otherwise noted: ug/L	n units, un	less otherwi	ise noted:	ug/L	Associated	Associated Samples: 1-5	
Analyte	Maximum PB ^a (mg/Kg)		Maximum Maximum PB* ICB/CCB* (ug/L) (mg/L)	Action Level	-	2	т	
Fe			0.0085209 42.6045	42.6045	8.0	27	17	
Sample	Sample Concentration units, unless otherwise noted: ug/L	on units, un	less otherwi	ise noted:	ng/L	Associated Samples:	Samples: 6-12	12
Analyte	Maximum PB ^a (mg/Kg)	Maximum PB ^a (ug/L)	Maximum Maximum PB ^a ICB/CCB ^a (ug/L) (mg/L)	Action Level	7	ω	თ	10
Fe			0.011822	59.11	25	25	28	51
Sample	Sample Concentration units, unless otherwise noted: ug/L	on units, un	less otherwi	ise noted:	ug/L	Associated	Associated Samples: All	

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.

0.14

0.725

0.145 (ng/L)

В

Action Level

Maximum ICB/CCB^a

Maximum PB^a (ug/L)

Maximum PB^a (mg/Kg)

Analyte

LDC#: 29948A4

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Page: of ______
Reviewer: ______
2nd Reviewer: _____

METHOD: Metals (EPA Method 6010B/7000)

	Concentra	ation (ug/L)	BBD
Analyte	5	12	RPD
Arsenic	0.75	_{0.70} Ü	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

\\LDCFILESERVER\Validation\FIELD

DUPLICATES\FD_inorganic\29948A4.wpd

LDC#: 29946AY

VALIDATION FINDINGS WORKSHEET Field Blanks

Page:_	of_/
Reviewer:_	or
2nd reviewer:_	

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

Y N N/A Y N N/A	Were field blanks identified in this SDG? Were target analytes detected in the field blanks?	
	Field Blank / Trip Blank / Rinsate / Other(circle of	nne)
	Analyte	Concentration Units (MQ)
	FE	8.0
	Ca (ma/L)	0.018

Sample:	Field Blank / Trip Blank / Rinsate / Other (circle	e one)
	∆nalyte	Concentration Units (
l		

LDC# SAPAS

Initial and Continuing Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

Page: 1 of 1 2nd Reviewer. 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 <u>measured</u> in the analysis of the ICV or CCV solution True = concentration (in ug/L) of each analyte in the $\overline{\text{ICV}}$ or CCV source

					Recalculated	Reported	
Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	%R	%R	Acceptable (Y/N)
1CC	ICP (Initial calibration)	B Ca	21.108	90	707	וסר	<u>۲</u>
TON	ICP/MS (Initial calibration)	CC	100,003	90	701	(0)	
	CVAA (Initial calibration)						
RNJ	VO (Continuing calibration)	Fe	20.02	Co.178 50	8	()01	
CCV7	CV7 ICP/MS (Continuing calibration)	AS	0.89	100	96	86	\
	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# CANCOLD

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

Page: Reviewer. 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 = Found x 100 True

Where, Found = Concentration of each analyte <u>measured</u> 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:

 $RPD \approx |S-D| \times 100$ (S+D)/2

S = Original sample concentration D = Duplicate sample concentration Where,

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

%D = [I-SDR] × 100

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

	Acceptable (Y/N)) -)	
Reported	%R/RPD/%D	٦,96	105	9hb	3,11	
Recalculated	%R/RPD/%D	7.96	901	976	3.11	
	True / D / SDR (units)	500	1000	100	1,677	
	Found / S / I (units)	20184	1.683.1	001 (SS9-SHOW) GOD	1,73	
	Element	g	te	Co	RS	
	Type of Analysis	ICP interference check	Laboratory control sample	Matrix spike	Duplicate	ICP serial dilution
	Sample ID	ISAB	537	57	5	\geq

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#: 29948AU

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	of_
Reviewer:_	OR_
2nd reviewer:	101

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

Please Y N N Y N N Y N N	see qua <u>I/A</u> I/A I/A	Have results been reported and	d calculated correctly? I range of the instruments	able questions are identified as "N/A". and within the linear range of the ICP?
Detecte equatio		te results for	As	were recalculated and verified using the following
Concentr	ation =	(RD)(FV)(Dil) (In. Vol.)	Recalculation:	
RD FV In. Vol. Dil	= = =	Raw data concentration Final volume (ml) Initial volume (ml) or weight (G) Dilution factor	Raw pera =	2.416 ugl

#	Sample ID	Analyte	Reported Concentration	Calculated Concentration	Acceptable (Y/N)
	7	FE	57	57	Ų
		As	24	2.4	
		C	2.3	2.3	
		Pb	0.14	0,14	
		Calngli	32	32	
		mg	9,9	9,9	
		Ng.	41	41	
		KJ	1,9	1,0	
				· · · · · · · · · · · · · · · · · · ·	
$\overline{}$			***************************************		
_					

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-24-1MSD MW-24-1DUP

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

^{**}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	рН	3 days	48 hours	J (all detects) UJ (all non-detects)	Р

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	0.28 mg/L	0.28U mg/L
	Chloride	0.24 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:

	Conce		
Analyte	MW-12-2	DUP-4-2Q13	RPD
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-24-3 MW-24-1 DUP-4-2Q13	рН	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	Α

LDC #: 29948A6

SDG #: 1308753

VALIDATION COMPLETENESS WORKSHEET

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Page: of Pag

Laboratory: BC Laboratories, Inc.

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
l.	Technical holding times	BW	Sampling dates: 4/30/13
li	Initial calibration	A	. /
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	m5/0
VI.	Duplicates	A	0.6
VII.	Laboratory control samples	A	155
VIII.	Sample result verification	A	Not reviewed for Level III validation.
IX.	Overall assessment of data	A	
X.	Field duplicates	SW.	(5,12)
xı	Field blanks	SW	EB=1

Note:

A = Acceptable

ND = No compounds detected

D = Duplicate

N = Not provided/applicable SW = See worksheet R = Rinsate FB = Field blank TB = Trip blank
EB = Equipment blank

Validated Samples:** Indicates sample underwent Level IV validation

	war	18.40180					
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#: 09948AS

VALIDATION FINDINGS CHECKLIST

Page: \(\frac{1}{2} \) of \(\frac{1}{2} \)
Reviewer: \(\frac{1}{2} \)

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times		h		
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) \leq 20% for waters and \leq 35% for soil samples? A control limit of \leq CRDL(\leq 2X CRDL for soil) was used for samples that were \leq 5X the CRDL, including when only one of the duplicate sample values were \leq 5X the CRDL.				
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?				
Was an LCS analyzed per extraction batch?	1			
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 FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: 2 2nd Reviewer: 2

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#: OrangAl

VALIDATION FINDINGS WORKSHEET Sample Specific Analysis Reference

Page:	<u>1_of_</u>	_1_
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All circled methods are applicable to each sample.

Sample ID	Damanatan
1-17	Parameter PH) TDS (CI) F (NO) (NO) (SO) O-PO (AIK) CN NH3 TKN TO (Cr6+(CIO))
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
QC 13,14	pH TDS(CI) F (FO) NO, (SO4)O-PO4 AIK CN NH3 TKN TOC(CT8+ CIO4
15	PH (TDS) F (NO) (NO) (SO) O-PO4 AIK CN NH3 TKN TOC (C16) (C104)
16	PH) TDS CI F NO3 NO2 SO4 O-PO4 (AIK) CN NH3 TKN TOC Cr6+ CIO4
17,18	PH TDS (CI) F (NO) NO (SO4 O-PO4 AIK CN NH3 TKN TOC (CT6) CIO4
19	PH (DS)C) F NO, NO, SO40-PO4 AIK CN NH3 TKN TOC CTO (CIÓ4)
70,21	PH TDS CI F NO3 NO2 SO4O-PO) AIK CN NH3 TKN TOC Cr6+ CIO4
22	pH TDS CI F NO3 NO2 SO O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
' I	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
ľ	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
1	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
İ	pH TDS CLF NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
1	pH TDS CLF NO. NO. SO. O. PO. Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO. NO. SO. O. PO. Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH_TDS_CL_F_NO ₂ _NO ₂ _SO ₄ _O-PO ₄ _Alk_CN_NH ₂ _TKN_TOC_Cr6+_ClO ₄

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Comments:__

LDC #: 29948A6

VALIDATION FINDINGS WORKSHEET Technical Holding Times

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All circled dates have exceeded the technical holding time.

N N/A Were all samples preserved as applicable to each method?

N N/A Were all cooler temperatures within validation criteria? 150.1 Method: Parameters: Technical holding time: Sampling Analysis **Analysis Analysis Analysis Analysis** date date Sample ID date date date Qualifier

LDC #: 29932A6

VALIDATION FINDINGS WORKSHEET Blanks

Page: Of Reviewer: 2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units:	Blank ID PB	Blank ID ICB/CCB (mg/L)	Blank Action Limit	-	Associated Samples:	amples: All	
SO4		0.297	1.485	0.28			
Conc. units:	Blank ID	Blank ID	Blank		Associated Samples:	amples; 1-5	
	PB	ICB/CCB (mg/L)	Action Limit	-			
Ö		0.128	0.64	0.24			
Conc. units:	: mg/L				Associated Samples:	amples: 6-10	
Analyte	Blank ID	Blank ID	Blank				
	PB	ICB/CCB (mg/L)	Action Limit	No Qualifiers			
ū		0.15300	0.765				
Conc. units:	s: mg/L				Associated Samples:	amples: 11,12	
Analyte	Blan	Blank ID	Blank				
	PB	ICB/CCB (mg/L)	Action Limit	No Qualifiers			
CI		0.159	0.795				
Conc. units	s: mg/L			,	Associated Samples:	amples: 11	
Analyte	B	Blank ID	Blank				
	PB	ICB/CCB (mg/L)	Action Limit	No Qualifiers			
оРО4-Р		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#<u>29948A6</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:__of__ Reviewer:__**O** 2nd Reviewer:__**O**

Inorganics: Method See Cover

	Concentra	tion (mg/L)	
Analyte	5	12	RPD
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 #: <u>29</u> SDG #:	VALIDATION FINDINGS WORKSHEET Field Blanks	Page:of Reviewer: 2nd reviewer:
N N/A	were field blanks identified in this SDG? Were target anlytes detected in the field blanks? Field Blank / Trip Blank / Rinsate (circle one))
	CIC	Concentration Units (M9/4 5.74),24),28
	Analyte	Concentration Units ()

LDC# ONCHUSAS

Validation Findings Worksheet Initial and Continuing Calibration Calculation Verification

Page: of Reviewer: OL

Method: Inorganics, Method See cover

_ was recalculated.Calibration date: $\sim 1/20/15$ The correlation coefficient (r) for the calibration of \overline{C} An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100

Where, Fo

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

					Recalculated	Reported	Acceptable
Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	r or r²	r or r²	(N/X)
Initial Calibration		0	0	0.000			
Verification		s1	0.5	0.055	0.99985	0.99571	
		s2	5	0.484			
	(53	20	2.021			>
	5	s4	50	6.086			•
		s5	100	13.425			_
		9s	200	29.276			
Calibration verification	Say	ICV	100	100 101,394	101	ı Qı	
Calibration verification	Clar	CCV	10	9888	L:38	PK, Y	
Calibration verification	NOZN	つ	0,5	0,4623	43.5	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 #: 2994818

VALIDATION FINDINGS WORKSHEET Level IV Recalculation Worksheet

Reviewer: 45

METHOD: Inorganics, Method Seconds

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

 $%R = Found \times 100$

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:

Where, RPD = $\frac{|S-D|}{(S+D)/2} \times 100$

S 0

Original sample concentration Duplicate sample concentration

					Recalculated	Reported	
	Type of Analysis	Element	Found / S (units)	True / D (units)	%R/RPD	%R / RPD	Acceptable (Y/N)
	Laboratory control sample	Á	(&,7)	001	101	יס ר)~ -
	Matrix spike sample	Ú	(SSR-SR)	50,505 103	1073	103	
	Duplicate sample	te	8.7	8,16	271.0	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 #: raquetto

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page: of Reviewer: 2nd reviewer:

METH	IOD: Inorganics, Metho	d See Cover			
YN	N/A Have results N/A Are results w	ow for all questions answered "N". Not appl been reported and calculated correctly? vithin the calibrated range of the instrument tion limits below the CRQL?		re identified as "N/	Ά".
	ound (analyte) results f ulated and verified usin	for ng the following equation:	rep	orted with a positi	ve detect were
Concen	tration =	Recalculation:			
= 0.00C	11x2+0.0799x-0.01	15 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	.0145) +6.079	92 -0,0799	-19099
		210,000	1)		
#	Sample ID	Analyte	Reported Concentration ()	Calculated Concentration	Acceptable (Y/N)
	7	pH (units)	8,27	827	Y
		T05	220	220	
		CI	8,4	8.4	
		NO3-N	1.1	ld	
ļ		504	19	19	
		Cot.	0,0028	8500.0	
		Bicalb	200	200	
		AIK	160	160	1
-					
					,

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)	Р
4/30/13 (19:27)	Pentachloroethane	85.4	All samples in SDG 1308660	J (all detects) UJ (all non-detects)	Р

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)	Р	Continuing calibration (%D)
1308660	MW-23-1	Trichloroethene	J (all detects)	А	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 VALIDATION COMPLETENESS WORKSHEET SDG #: 1308660 Level III/IV Laboratory: BC Laboratories, Inc.

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	Д	Sampling dates: 4/29/13
11.	GC/MS Instrument performance check	Δ	, ,
111.	Initial calibration	Д	% psD = 20, 12
IV.	Continuing calibration/ICV	SW	104/cov = 30
V.	Blanks	Д	
VI.	Surrogate spikes	4	
VII.	Matrix spike/Matrix spike duplicates	SW	
VIII.	Laboratory control samples	A	LLS
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	Δ	Not reviewed for Level III validation.
XII.	Compound quantitation/RL/LOQ/LODs	4	Not reviewed for Level III validation.
XIII.	Tentatively identified compounds (TICs)	Δ	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	NO	TB = 1 $SB = 2$ $FB = 3$

Note: A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate FB = Field blank

ı.

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	BW D 2362	31	
2	SB-3-42913	12	MVV-3-2	22		32	
3	EB-6-42913	13	MVV-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	

Page:		2
Reviewer:F	T	
2nd Reviewer:	<u> </u>	7

Method: Volatiles (EPA Method 524.2)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times			· ·	A) 1/4
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?				COMPLETE THE CONTROL OF THE CONTROL
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.			1	
M. Surrogate spikes				The state of the s
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				18 1 (4) 1 (
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?	7386	- /		
VIII. Laboratory control samples				(A)
Was an LCS analyzed for this SDG?				
Was an LCS analyzed per analytical batch?	<i></i>			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				

VALIDATION FINDINGS CHECKLIST

Pag	e:	<u> 20f</u>	2
Reviewer:			
2nd Review		10	_

Validation Area	Yes	No	NA	Findings/Comments
IX. Regional Quality Assurance and Quality Control				The state of the s
Were performance evaluation (PE) samples performed?				
Were the performance evaluation (PE) samples within the acceptance limits?			_	
X. Infernal 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?	سسا			
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	· · · · · ·			Section 1
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 \pm 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				100
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. CHOIOIHEAIRAINE	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. Propionitnile
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. lodomethane
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	рррр.
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	9999.
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	TITT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	ບບບບ.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	ww.

LDC# 29948B /

VALIDATION FINDINGS WORKSHEET Continuing Calibration

Reviewer:_ Page:_ 2nd Reviewer:_

METHOD: GC/MS VOA (EPA Method 524.2)

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

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

Were all percent differences (%D) < 30%?

Qualifications	d/ 5m/5	,, ,	1	0/1/1/	1			The state of the s								
Associated Samples	114															
Finding %D (Limit: <30.0%)	32.8			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	£ £											
Compound	P			Pento information	, , , , , , , , , , , , , , , , , , ,											4:
Standard ID	130506-6013			1200,000	20000											
	4/30/13	50:61,		4/30/13	19:27	,										
#																

LDC# 29948B/

VALIDATION FINDINGS WORKSHEET Matrix Spike/Matrix Spike Duplicates

Reviewer:_ 2nd Reviewer:_ Page:_

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" 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.

Was a MS/MSD analyzed every 20 samples of each matrix? Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

	ualifications	J/B det																								
QC limits?	Associated Samples	8														1			-		_			_		
es (RPD) within the	RPD (Limits)	(62) 4.02)	())	())	(((())	()))))	()	,)		())
/e percent differenc	MSD %R (Limits)	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	(
were the insulish percent recoveries (%K) and the relative percent differences (KPD) within the QC limits?	MS %R (Limits)	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	(
ercerit recoverie	Compound	S																								
VVere the MS/MSD p	MS/MSD ID	14 + 15														The second secon										
T (IN /IN/A	# Date																									

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VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

Page: / of / 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:

 $A_{\mathbf{x}}$ = Area of compound, $C_{\mathbf{x}}$ = 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

RRF = $(A_\nu)(C_s)/(A_s)(C_\nu)$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

					Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
#	Standard ID	Calibration Date	Compound (Reference Internal	erence Internal Standard)	RRF (std)	RRF (std)	Average RRF (initial)	Average RRF (initial)	%RSD	%RSD
_	ICAL	4/18/13	Acetone	(1st Internal Standard)	3.056215 OX 2123205	205 a.a	2.805742Ki	0.028057	7.107243	7.107
			Methyl Met	Methy/ Metacry/ate (40) (2014)	7.61857xio 0.07668		7.123823×10.0.07123B		4.473303	4.473
			Pentachbra	(3rd Internal Standard)	0.5×14358 0.55145		0.5447112		5.854311	5.854
2	1 CAL	81/81/1	G	(70) (1st Internal Standard)	0.9033516	2.90335	8043348.0 Sezas 0.80 x6408	0.86864	10.66688	10.667
		•	9	(2nd Internal Standard)		0.3343/		0.33012	4.712/99	4.7/22
			EE	(3rd Internal Standard)	1.887303		88/32 18.1 OEL 88.1	1.9254 6.233496	6.2 33496	6.233
~				(1st Internal Standard)		1				
		-		(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# 279 48B)

Continuing Calibration Results Verification VALIDATION FINDINGS WORKSHEET

\ \ \ \		1
Page:	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 = $(A_\nu)(C_b)/(A_b)(C_\nu)$

Where: ave. RRF = initial calibration average RRF RRF = continuing calibration RRF A_x = Area of compound, A_s = Area of C_x = Concentration of compound, C_s = Concen

 $A_{\rm ls}$ = Area of associated internal standard $C_{\rm ls}$ = Concentration of internal standard

						Reported	Recalculated	Reported	Recalculated
#	Standard ID	Calibration Date	Compound (Re	Compound (Reference internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0 %	0 %
-	Zm2	<1/oe/h	Autone	4/30/13 Authore (1st Internal Standard)	2.805 742 XD	2.805742 xD 2.874953410	6.028749	2-5	2-2
		-	methy 1 Mi	こ する と アグタ	7.123823XD	1.37426KX0	0.073783	3.6	3.6
			(Fentaunto	(3rd Internal Standard)	2.5447112		656100	45.4	45.4
2			C	(1st Internal Standard)	0.86 80 408			15.7	/57
			\$	(2nd Internal Standard)	0.330/203	4.340464	0.34046V	7.8	3.1
			EE	(3rd Internal Standard)	1.925438	1.925438 1.92304	1.7230V	0./	0.7
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#. 27948B)

VALIDATION FINDINGS WORKSHEET Matrix Spike/Matrix Spike Duplicates Results Verification

Page: of Seviewer: FT Sud Reviewer:

トン METHOD: GC/MS VOA (EPA SW 846 Method 8260) 52% 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 \$/5

	ďs	Spike	Sample	Spiked Sample	ample	Matrix Spike	Spike	Matrix Spike Duplicate	Duplicate	MS	MS/MSD
Compound	Ad N	Added, (μ2/4	Concentration (45 /L	Concentration (45/4)	74jon	Percent Recovery	ecovery	Percent Recovery	ecovery	E E	RPD
	MS	MSD	>) SM	MSD	Reported	Recalc.	Reported	Recalc	Reported	Recalcillated
1,1-Dichloroethene	<i>نجد</i>	25.0	CM	084.80	26.870	h11	h11	101	19		542
Trichloroethene		-	2.7800	34.110	34.110 27.800	18	135	00/	CA	20.4	8.5
Benzene			ov	VT.K	W.770 27.30	11.5	15	601	601	5.06	5.06
Toluene			l	ash.k	411 027.2 asy.x	114	111	201	10)	6.27	627
Chlorobenzene	->	À		76.90	201 St. 420 108	801	108	102	101	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

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

Page:of	Reviewer: FT	and Daviousor.
	Revi	אם היי

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

SSC = Spiked sample concentration SA = Spike added Where:

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

BW D2362 - LCS LCS ID:

	S	pike	Spiked S	ample	01	S	I GSD	d;	ISD I	CS/I CSD
Compound	Add (143 /	Addgd 49/L)	Concentration	ration +	Percent Recovery	Recovery	Percent Recovery	ecovery	. X	RPD
	C SOT	CSD	SOT	CSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	2.0	60	027.75	44	///	///				
Trichloroethene	•		CH1.82		1/3	1/3				
Benzene		_	N.00		611	///				
Toluene			J85.56		011	011				
Chlorobenzene	1	P	x. %0	3	101	hal	NAN			

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#: 27948B)

VALIDATION FINDINGS WORKSHEET **Surrogate Results Verification**

Page:_	_/ _{of_} /
Reviewer:F	-T
2nd reviewer:_	<u>n</u>

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	l	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 #: 29 94 8 /3)

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	<u>/</u> of_/	_
Reviewer:	FT	
2nd reviewer:	1~	

METHOD: GC/MS VOA (EPA Method 524.2)

Y N N/A

Y/N N/A

Were all reported results recalculated and verified for all level IV samples?

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

-			
Concer	ntration	$A_{ls} = \frac{(A_{ls})(I_{s})(DF)}{(A_{ls})(RRF)(V_{s})(\%S)}$	Example:
A _x	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D. #4, Styrene
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	
l _s	=	Amount of internal standard added in nanograms (ng)	Conc. = $(9653)(10)$
RRF	=	Relative response factor of the calibration standard.	117470 2.17311
V _o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).	= /,
Df	=	Dilution factor.	0.27 ug/L
%S	=	Percent solids, applicable to soils and solid matrices	· ·

#	Sample ID	Compound	Reported Concentration	Calculated Concentration	Qualification
	Campio is				1 Quanton
<u> </u>					
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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 Associate yte Concentration 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	
MVV-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	А
1308660	MW-3-2	Lead	0.12U ug/L	Α

LDC #: 29948B4

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

SDG #:_	1308660
Laborato	ry: BC Laboratories, Inc.

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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
l.	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	PT	ms/D
VII.	Duplicate Sample Analysis	À	Qo
VIII.	Laboratory Control Samples (LCS)	A	LÊS
IX.	Internal Standard (ICP-MS)	A	
X.	Furnace Atomic Absorption QC	\wedge	
XI.	ICP Serial Dilution	M	
XII.	Sample Result Verification	A	Not reviewed for Level III validation.
XIII.	Overall Assessment of Data	A	
XIV.	Field Duplicates	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
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

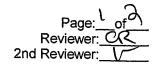
EB = Equipment blank

Validated Samples:** Indicates sample underwent Level IV validation

	water					
1	SB-3-42913	11	MVV-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	MVV-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	

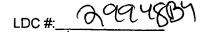
Notes:				

VALIDATION FINDINGS CHECKLIST

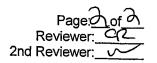


Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times	<u> </u>	<u>k </u>	L	0
All technical holding times were met.				
Cooler temperature criteria was met.		-		
II. ICP/MS Tune		<u> </u>	· · · · · · · · · · · · · · · · · · ·	
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) \leq 20% for waters and \leq 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were \leq 5X the RL, including when only one of the duplicate sample values were \leq 5X the RL.				
VII. Laboratory control samples	, <u>,</u>			
Was an LCS anayized 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 FINDINGS CHECKLIST



Validation Area	Yes	No	NA	Findings/Comments
VIII. Furnace Atomic Absorption QC			L	Findings/comments
If MSA was performed, was the correlation coefficients > 0.995?				r
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.	7			
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.				
Target analytes were detected in the field duplicates.				-
XV. Field blanks			<u></u>	
Field blanks were identified in this SDG.				
Target analytes were detected in the field blanks.	/			

LDC #: <u>A9948B</u>Y

VALIDATION FINDINGS WORKSHEET Sample Specific Element Reference

Page:	l of l
Reviewer:	02
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,
DC-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,
	- 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,
	il	Al, 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,
	- 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,
		Al, 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,
	- 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,
	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,
		Analysis Method
CP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fa, Pb, Mg Mn, Hg, Ni, K)Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,
CP-MS	- 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,
GEAA	li li	Al Sh As Ba Re Cd Ca Cr Co Cu Fe Ph Mg Mn Hg Ni K Se Ag Na Tl V Zn Mo B Sn Ti

Comments: Mercury by CVAA if performed

LDC #: 29948B4

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, 2

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-	19
Action Level	52.045
Maximum ICB/CCB ^a (mg/L)	0.010409 52.045
Maximum PB ^a (ug/L)	
Analyte Maximum Maximum PB ^a ICB/CCB ^a (mg/Kg) (ug/L)	
Analyte	Fe

1, 12		
Samples: 1		
Associated Samples:		
ng/L	11	0.12
Sample Concentration units, unless otherwise noted: ug/L	Action Level	0.725
less otherw	Analyte Maximum Maximum Action PB ^a PB ^a ICB/CCB ^a Level (mg/Kg) (ug/L) (ug/L)	0.145
on units, un	Maximum PB* (ug/L)	
oncentratic	Maximum PB ^a (mg/Kg)	
Sample (Analyte	Pb

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 # <u>DA9</u>48BY

VALIDATION FINDINGS WORKSHEET Field Blanks

Page:_	of
Reviewer:	01
2nd reviewer:	

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

N N/A	Were field blanks identified in this SDG? Were target analytes detected in the field blanks?	
Sample:	Field Blank / Trip Blank / Rinsate / Other (SB) (circle o	ne)
	Analyte	Concentration Units (パダルナ
	Fe Ca(me/L)	0,024
	Chiago :	
Sample:	Field Blank / Trip Blank / Rinsate / Other (circle	one)
	Analyte	Concentration
	Fe	84
	(a (mg/L)	0.001
		,

100 # 5634804

VALIDATION FINDINGS WORKSHEET Initial and Continuing Calibration Calculation Verification

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 \approx concentration (in ug/L) of each analyte <u>measured</u> in the analysis of the ICV or CCV solution True \approx concentration (in ug/L) of each analyte in the ICV or CCV source

					Recalculated	Reported	
Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	%R	%R	Acceptable (Y/N)
ICN	ICP (Initial calibration)	ઇ	09975	90	5'66	806)~
7C)	ICP/MS (Initial calibration)	5	829'bh	B	82	843	
	CVAA (Initial calibration)						
	ICP (Continuing calibration)						
Cosc	ICP/MS (Continuing calibration)	£	99'70]	001	7 0	101	
3	CVAT (Continuing calibration)	Mg	9L'6h	50	8/8	5'bb	1
	GFAA (Initial calibration)	1					
	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#: 29948134

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

Page: 2nd Reviewer: 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 = Found x 100

Where, Found = Concentration of each analyte <u>measured</u> 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 = $\frac{|S-D|}{(S+D)/2} \times 100$

S = Original sample concentration D = Duplicate sample concentration Where,

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

 $%D = II - SDRI \times 100$

Where, I = Initial Sample Result (mg/L) SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Acceptable (Y/N) ٧-%R / RPD / %D Reported 1,21 97.7 507 %R / RPD / %D 9,86 タルク Recalculated (O) True / D / SDR (units) 000 たどつらて 00 8 1 (SSR-SR) 16871 Found / S / I (units) 1828 102,6 Element 5 હ £ لوا Laboratory control sample ICP interference check Type of Analysis ICP serial dilution Matrix spike **Duplicate** KUSAR 527 Sample ID $\tilde{\zeta}$ 0

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

LDC#: 2994867

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

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

Page:_	\of_	
Reviewer:	OR	•
2nd reviewer:_	1	-

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

Have results been reported and calculated correctly?

YN N/A YN N/A	Are results w Are all detect	ithin the calibrat tion limits below	ed range of the insthe the CRDL?	truments	and within t	he linear rai	nge of the IC	P?	
Detected anal equation:	yte results for _		Fe	-,	were re	ecalculated	and verified	using the following	nę
Concentration = RD = FV = In. Vol. = Dil =	(RD)(FV)(Dil) (In. Vol.) Raw data conce Final volume (m Initial volume (m Dilution factor	1)	Recalcul	lation:) -	52,6;	1914	<u>.</u>	
# 5	Sample ID		Analyte		Reported Concentrat (VS/L-)	ion Cor	alculated ncentration	Acceptable (Y/N)	
	3		Fe As Pb Ca Me 15	(ngli)	53 3.7 3.15 4.7 0.30 88 1.7	3 0 4.			
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

10100 20 7

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-3-3	рΗ	3 days	48 hours	J (all detects) UJ (all non-detects)	Р

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
МВ	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)	Α

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	pΗ	J (all detects) UJ (all non-detects)	Р	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)	А	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	А
1308660	EB-6-42913	Chloride	0.14U mg/L	А

LDC #: 29948B6

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

SDG #: 1308660 Laboratory: BC Laboratories, Inc.

2nd Reviewer:

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	BSU	Sampling dates: 4129/13
11	Initial calibration	Á	,
III.	Calibration verification	A	
IV	Blanks	SW	
V	Matrix Spike/Matrix Spike Duplicates	A	ms/0
VI.	Duplicates	A	O.O.
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	$ \wedge $	
XI	Field blanks	15W_	50=1 63=2

Note:

A = Acceptable

ND = No compounds detected

D = Duplicate TB = Trip blank

N = Not provided/applicable SW = See worksheet

R = Rinsate FB = Field blank

EB = Equipment blank

Validated Samples:** Indicates sample underwent Level IV validation

	ware	·					
1	SB-3-42913	11	MW-3-2	21 M	1W-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:	 		
,			

VALIDATION FINDINGS CHECKLIST

Page: \(\frac{1}{2}\) of \(\frac{1}{2}\)
Reviewer: \(\frac{1}{2}\)

Method:Inorganics (EPA Method See cover)

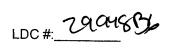
modification (2.1 // Modificace 2.000 =)				
Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.				
Cooler temperature criteria was met.				
II. Calibration				
Were all instruments calibrated daily, each set-up time?				
Were the proper number 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.	/	ſ		
Were the MS/MSD or duplicate relative percent differences (RPD) \leq 20% for waters and \leq 35% for soil samples? A control limit of \leq CRDL(\leq 2X CRDL for soil) was used for samples that were \leq 5X the CRDL, including when only one of the duplicate sample values were \leq 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?		1		
Were the performance evaluation (PE) samples within the acceptance limits?				

LDC#: 29948836

VALIDATION FINDINGS CHECKLIST

Page: Zof Z Reviewer: CZ 2nd Reviewer: V

Validation Area	Yes	No	NΑ	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.				



VALIDATION FINDINGS WORKSHEET Sample Specific Analysis Reference

Page:	_1_of1_
Reviewer:	CR
2nd reviewe	r:

All circled methods are applicable to each sample.

Sample ID	Parameter
1-17	PH/TDS/CI) F (NO, (NO, (SO4)O-PO4(AIR)CN NH3 TKN TOC C18+(CIO4)
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
QC1314	pH TDS (C) F (NO) (NO) (SO), O-PO, AIK CN NH3 TKN TOC (FB+) (CIO)
15	pH (TDS)(C) F (NO) (NO) (SO) O-PO4 AIK CN NH3 TKN TOC (C18+) CIO4)
16,11	pH TDS CI F NO3 (NO) SO4 O-PO4 AIK CN NH3 TKN TOC (CTG) CIO4
180	PH) TDS CI F NO3 (NO2) SO4 O-PO4 (ATK) CN NH3 TKN TOC (CTB+) CIO4
	pH TDS (C) F NO3 NO2 (SO4)0-PO4 AIK CN NH3 TKN TOC Cr6+ (CIQ)
21	PH TDS (C) F (NO) NO, SO O-PO4 AIK CN NH3 TKN TOC Cr6+ (CIO4)
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
·	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
-	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIK CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ AIk CN NH ₃ TKN TOC Cr6+ CIO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CI F NO3 NO2 SO4 O-PO4 AIK CN NH3 TKN TOC Cr6+ CIO4
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CI F NO ₃ NO ₂ SO ₄ O-PO ₄ Alk CN NH ₃ TKN TOC Cr6+ ClO ₄
	pH TDS CLF NO3 NO2 SO4 O-PO4 Alk CN NH3 TKN TOC Cr6+ ClO4
	pH TDS CLF NO, NO, SO, O-PO, Alk CN NH, TKN TOC Cr6+ ClO,

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Comments:__

LDC #: 29948B6

VALIDATION FINDINGS WORKSHEET Technical Holding Times

Page:_	of_	
Reviewer:	ar	
2nd reviewer:	$-\bar{\zeta}$	

All circled dates have exceeded the technical holding time.

Y N N/A Were all samples preserved as applicable to each method?

Method: Parameters: Technical holding time: Sampling Analysis Analysis Analysis Analysis Analysis Analysis	<u>YN N/A</u> Were all <u>YN N/A</u> Were all coole	samples preser er temperatures	ved as applicab <u>within validatior</u>	le to each methon criteria?	od ?			
Technical holding time: Sampling Analysis			150.1					
Sampling Analysis	Parameters:							
Sample ID date date date date Qualit	Technical holding tin	ne:	48hg					
Sample ID date date date date Qualit	·	Sampling	Analysis	Analysis	Analysis	Analysis	Analysis	
170, 18 9[29](5 51415 C3day)	ا لما	date	date	date			date	Qualifier
	1-12,18	119115	51415	CSday)			DIOTH
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LDC #:	SDG#

VALIDATION FINDINGS WORKSHEET Negative Blanks

Page: or Reviewer: O.

METHOD: Inorganics, Method

The absolute value of the negative blank conentrations listed below exceeded the RL

Qualifications Associated Samples þ 110m 200'0 -0,00495mg/l Negative Blank Concentration Analyte \$ Blank ID Comments: MB

NEGBLANK.4SW.wpd

LDC #: 29948B6

VALIDATION FINDINGS WORKSHEET Blanks

Page: Of A Reviewer: CA 2nd Reviewer:

METHOD:Inorganics, Method See Cover

s: All			
Associated Samples:			
ociate			
Ass		2	0.14
		-	0.19
	Blank	Action Limit	0.685
	Blank ID	ICB/CCB (mg/L)	0.137
: mg/L	Blank ID	PB	0.103
Conc. units:	Analyte		ō

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 #: SDG #:	9948036	VALIDATION FINDING <u>Field Bla</u>	S WORKSHEET nks	Page: of Reviewer: Other Page: of Page: Other Page: Ot
YN N/A	Were field blank Were target anly	res identified in this SDG? ytes detected in the field blank Field Blank / Trip Blank	is?	3
		Analyte	pH(units)	Concentration Units (Mg/)
Sample:	2	Field Blank / Trip Blank / F	Rinsate (circle one	
		Analyte	pH (units) Cl NO35N	Concentration Units (MG) / L 5.54 0.14 0.047

100 #: 20948B6

Validation Findings Worksheet Initial and Continuing Calibration Calculation Verification

Page: of Reviewer: 22nd Reviewer: 1

Method: Inorganics, Method See Core

_ was recalculated.Calibration date: $\frac{9/29}{6}$ The correlation coefficient (r) for the calibration of An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100

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

					Recalculated	Reported	Acceptable
Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	r or r²	r or r²	(Y/N)
Initial Calibration		0	0.15	0.013			
Verification		s1	0.5	0.078	0.99985	0.99654	
		s2	5	0.724			-
	<i>-</i>	s3	20	3.158)-
		s4	90	9.641			_
		SS	100	20.924			
		98	200	21.698			-
Calibration verification	Sor	#CV	100	100.063	100	(30)	
Calibration verification	Clor	CCVI	01	9,2681	92.7	627	
Calibration verification	NOUN	CCV7	5'0	0.4582r	417	4.7)

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 # 29948 DL

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

2nd Reviewer: Page:_ Reviewer.

METHOD: Inorganics, Method Seconer

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

Where, $%R = Found \times 100$

Found = concentration of each analyte <u>measured</u> 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:

Where, RPD = $\frac{|S-D|}{(S+D)/2}$ x 100

S = 0

Original sample concentration Duplicate sample concentration

I			 	T	7
		Acceptable (Y/N))		1
	Reported	%R/RPD	9.pp	8,8	621.0
	Recalculated	%R/RPD	99.8	8.5	0.129 0.129
		True / D (units)	285	10, 101	7.78
		Found / S (units)	286	(SSR-SR) S, 1785 10.101	U'L
		Element	108	600	も
		Type of Analysis	Laboratory control sample	Matrix spike sample	Duplicate sample
		Sample ID	SZI	19	Å

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#: \ \ Qa4875

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page: Of Pag

METH	IOD: Inorganics, Metho	od <u>See Cov</u>	62_			
Please X N Y N Y N	N/A Have results N/A Are results w	been reported	ons answered "N". Not app and calculated correctly? ated range of the instrumen v the CRQL?		e identified as "N	/A".
	ound (analyte) results t ulated and verified usin		equation:	rep	orted with a positi	ve detect were
Concen	tration = .0002x2+0.1774 = 0	o.0133	Recalculation: \[\frac{14(0 \text{ part})(1.6}{2} \]	37+0.0133)+	-6.1774) ²	1 -0.1774
			7	(0.0002)		9,7
#	Sample ID		Analyte	Reported Concentration	Calculated Concentration (W2/4)	Acceptable (Y/N)
	3		off(units)	9.613	9,61	7
			C\	9,2	9.2	
			NO3-N	8,1	0039	
			AIK	170	6,1	
	· · · · · · · · · · · · · · · · · · ·		Bicarb.	170	120	
			(a13)	42	42	+
	-					
Vote:_						
						· · · · · · · · · · · · · · · · · · ·